PEAC
PRIVATE EDUCATION ASSISTANCE COMMITTEE
Trustee of the Fund for Assistance to Private Education

DepED
DEPARTMENT OF EDUCATION

2016

LEARNING MODULE

Mathematics G7 | Q1.1

Number and Number Sense

PEAC
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Trustee of the Fund for Assistance to Private Education

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NOTICE TO THE SCHOOLS

This learning module (LM) was developed by the Private Education Assistance Committee under the GASTPE Program of the Department of Education. The learning modules were written by the PEAC Junior High School (JHS) Trainers and were used as exemplars either as a sample for presentation or for workshop purposes in the JHS In-Service Training (INSET) program for teachers in private schools.

The LM is designed for online learning and can also be used for blended learning and remote learning modalities. The year indicated on the cover of this LM refers to the year when the LM was used as an exemplar in the JHS INSET and the year it was written or revised. For instance, 2017 means the LM was written in SY 2016-2017 and was used in the 2017 Summer JHS INSET. The quarter indicated on the cover refers to the quarter of the current curriculum guide at the time the LM was written. The most recently revised LMs were in 2018 and 2019.

The LM is also designed such that it encourages independent and self-regulated learning among the students and develops their 21st century skills. It is written in such a way that the teacher is communicating directly to the learner. Participants in the JHS INSET are trained how to unpack the standards and competencies from the K-12 curriculum guides to identify desired results and design standards-based assessment and instruction. Hence, the teachers are trained how to write their own standards-based learning plan.

The parts or stages of this LM include Explore, Firm Up, Deepen and Transfer. It is possible that some links or online resources in some parts of this LM may no longer be available, thus, teachers are urged to provide alternative learning resources or reading materials they deem fit for their students which are aligned with the standards and competencies. Teachers are encouraged to write their own standards-based learning plan or learning module with respect to attainment of their school's vision and mission.

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MATHEMATICS 7

Module 1.1: Number and Number Sense

☑ **MODULE INTRODUCTION AND FOCUS QUESTION(S):**

Have you at a certain time asked yourself what would life have been like without numbers? If yes, how have you pictured it? Do you picture it as a progressive life? A life filled with technology? If so, why do you think that would be the case?

Read on and discover how vital numbers are in our life.

☑ **MODULE LESSONS AND COVERAGE:**

In studying this module, you will examine these questions when you take the following lessons:

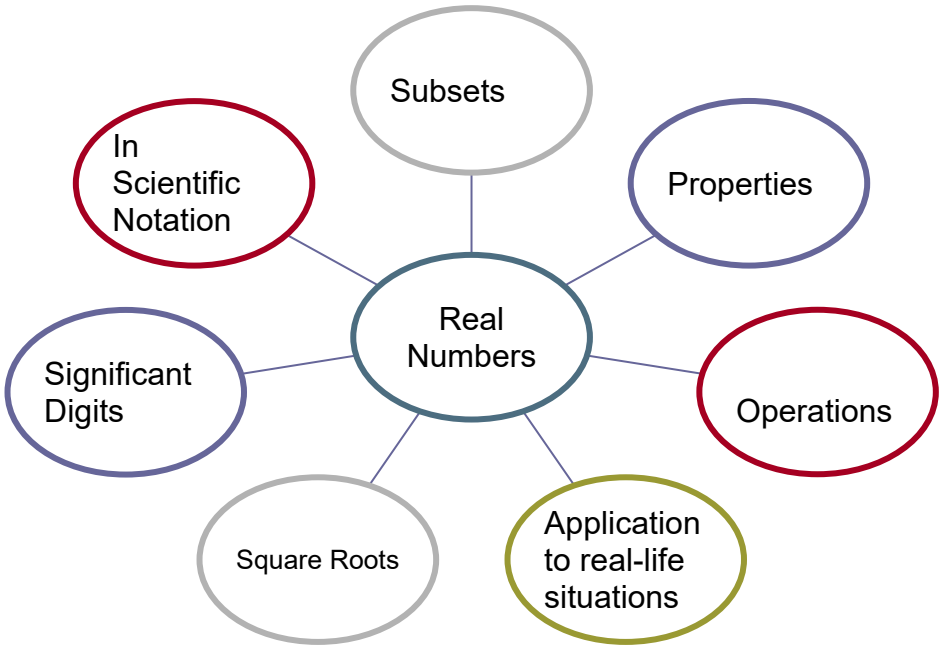
Lesson No.	Title	You'll learn to…	Estimated Time
Lesson 1	BASIC IDEA OF SETS	Describe and illustrate well-defined sets, universal set, subsets and null sets. Define, describe and find the union, intersection and complement of sets. Describe, represent and compare the different subsets of real numbers. Use Venn-diagram to represent sets, subsets, and set operations.	2 hrs
Lesson 2	REAL NUMBER SYSTEM	Describe and illustrate the absolute value of a number on a number line as the distance of the number from 0.	5 hrs

		Arrange real numbers in increasing or decreasing order. Perform fundamental operations on integers: addition, subtraction, multiplication, division State and illustrate the different properties of the operations on integers. Define and illustrate rational numbers and arrange them on a number line. Express rational numbers (both repeating and terminating/non-repeating and non-terminating) from fraction form to decimal form and vice versa. Perform operations on rational numbers and illustrate their properties. Define and illustrate irrational numbers	
Lesson 3	SQUARE ROOTS	Determine between what two integers the square root of a number is. Describe principal roots and tell whether they are rational or irrational. Illustrate and graph irrational numbers on a number line with and without appropriate technology. Estimate the square root of a number to the nearest tenth.	3 hrs
Lesson 4	SIGNIFICANT DIGITS	Define and illustrate significant digits	2 hrs

		Determine the significant digits in a given situations.	
Lesson 5	SCIENTIFIC NOTATION	Define and illustrate scientific notation Write very large or very small numbers in scientific notation.	2 hrs

☑ **Concept Map of the Module**

Here is a simple map of the above lessons you will cover:



☑ Expected Skills

To do well in this module, you need to remember and do the following:

1) Answer all the exercises and process questions completely.
2) Study the explanations well.
3) Supplement yourself with other learning materials when available and necessary.
4) Write down your thoughts to help you in processing information.
5) Keep in mind that your success in this module depends on how much effort you put into doing the activities in this module.

PRE-ASSESSMENT

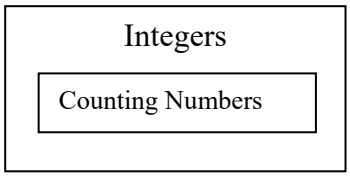
Let's find out how much you already know about numbers and number sense. Answer the exercise below.

Exercise 1: Click on the letter that you think best answers the question. Please answer all items then click on "Submit" to see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this module.

1) If set A = { 1, 2, 3, 4, 5 }, which of the following sets is a subset of set A? *(A)*

A. B = { }
B. C = { 0, 1 }
C. D = { 1, 3, 6, }
D. E = { 2, 4, 8 }

2) Which of the following sentences describes the relationship illustrated in the diagram? *(M)*



A. All integers are counting numbers.
B. All counting numbers are integers.
C. Counting numbers are not integers.
D. Some counting numbers are integers.

3. As part of your research work, you need to gather data in the specific subjects enrolled by 228 students. Your research output will be presented to the panel during your defense. Your data shows the following enrolment records

Biology = 86 students
Communication Arts = 89 students

Algebra = 145 students
Algebra and Biology = 24 students
Biology and Communication Arts = 16 students
Algebra and Communication Arts = 22 students
Algebra, Biology and Communication Arts = 15 students

How many students are enrolled in only one subject? *(T)*

A. Algebra = 84, Biology = 31, Communication and Arts = 36
B. Algebra = 145, Biology = 86, Communication and Arts = 89
C. Algebra = 84, Biology = 79, Communication and Arts = 36
D. Algebra = 49, Biology = 62, Communication and Arts = 62

4. Which of the following shows the Associative Property of Integers? *(A)*

A. (-4 + 5) + 9 = 9 + (-4 + 5)
B. -4 (5 + 9) = (-4)(5) + (-4)(9)
C. (-4 + 5) + 9 = -4 + (5 + 9)
D. (-4 + 5) + 9 = 9 + (5 + -4)

5) Simplify $\frac{-3\,[(-4+2)-(-9+6)]}{(-4-1)}$. *(A)*

A. -3
B. -1/5
C. 3/5
D. 1

6. What operation is best to use to solve the problem below?
The water level in Ipo Dam is at 150.20 meters, which is above its overflow limit of 100.87 meters. How much water must be released to put the dam in stable water level? (M)

A. addition
B. subtraction
C. multiplication
D. division

7. As a student, you are asked to record your cash flow for the week as a requirement in your Technology and Livelihood Education subject. Considering a + sign for the allowance received and – sign for the expenses incurred as shown below, which figure would best represent the amount at the end of the week? *(T)*

+60, -45, +70, -52, +65, -48, +70,-55, +65, -42

A. -88
B. -98
C. 88
D. 98

8. You are a bakery owner and you want to know if you have made a profit for the day. You are given the following information: (T)

i. The daily wage of your employees is Php 500.00 each and you have 4 employees.

ii. The bakery sold 1000 pieces of bread at Php 5.00 each.

iii. Other operational expenses of the bakery amounts to Php 2000.00

Did the bakery make a profit for the day?

A. Yes, the bakery made a profit of Php 1000.00 for the day.
B. Yes, the bakery made a profit of Php 2500.00 for the day.
C. No, the bakery just managed to break even for the day.
D. No, the bakery lost Php 500.00 for the day.

9. Perform the indicated operations. $[(1/3 + 1/3) - ½][1/8 \div ¼]$ (A)

A. 1/12
B. 1/8
C. 1/6
D. 1/4

10. Which of the following is an irrational number? (A)

A. a repeating terminating decimal
B. a repeating non-terminating decimal
C. a non-repeating non-terminating decimal
D. a non-repeating terminating decimal

11. You want to buy your mother a gift worth Php 200. If your daily allowance is Php 100.00, which of the following would let you save for the gift in the least number of days? (M)

A. saving 1/5 of your daily allowance
B. saving 2/5 of your weekly (5 school days) allowance
C. saving 0.3 of your daily allowance
D. saving 0.15 of your weekly allowance

12. A rich man died without leaving a will. As such, his widow will get half of the inheritance and the rest will be equally divided among his five children. What part of the inheritance will each child get? (M)

A. 1/20
B. 1/10
C. 1/5
D. ½

13) Ana plans to buy a bag worth P 600.00. She receives a daily allowance of P60.00 during school days. If she saves ¼ of her allowance, how long would it take her to buy a bag?

A. 20 days
B. 30 days

C. 35 days
D. 40 days

14) What number has no real square root? (A)
A. odd
B. even
C. positive
D. negative

15) Which of the following is TRUE? (A)
A. $\sqrt{-9} = -9$
B. $\sqrt{50} = 5\sqrt{2}$
C. $2\sqrt{16} = 6$
D. $\sqrt{0} = \pm 0$

16) What is the answer when you simplify? (A)
A. 16
B. 26
C. $\sqrt{196}$
D. $\sqrt{246}$

17) Which of the following has two significant digits?
A. 0.024
B. 2.40
C. 24.03
D. 243

18) Which is the scientific notation of 42,000? *(A)*
A. 42×10^3
B. 4.2×10^4
C. 42×10^{-3}
D. 4.2×10^{-4}

19) Ana was given the following distances (in km) measured individually by 5 runners in a recently held fun run in Pasig as follows; 5.67, 1.1, 0.9378 and 7.73. having observed that each measurement differs in the number of significant digits, how should Ana express the average in relation to significant digits? *(M)*
A. the average is rounded off to 4 significant digits
B. the average is rounded off to 3 significant digits
C. the average is rounded off to 2 significant digits
D. the average is rounded off to 1 significant digits

20) You are an aspiring astronomer. Your mentor has tasked you to research the distances of different planets from the sun. Which is the most efficient way to represent your data?*(T)*

A. use of scientific notation
B. use of standard notation
C. use of exponential notation
D. use of expanded notation

Lesson 1: The Basic Idea of Sets

EXPLORE

Let us start the module by doing the Think-Pair-Share activity. As you go through this part, keep on thinking about this question: ***How does the classification of numbers help us solve daily life problems?***

ACTIVITY 1. Group Me!

Using the numbers -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9, form 3 different groups of numbers according to the kind of description you would like to label each group. Complete the table below and answer the study questions that follow. Then click 'SUBMIT" to check your answers.

GROUP OF NUMBERS	DESCRIPTION

Teacher's answer to the activity:
Answers here may vary depending on how you decided to group and label your answers. For example, 0,1,2,3,4,5,6,7,8,9 are whole numbers less than 10; -1, -2,-3,-4 are negative integers greater than -5; 1,3,5,7,9 are odd numbers less than 10; 2,4,6,8 are even numbers less than 9; 1,2,4,8 are factors of 8.

Study Questions:

1. How many groups did you make?

   _____
   _____
   _____

2. How did you group the numbers? What guided you?

   _____
   _____
   _____

3. Is there a right way of classifying numbers? Explain.

   _____
   _____
   _____

4. Where in daily life do you find yourself classifying numbers? How often do we do this task?

   _____
   _____
   _____

5. Is classifying numbers important for computation? Why or why not?

   _____
   _____
   _____

On your own, you tried to group and label the given numbers. Let's find out how to classify these numbers by doing the next part.

FIRM-UP

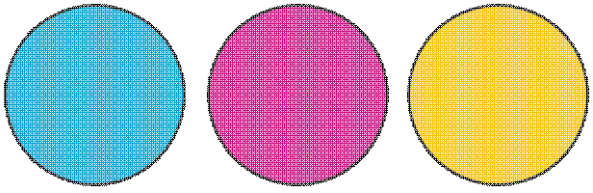
You just tried doing a simple activity on classifying numbers. Your goal in this section is to learn the different types of classification.

Reflect on the question:

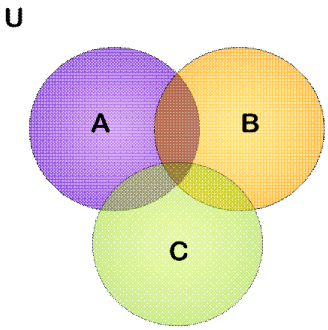
How would you determine the appropriate type of classification needed to solve real-life problems?

Types of classification

1**. DISCRETE** Classification involves dividing objects (or concepts) into groups such that there is no overlap between the groups. Any single item is a member of only one group at a time.

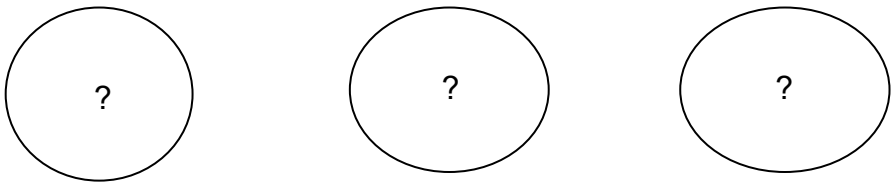


2. **OVERLAPPING** Classification involves as its name implies, dividing objects (or concepts) into groups such that some items belongs to more than one group simultaneously.



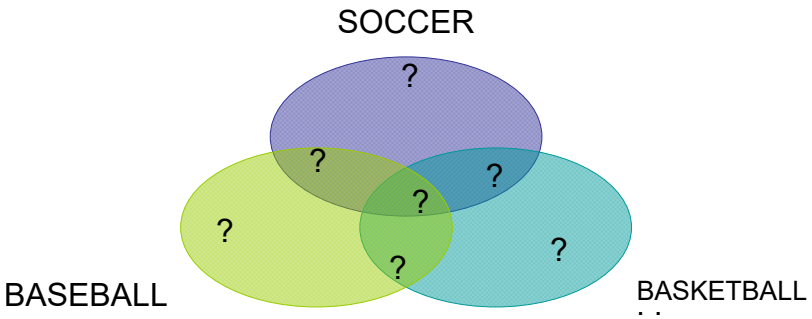
3. **HIERARCHICAL** Classification involves the groups being placed one inside another.

Given different objects such as orchid, gumamela, apple, pechay, orange, durian, Cabbage and strawberry, you can classify them as fruits, flowers, and vegetables using discrete classification.

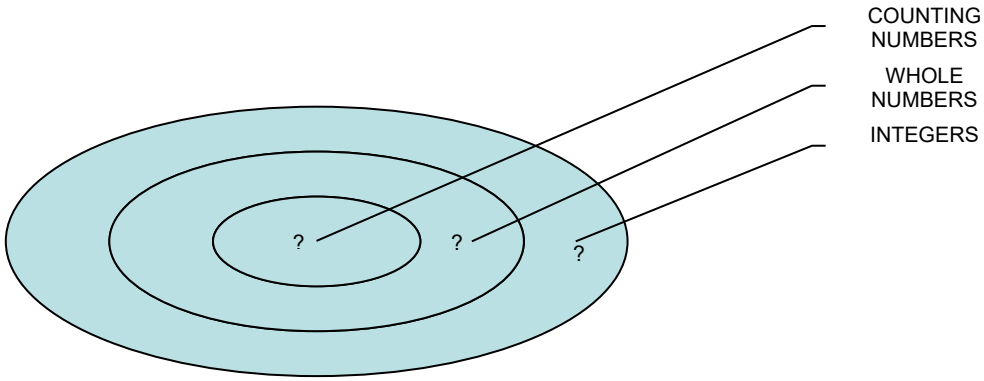


FRUITS FLOWERS VEGETABLES

Knowing the names of the varsity players in your school, you can classify them using overlapping classification. Who are these players who are good in basketball only? Who are good in soccer only? Who are good in baseball only?
Who are these players who are good in soccer and also in basketball? Who are these players who can play baseball and basketball? Who can play baseball and soccer? Is there anybody who can be a soccer, baseball and basketball varsity?



Given sets of numbers like 0, 1, 2, 3, -2, -3, -4, 4, 5, 6 and -1: You can classify them using hierarchical classification. Which numbers here are counting numbers? Which are whole numbers? Which are integers? Are counting numbers whole numbers? Are whole numbers integers?



Try This!

ACTIVITY 2. Classifying concepts using appropriate type of classification.

Consider the three types of classification. Classify the given concepts in A, in B, and in C.

A. Squares, Circles, Triangles
B. Integers, Whole numbers, Rational numbers
C. Using Numbers 1 to 20: Prime numbers, Even numbers, Multiples of 12

Create a discrete classification using the concepts in A, overlapping classification using concepts in B and hierarchical classification using concepts in C. Then click "SUBMIT" to check your answers.

Write your answers here:

ACTIVITY 3. Journal Writing – Recording one's thoughts/feelings

Write a brief description of how to create or make a discrete, overlapping and hierarchical classification of concepts/objects. Then click "SAVE".

You gave your initial idea on how concepts/objects are classified. Your goal in this section is to enhance your learning and understanding of key concepts of sets and its operation, and subsets of real numbers using Venn diagrams.

Remember to focus on these questions:

How can one organize and represent information to be processed and learned using set concepts and operations?

How can we solve real-life problems using these concepts?

Classifying things is putting things in a set. Do this in the next activity.

ACTIVITY 4. Describing a set

List down the following and make a description for each group:
Group A: Three classroom objects
Group B: Four favorite fruits
Group C: Three favorite flowers

Group's Description:

Answer the question:
1. When can we say that a collection of things is well-defined?
Given the two collections below, which of the two collections is a set? Justify your answer.

a. The collection of the three best TV programs.
b. The collection of cabinet secretaries presently serving in our government.

Justification!

A **set** is a well-defined collection of items/objects. “Well-defined” means that we can decide whether the object does or does not belong to the set. Each item is called an element or a member of the set.

A set is usually named with a capital letter and maybe defined in three ways:

1. Roster or listing method. **This is done by listing the elements of a set. For example a set of ball games may be written as**

A = { basket ball, volley ball, baseball, soccer, foot ball}

2. Description notation or Rule Method. **This is done by writing the elements of a set with the use of a descriptor. For example, B = {x| x is scenic spot in the Philippines}. This is read as “the set B contains the element x such that x is a scenic spot in the Philippines.”**

The elements are separated by commas and enclosed in braces. If the number of elements is a set is large, we can write only enough elements to establish a pattern.

S = { 0,2,4,6,…,18}

In set S, the three dots indicate that the pattern continues through 18, but the numbers between 6 and 18 are not listed.

1. A set may also be defined by stating a property which its elements must satisfy. This is called the rule method. To do this we can use the set-builder notation form of a set.

Example: Set W is a set of whole numbers
If “x “ represent any whole number, we present this as

W = { x/x is a whole number }

Read as “ the set of all x such that x is a whole number.”

To show that 5 is an element of the set W, write $5 \in W$ read as “ 5 is an element of the set W” and to indicate that 4.3 is not an element of set W, write $4.3 \notin W$.

Exercise 1. Define each set in roster notation.

1. whole numbers less than 15

_____

2. vowels in the name Figueroa

_____

3. integers greater than -4

_____

4. months having 30 days

_____

5. whole numbers greater than 3

_____

6. whole numbers less than 7

_____

7. natural numbers less than 10

_____

8. consonants in the name Kenneth

_____

9. days of the week

_____

10. set of whole numbers

_____

We previously defined what a set is. We now describe other terms related to it.

Remember to focus on these questions:

How the types of classification facilitate the organization and processing of information to solve real-life problems?
How can one organize and represent information to be processed and learned ?
How can these terms related to sets be used to understand the operations of sets?

UNIVERSAL SET:

Note that when all the sets in a discussion are subsets of a given set, we call that "over-all" set the universe or the universal set (U) of the discussion. When you are talking about whole numbers, the universe is { 0,1,2,3,…}. In any discussion, it is important to know what the universe is. An infinite set is a well-defined collection of items/objects (elements cannot be counted or listed) as the set of whole numbers or the set of real numbers. It can be finite set (elements can be counted or listed) such as { a,e,i,o,u }.

Exercise 2. Tell whether each of the following sets is finite or infinite:

1. { 0, 3, 6, 9,…}

_____ _____

2. { 1, 2, 3,…, 7, 8 }

_____ _____

3. { 9, 10, 11, 12,…}

_____ _____

4. { 2, 8, 6, 7 }

_____ _____

5. { 8, 10. 12,…,20, 22}

_____ _____

6. W = { the set of whole numbers}

_____ _____

7. L = { the set of whole numbers less than 7 }

_____ _____

ACTIVITY 5. Defining a null or empty set

Consider the following sets:
A = set of weeks containing 8 days
B = set of letters in the word “door” that are also in the word “maybe”
C = set of digits in the numeral “584” that are also in the numeral “10,396

Questions to Answer:

What are the elements of set A? set B? and set C?
What did you notice in your answers?
What do you call this type of set?

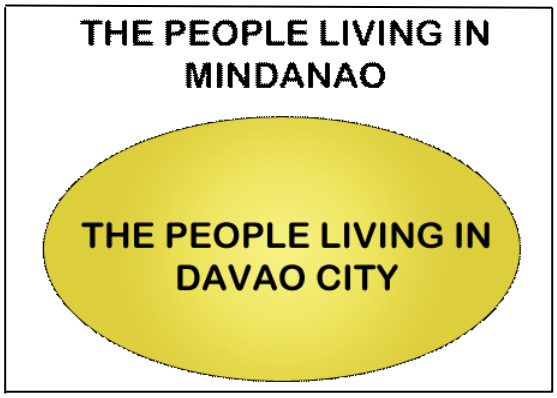
A **null or an empty set** is a set with no elements. Ø is a symbol used to denote an empty of null set.

SUBSETS

LET US EXPLORE:

Does every person living in Mindanao live in Davao City? No. But everyone lives in Davao City lives in Mindanao. We describe the relationship by saying that the set of people living in Davao City is the subset of (in symbol, $\subset$) the set of people living in Mindanao.

{The people living in Davao City } $\subset$ {The people living in Mindanao }
The diagram below illustrates this statement.



{The people living in Cagayan de Oro City } $\subset$ { The people living in Mindanao}. What else can you consider as a subset of the set of people living in Mindanao? Can you consider yourself as a part of the subset of the people living in Mindanao? Why or why not?

{The people living in Luzon } $\not\subset$ { the people living in Mindanao }. Can you name/list some sets that are not subsets of the people living in Mindanao? What are these sets?

How many subsets of the set S = {a, b, c } can you identify? To find these subsets is to form them by choosing elements of S. For example, if you choose the elements a and b, you form the subset { a, b }. If you decide to choose all the elements of S, you obtain { a, b, c } , which is S itself. Thus, S $\subseteq$ S. It is called an

improper subset. The other subsets of a set are called proper subsets. What happens if you choose no element of S at all? You form a set with no elements. Thus if S is any set whatever, then Ø is a subset of S.

Exercise3. List down the subsets of the following sets and indicate the number of subsets for each set.

1.{ a }
Subsets:
_____
Number of Subsets:
_____

2. { a, b }
Subsets:
_____
Number of Subsets:
_____

3. { a, b, c }
Subsets:
_____
Number of Subsets:
_____

4. { a, b, c, d }
Subsets: _____
Number of Subsets: _____

Questions:
a. How did you determine the number of subsets?
_____
_____
_____

b. Give a set with n elements, how many subsets can you form?
_____
_____
_____

c. How will you check if your formula is correct?
_____
_____
_____

In exercise 3 , you see that the number of subsets of a set with n elements is 2n.

Apply the formula you have derived in the next exercise.

Exercise 4.

Determine the number of subsets for the following sets:

1. { } or _____
2. { 1 } _____
3. { 1, 2, 3 } _____
4. { 1, 2, 3, 4 } _____
5. A set of 5 elements or members _____
6. A set of 6 elements _____

Write yes or no to tell whether the first set is a subset of the second set.

1. { 2, 4 } ;{ 2, 4, 6 } _____
2. { 5, 7 }; { 1, 7, 8 } _____
3. {1, 2, 3, 5 }; { 1, 2, 3, 5 } _____
4. { }; { 1, 2, 3, 5, 6, 7 } _____
5. { 7 }; { 3, 5, 7 } _____
6. { 1, 3, 5 }; { 1, 2, 3, 4, 5 } _____
7. { 3, 4, 5 }; { 1, 2, 3, 4,… } _____
8. { 7, 9 }; { 1, 3, 5, 9, 11 } _____
9. {2, 4, 6 }; { 0, 2, 4, 6, 8,.. } _____
10. { 3, 4 }; { 3, 4 } _____

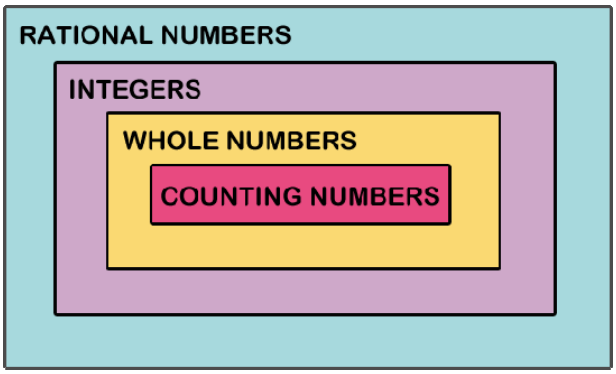
You learned sets, its subsets and its operations. Now, let's apply what you have learned to the set of real numbers. You know pretty well that sets of numbers are important in Mathematics. The next exercises will determine how well you can recall the different subsets of the set of real numbers.

Exercise 5. Identify or name the following sets of numbers:

1. { 1, 2, 3, 4, 5, 6,…} _____
2. { 2, 4, 6, 8, 10, 12,…} _____
3. { 2, 3, 5 7, 11, 13,…} _____
4. { 0, 1, 2, 3, 4, 5, 6,…} _____
5. { 1, 3, 5, 7, 9, 11,…} _____
6. { 4, 6, 8, 9, 10, 12,..} _____
7. { …, -4, -3. -2, -1 } _____
8. { √2, √3, √5,…} _____
9. { set of fractions} _____
10. { set of decimals} _____
11. { …, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, …} _____

Most set of numbers are parts of other sets of numbers. Venn diagrams (invented by John Venn, an English mathematician) are used to show relationship between sets. Venn drew a rectangular region to represent the universal set U. He used circular regions within the rectangle to represent subsets of U. The diagram below shows how counting numbers, whole numbers, integers, and rational numbers are related.

Diagram # 1



Questions to Answer:

1. How does the set of counting numbers differ from the set of whole numbers?
2. How would you describe the relationships of the sets of numbers as illustrated in the diagram?

Exercise 6.

Classify the following numbers as counting numbers, whole numbers, integers, and rational numbers. Put a √ mark.

	Counting Numbers	Whole Numbers	Integers	Rational Numbers
0				
2				
-3				
1 ¾				
1.5				

Classify the following numbers as rational, irrational, or real numbers. Put a √ mark.

	Rational Numbers	Irrational Numbers	Real Numbers
2/3			
7			
0			
2.6			
√2			
√3			
√5			

Questions to Answer:

1. Which rational number is an integer but not a whole number?
2. Which set/s of numbers are/is subset/s of whole numbers?
3. Which are subsets of integers?
4. Which are subsets of Rational numbers?
5. Which are subsets of Irrational Numbers?

We are done with the basic idea of sets as well as subsets of the set of real numbers. Answer the next activities.

For you to be guided, keep in mind these questions:

How the types of classification facilitate the organization and processing of information to solve real-life problems?

How can one organize and represent information to be processed and learned ?

How can we solve real-life problems using these concepts?

ACTIVITY 6.

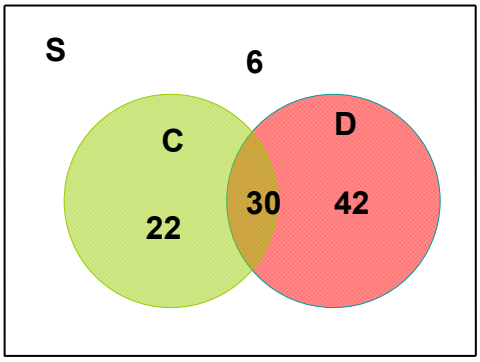
Answer the following questions.

1. How many counting numbers less than 50 are even and not composite.
2. How many counting numbers less than 50 are both even and composite?
3. What is the intersection of the set of integers and the set of positive numbers?
4. What is the union of the set of rational numbers and the set of irrational numbers?
5. What is the union of zero and the set of natural numbers?
6. Find three types of numbers that are subsets of one other type of numbers.
7. Find two types of numbers that are subsets of at least two other types of numbers.
8. A student council representative surveyed 100 students to find what type of refreshments they purchased at basketball games. The results of the survey are shown below.

S = the set of students surveyed
C = the set of students who purchased candy bars
D = the set of students who purchased soft drinks

How many students surveyed purchased neither candy bars nor soft drinks?

A. 42 B. 30 C. 22 D. 8 E. 6



We are done discussing the subsets of real numbers. Let's now move on to the operations of sets. One of these is the union of sets. How the subsets of the set of real numbers are can be illustrated in the operations of sets?

UNION (OR SUM) OF SETS:

Exercise 7. **Defining Union of Sets**

Consider the situation below.

A Club Merger.

The Mathematics club and the Science Club at GSC High School held a joint meeting to discuss plans to combine the two groups. Only members of one or the other of these groups were admitted to the meeting.

Given the following facts, tell which of the students, Ana, Ben, Cathy and Dante, were allowed into the meeting.

Ana belonged to the Mathematics Club but not to the Science Club.
Ben belonged to the Science Club but not to the Mathematics Club.
Cathy belonged to both clubs.
Dante belonged to neither clubs.
Justify your answer.

Write answers here.

Two or more sets can be combined to form new sets. Two of these new sets are the union (sum of sets) and intersection (product) of the sets. These sets are best illustrated using the Venn diagrams.

Diagram #2 (yellow green color)

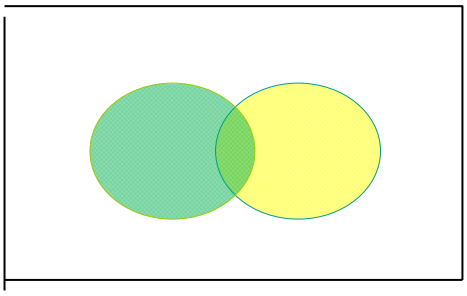
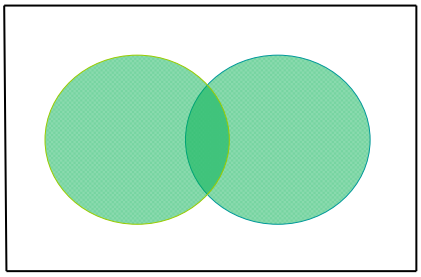


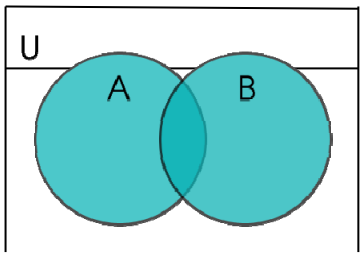
Diagram #3 (green color)



How would you describe the union of two sets? How would you describe the intersection of two sets.

A union B , written as (AUB), is the set consisting of all elements that are found in A or in B or in both.

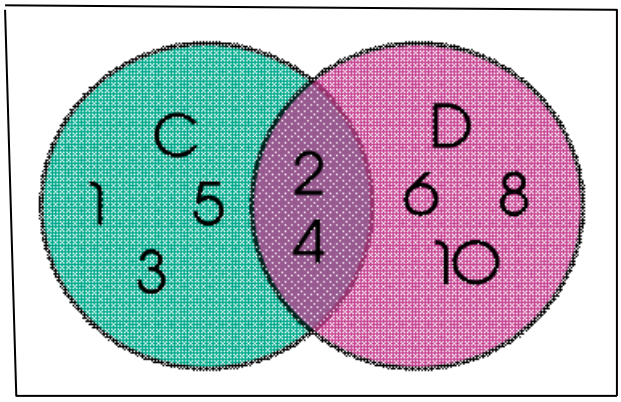
AUB = { x/x € A or x € B }



Using the diagram #4 below, find CUD by listing the elements or members.

C U D =?

Diagram #4



Answer: C U D = {1,2,3,4,5,6,8,10}

Questions to Answer:

1. How are the elements of the union of two or more sets determined?
2. In what real-life situations will this idea of the union of sets make sense?

Let's now move to the next operation of sets.

INTERSECTION (OR PRODUCT) OF SETS: ????

Exercise 8. Defining Intersection of Sets
Consider the situation below.

An insurance agency began a sales campaign to win new customers. During the first week of the campaign 15 new customers bought fire insurance and 25 new customers bought auto-mobile insurance. However, the agency counted only 36 new customers during the week. How did the agency manager explain the difference between the number of new customers and the number of insurance policies issued to new customers?

Answer box:

Given any sets, whether they are sets of insurance policy holders , sets of numbers, or sets of other objects, it is often useful to ask, "What members, if any, do the sets have in common?" The set containing elements common to two or more sets is called the intersection of sets.

Definition:

The intersection of A and B, written as A∩B, is the set consisting of all elements that are found in both sets A and B.

In symbols we write this as

A∩B = { x / x € A and x € B }

Referring to diagram 4, find C∩D by listing the members.

Answer: { 2,4 }

Study further the examples below.

Given sets: A = { 1, 3, 5 }, B = { 3, 6 } and C = { 2, 4 }.

Find:

a. AUC b. AUB c. A∩B d. A∩C e. (A∩B)UC

Solution:

AUC is the set of those elements that are in A, in C or in both sets.
{ 1, 3, 5 } U { 2, 4 } = { 1, 2, 3, 4, 5 }
AUB is the set of those elements that are in A, in B or in both sets. Common elements are listed only once. Thus, { 1, 3, 5 } U { 3, 6 } = { 1, 3, 5, 6 }.
So, AUB= { 1, 3, 5, 6 }

A∩B is the set of elements common in A and B. The only element common to both A and B is 3. { 1, 3, 5 } ∩ {3, 6} = { 3 }. So, A∩B = { 3 }.
A∩C have no element in common. So, A∩C = Ø.
(A∩B)UC = { 3 }U{2, 4}. So, (A∩B)UC = { 2, 3, 4 }

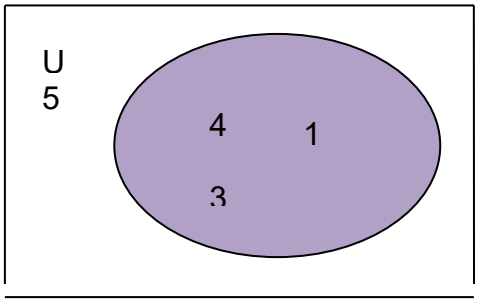
Questions to Answer:
1. How are elements of the intersection of two or more sets determined?
2. In what particular situation in real life will this idea apply?

Another operation on sets is finding their complements. Let's now find out what the complement of a set is all about and where in real life can we see this concept at work.

COMPLEMENT OF THE SET (OR DIFFERENCE OF TWO SETS)

Look at the diagram below. What are the elements of U? What are the possible subsets? Is set A a subset of U? What are elements of U that are not elements of A? These elements comprise the complement of a set. In set-builder notation, A^C or A' = { x/ x ∈ U and x ∉ A }. In the diagram below, A^C or A' = { 1, 2, 5 }

Diagram #5



If U is the universal set, the complement of S with respect to U is written as S^c or S' (read as "S prime") is the set consisting of all elements of U that cannot be found in S. If U = { 1, 2, 3, 4, 5, 6, 7, 8, 9 } and S = { 0, 2, 4, 6, 8 }, what do you think are the elements of S' or S^C ?

For further readings about the lesson, visit
http://www.infoplease.com/ce6/sci/A0861028.html

You just learned the basic operations of sets . Check your understanding by doing the following activities.

ACTIVITY 7.

Let U = { 1, 2, 3, …,19, 20 }; A = { 2, 3, 5, 7, 11, 13, 17, 19 }
B = { 2, 4, 6, 8, … , 18 } and D = Ø

Find the following:

1. A^C or A' _____
2. B^C or B' _____
3. A∩B _____
4. B∩C _____
5. BUC _____
6. CUD _____
7. AUB _____
8. (A∩B)∩C _____
9. A∩(BUC) _____
10. CU(B∩A) _____

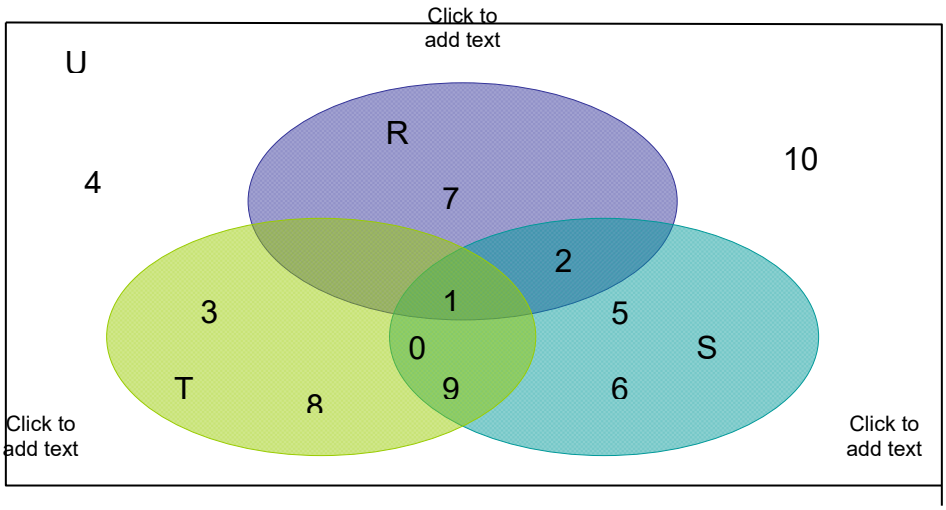
Questions to Answer:

1. How's your understanding of the types of classification helps you in doing the operations of sets?
2. How can you apply your understanding of the operations of sets to solve real - life problems? In what particular situation?

In the next activity you will be asked to do set operations given a Venn diagram to describe the relationships of sets. Probe into your understanding of set operations by doing the activity.

ACTIVITY 8.

Refer to the diagram below, and name the members/elements of each of the following sets.



1. RUS _____
2. RUT _____
3. TUS _____
4. UUR _____
5. TUU _____
6. RUR _____
7. (RUS)UT _____
8. RU(SUT) _____
9. (S∩T)UR _____

10. (R∩S)UT _____

Question to Answer:

1. In what situation can this concept of operations of sets be useful?

To further enhance your understanding of operations of sets, Visit: *http://math4children.com/Grade3/quizzes/sets/Sets-elements,%20intersections,%20union,%20complement/index.html*

This website is an interactive quiz on operations of sets. Just click the start button to begin and click on “submit” if you are done answering the items.

http://ilc.upmin.edu.ph/index.php?option=com_content&task=view&id=30&Itemid=48

This website helps the learner to identify the different set operations. Click the next button and click the link of the desired page you want to open.

END OF FIRM-UP

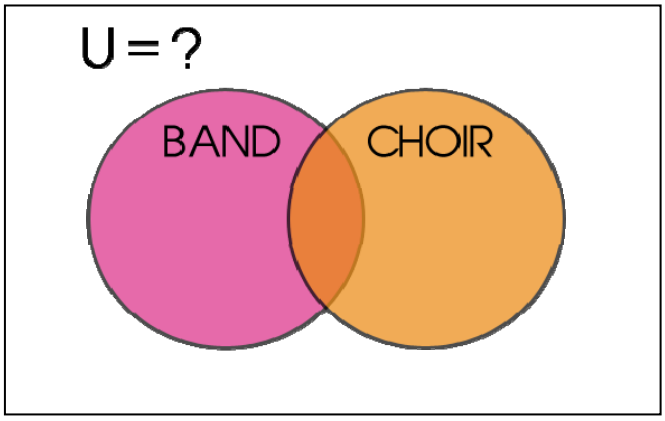
In this section, the discussion was about the basic idea of sets. You also learned the basic operations of sets and this experience gives you an idea about representing, organizing and processing information to help you solve real-life problems.

DEEPEN

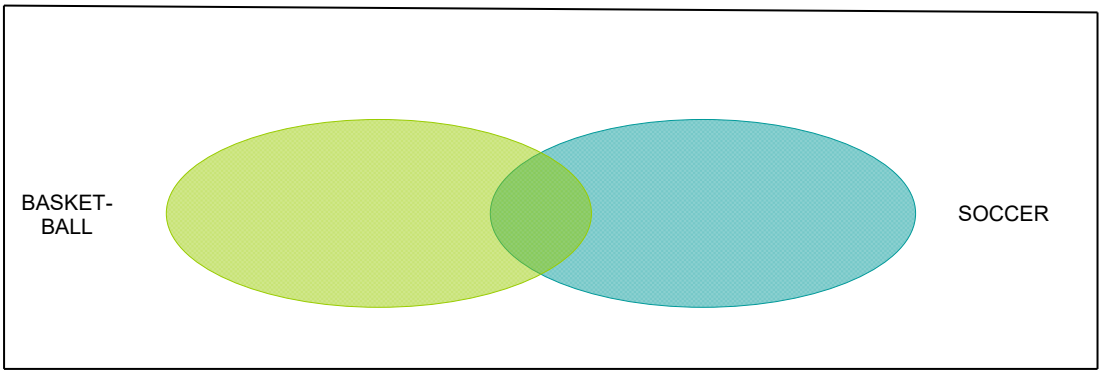
Your goal in this section is to take a closer look on how the concepts of sets can be used as a tool for processing information to address some problems in real-life situation.
For your guidance, keep in mind these questions:
How do you classify the given sets of information?

Exercise 9: Answer the given problems.

1. Suppose there are 36 students in a class. Of those students, 8 plays in the band, 12 sing in the choir, and 5 are in both the band and the choir. How many of the 36 students are in neither group? Show your answer by completing the Venn diagram below.



2. Suppose that in your homeroom class 8 students are on the basketball team and 11 students are on the soccer team. Five of the students are on both teams. Another twelve students are not on either teams. How many students are there in the class? Show your answer by completing the diagram below.



3. Draw a Venn diagram to solve the problem below.

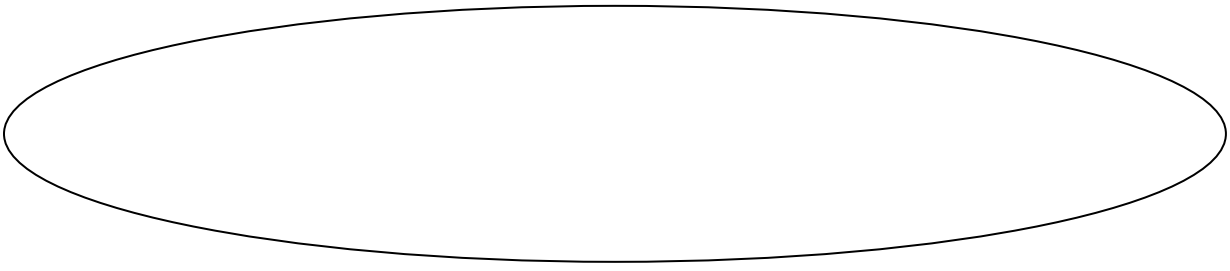
Twenty-four students are on tour of the United Nations building. Twelve of these students speak Russian, six speak German, and fifteen speak Spanish. Only one student speaks all three languages. Two speak Russian and German, and two different students speak German and Spanish. How many students speak Russian and Spanish, but not German?

Draw diagram here:

4. Put the given numbers in groups using discrete, overlapping, and hierarchical groups as appropriate.

A possible set of numbers is:
0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 13.5, 14, 14.5, 15, 16, 16.75, 17, 18, 19

Use the space below for your answers:



Questions to Answer:

1. How would you describe your classification?

_____
_____
_____
_____

2. What categories were used to classify the numbers?

_____
_____
_____
_____

3. How's your classification skills help you solve real- life problems?

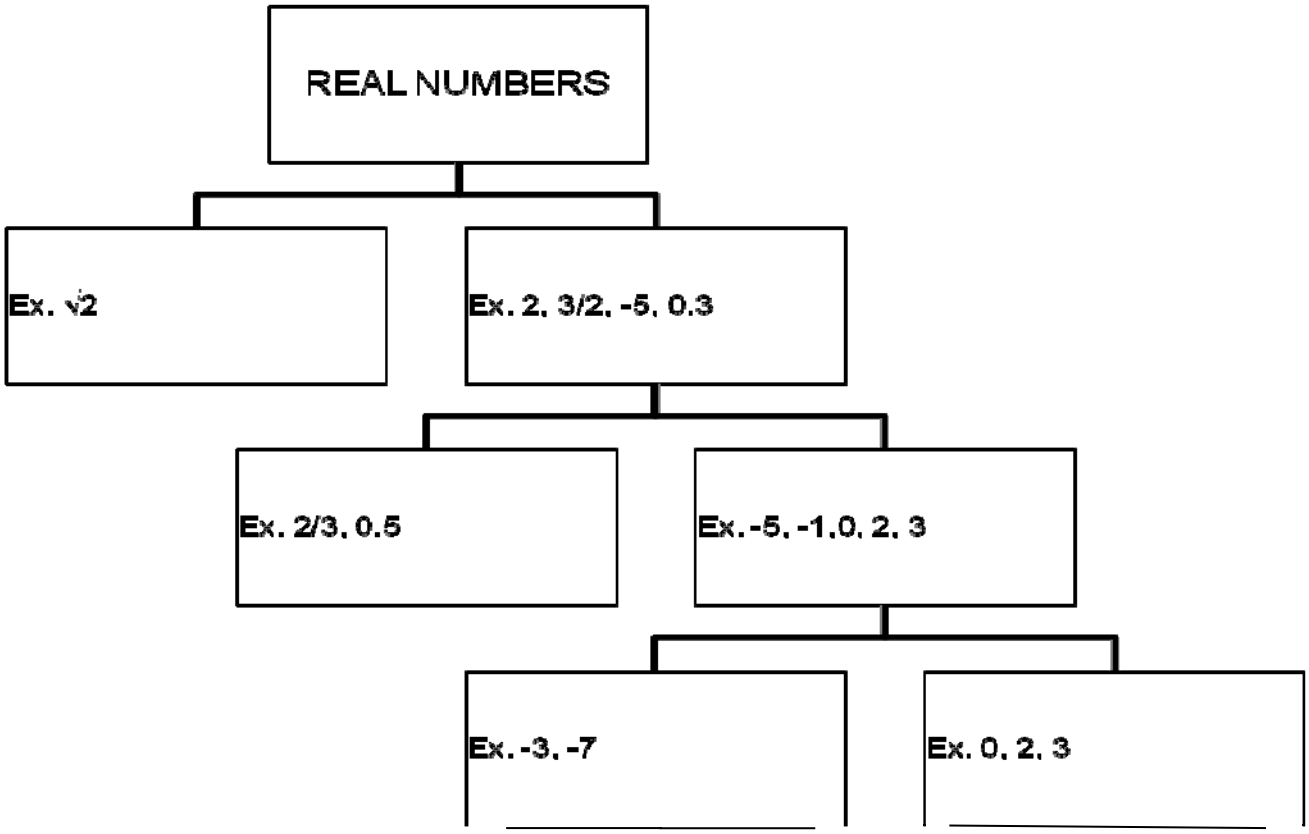
_____
_____
_____
_____

Reflection Log:

Describe in your journal your thinking processes while you were doing this exercise. That is, how did you think of different possibilities? How did you decide that they were correct or not?

Journal Writing

Complete the concept map below summarizing the subsets of real numbers.



END OF DEEPEN

In this section, the discussion was about concepts of sets as a tool for processing information and illustrating the use of this tool in addressing real-life problems. What new realization do you have about the topic? What new connections have you made for yourself?

Now that you have a deeper understanding of the lesson, you are ready to do the task in the next section.

TRANSFER

Before you begin this section, recall the question asked at the start of this module: ***How do the types of classification facilitate the organization and processing of information to solve real-life problems?*** The transfer section of the module will help guide you in determining the best answer to the question.

Your goal in this section is to apply your learning to real life situations. You will be given a practical task that will demonstrate your understanding.

A kinder school canteen manager surveyed 100 pupils to find the most saleable sandwich and most saleable juice drink available in the canteen. The result of the survey is shown below.

Number of pupils	Type of Sandwich Purchased
10	chicken and egg
6	chicken and tuna
3	tuna and egg
5	chicken, tuna and egg
22	tuna
20	egg
24	chicken

	Juice drink purchased
32	orange
20	pineapple
34	iced tea
1	orange and pineapple
3	iced tea and pineapple
4	orange and iced tea

Questions to Answer:

1. How many pupils surveyed did not purchase any sandwich? Any juice drink?
2. Which is the most salable sandwich? Juice drink?
3. How did the task help you see the real world use of the topic?

Write below a report on how you answered the problem. Refer to the given rubric as your guide.

Written Report:

RUBRIC

STANDARDS	4 Excellent	3 Satisfactory	2 Developing	1 Beginning
Feasibility	The proposal reflects an efficient use of capital, projects a highly profitable income and suggests a prime business location.	The proposal reflects an efficient use of capital, projects a sustainable income/profit, and suggests a good business location.	The proposal reflects unnecessary use of capital, projects a break-even return, and suggests a problematic business location.	The proposal reflects very inefficient use of capital, projects negative returns, and suggests a remote and inaccessible location.
Accuracy of data	Financial details of the business plan are computed accurately and free from	Financial details of the business plan are computed accurately. Computations	Financial details of the business plan have some errors	Financial details of the business are missing.

	errors. It shows step-by-step computations that are easy to follow.	are free from errors.	in the computation.	
Relevance and Application of Unit Concepts	The development of the plan shows thoughtful, careful and appropriate application of the majority of the concepts learned in the unit.	The development of the plan shows careful and appropriate application of at least half of the concepts learned in the unit.	The development of the plan shows appropriate application of a few of the concepts learned in the unit. However, certain errors are present in the application.	The development of the plan shows irrelevant and erroneous application of a limited number of concepts learned in the unit.

In this section, your task was to solve real-life problems using Venn diagrams. How did you find the task? Write your answer by accomplishing the 3-2-1 chart below.

Questions to Answer: How' are your classification skills? What can you now say about your understanding of the concepts of sets? How can sets be useful to solving real-life problems?

3-2-1-CHART

3	Things I Learned In This Lesson…
2	Things I Found Interesting…
1	Question I still Have…

You have completed this lesson. Before you go to the next lesson, you have to answer the following post-assessment.

Your knowledge of the types of classification, the basic idea of sets and the different subsets of real numbers prepares you for a more challenging task of exploring numbers and number sense in the next lessons of this module. The use of Venn diagrams is a big help in classifying information that are needed to solve some real-life problems.

POST - ASSESSMENT

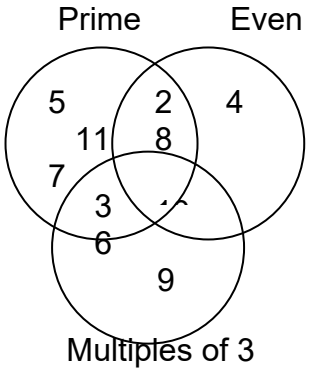
It's now time to evaluate your learning. Click on the letter of the answer that you think best answers the question. Your score will only appear after you answer all items. If you do well, you may move on to the next module. If your score is not at the expected level, you have to go back and take the module again.

DIRECTION: Determine what is being asked by the given statements. Choose the best answer among the given choices.

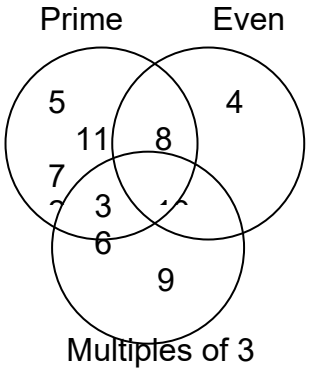
(A)
1) How many subsets will a set of 5 elements have?
A. 10
B. 25
C.32
D. 64

(M)
2) Where does each of the following real numbers belong on the Venn Diagram?
2, 3, 4, 5, 6, 7, 8, 9, 10, 11

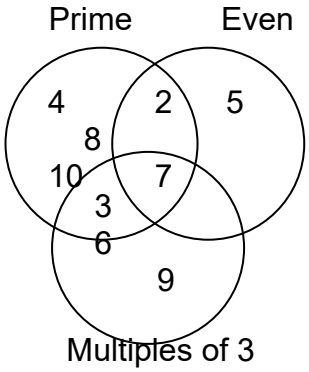
A.*



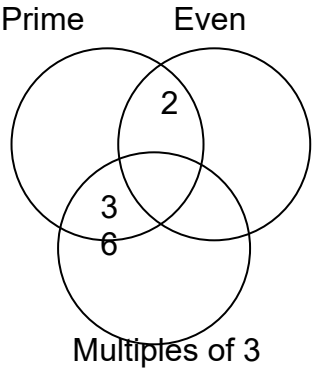
B.



C.



D.



(T)

3) As a canteen-in-charge , you are to make a survey of the food preferred by 30 nursery pupils as preferred for their Christmas Party options. The result will be presented to their class and class adviser. Your survey shows the following;

Spaghetti = 18 pupils
Sandwich = 15 pupils
Palabok = 13 pupils

Spaghetti and Sandwich = 6 pupils
Sandwich and Palabok = 3 pupils
Spaghetti and Palabok = 3 pupils
Sandwich, Spaghetti and Palabok = 2

How many students preferred spaghetti?
A. 4
B. 5
C. 6
D. 7

4) Which of the following shows the Distributive Property of integers? (A)
A. 6x (4 + y) = (6x + 4) (6x + y)
B. (6x + 4) + y = 6x + (4 + y)
C. 6x (4 + y) = (4 + y) 6x
D. 6x (4 + y) = 6x (4) + 6x (y)

5) Which should be done first in the process of subtracting integers with unlike signs? ***(A)***
A. add integers with unlike signs
B. Subtract integers with unlike signs
C. Change the sign of the subtrahend
D. follow the rules of addition

6) Which of the following statements is false? **(M)**
A. (-2)(-2)(-2) = -6
B. (-6)(-5)(1) = 30
C. (-11)(2)(1) = -22
D. (-3)(3)(-2) = 18

(T)
7) You are a nursing aid of MG hospital asked to closely monitor a 5-minute interval of a patient's temperature in the emergency room. The initial body temperature as recorded at 4:00pm was 39°C. Your monitoring noted the following; up 1°C, down 5°C, up 3°C, up 1°C, down 2°C, down 2°C and up 5°C. What is the patient's body temperature at 4:35pm?
A. 35°C
B. 37°C
C. 38°C
D. 40°C

8. You are a business owner and you want to know if you have made a profit for the month. You are given the following information:

i. The monthly salary of your employees is Php 8000.00 each and you have 5 employees.
ii. The store rent is Php 20000.
iii. Utilities expenses amount to Php 20000.00
iv. 100 pieces of your product were sold at Php 1000.00 each.

Did your business make a profit for the month? **(T)**
A. Yes, the business made a profit of Php 100000.00 for the month.
B. Yes, the business made a profit of Php 20000.00 for the month.
C. No, the business just managed to break even for the month.
D. No, the business lost Php 40000.00 for the month.

9. Perform the indicated operations. (3/4 ÷1/2) + (1/3 • 6/5) – 4/5 **(A)**
A. 1/7
B. 6/7
C. 9/10
D. 11/10

10. Which of the following is an irrational number? **(A)**
A. 2/3
B. 2/5
C. $\sqrt{2}$
D. $\sqrt{9}$

11. You want to save up to buy an item worth Php 500.00. If you earn Php 250.00 daily, which of the following would let you save for the item in the least number of days?**(M)**
A. saving 1/10 of your daily earning
B. saving 1/5 of your earnings every 4 days
C. saving 0.2 of your daily earning
D. saving 0.3 of your earnings every 6 days

12. A capitalist is investing 50 million pesos in putting up a chain of stores. 20 million of the capital is to be spent for the main store and the rest to be spent equally for the 6 store branches. What part of the capital will each store branch get? **(M)**
A. 1/10
B. 1/7
C. 1/5
D. 3/5

13. You are going to put up a business that needs a capital of Php 800,000. You already have 1/4 of the needed capital and there are 5 investors willing to contribute equally for the rest. How much should each of the investor contribute? **(T)**

A. Php 50,000
B. Php 80,000
C. Php 120,000
D. Php 150,000

14) What is the simplified form of $\sqrt{8\ 100}$? **(A)**

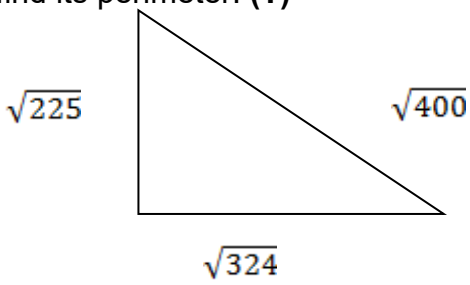
A. $2\sqrt{2\ 100}$
B. $20\sqrt{2}$
C. 900
D. 90

15) Which of the following is TRUE? **(M)**

A. The principal root of 0 is ± 0.
B. Each odd real number has no real square root.
C. Every positive number has two square roots.
D. The symbol $\sqrt{\ }$ is called radicand.

16) Perimeter of a polygon is computed by adding the measurement of all the sides.

Given the triangle below, find its perimeter. **(T)**



A. $\sqrt{949}$
B. $\sqrt{149}$
C. 53
D. 23

17) Which is NOT a significant digit? ***(A)***

A. a non zero digit
B. a zero placed before a non zero digit
C. a zero placed between two non zero digit
D. a zero placed after a non zero digit but after a decimal point

18) Which of the following shows a correct way of writing scientific notation? ***(A)***

A. 0.40×10^2
B. 4.00×10^2
C. 14.50×10^2
D. 0.40×10^2

19) Which scenario results to a number whose digits are all significant? *(M)*
A. measuring the distance from A to B
B. converting centimeters to meters
C. multiplying multiples of 10
D. giving a number with placeholder

20) In chemistry, which of the following quantities is best expressed in scientific notation? ***(T)***
A. atomic mass
B. electron mass
C. empirical mass
D. atomic weight

GLOSSARY OF TERMS USED IN THIS MODULE:

Discrete Classification- involves dividing objects (or concepts) into groups such that there is no overlap between the groups. Any single item is a member of only one group at a time.
Overlapping Classification- involves as its name implies, dividing objects (or sets concepts) into groups such that some items belongs to more than one group simultaneously
Hierarchical Classification-in here, the groups are placed one inside another.
set -is a well-defined collection of items/objects.
Venn diagrams -(invented by John Venn, an English mathematician) are used to show relationship between sets.
Universal set – a set containing all elements under consideration.
Finite Set – a set which elements are counted.
Infinite Set – a set which elements are not counted.
Null Set – a set with no elements
Union of sets – two or more sets combined to form a new set
Intersection of sets A and B – a set consisting of all elements that are found In both sets A and B
Complement of set S – is the set consisting of all elements of U that cannot be found in S

WEBSITE RESOURCES REFERENCES AND LINKS IN THIS MODULE:

Wooton, Dolciani & Beckenbach. Modern School Mathematics Structure and Method Course 1. (pp 6 – 30)
Lynch & Olmstead. Math Matters Book 3 An Integrated Approach (pp 12 – 15)
Jacobs, Russel I & Meyer, Richard A. Mathematics 2 Discovery and Practice (pp 35 – 40)
http://math4children.com/Grade3/quizzes/sets/Sets-elements,%20intersections,%20union,%20complement/index.html
An interactive Math Quiz on set operation
http://www.infoplease.com/ce6/sci/A0861028.html
Further readings about sets
http://ilc.upmin.edu.ph/index.php?option=com_content&task=view&id=30&Itemid=48
This explains sets and set operations and provides interactive formative quiz of the same topic.

Lesson 2: Real Number System

☑ LESSON INTRODUCTION AND FOCUS QUESTION(S):

(Initial motivational statements and questions will be given for students to focus on.)

Numbers are everywhere and we can use them anytime, most especially in counting and simple operations. But have you ever wondered how we arrive with the correct answer when we operate numbers? What are the rules or properties when we do operations on real numbers? How do we use these properties get right outcomes? What do these properties show about real numbers? *How can the knowledge of real numbers help us solve problems in daily life?* **Let us find the answer in this topic.**

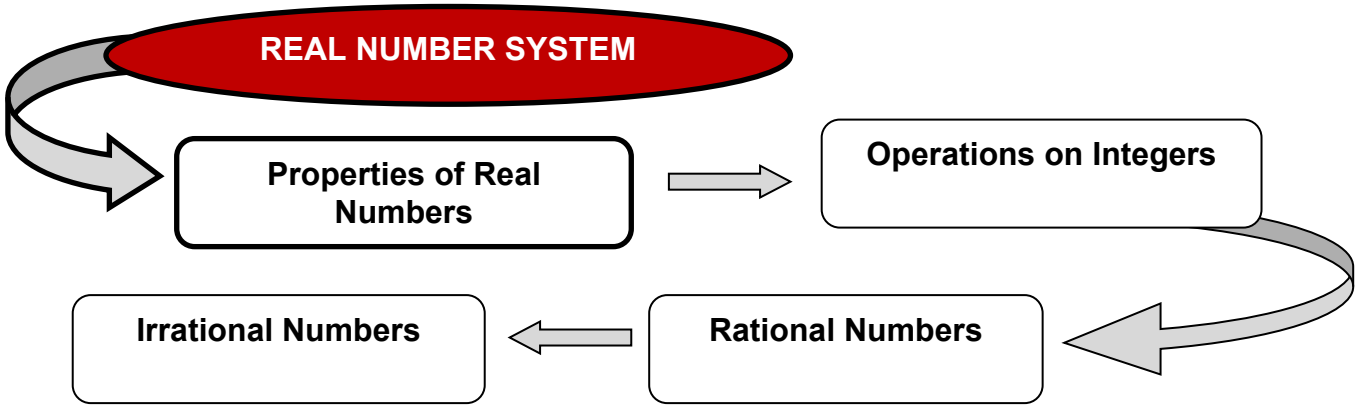
☑ LESSON COVERAGE:

This lesson has the following topics:

Title	You will learn to…	Estimated Time
2.1 Properties of Real Numbers	Illustrate the different properties of real number	3 hours
2.2.Operation on Integers		3 hours
2.3 Rational Numbers		3 hours

☑ Concept Map of the Lesson

Here is a simple illustration of the topics you will cover in this



☑ Expected Skills

To do well in this module, you need to remember and do the following:

1. Complete all the given exercises properly. Read and follow directions carefully.
2. Take note of important details, processes and methods in each lesson.
3. Go back to the lesson if you can't answer the given exercises.
4. Be persevering and study hard.

PRE-ASSESSMENT:

Let's find out how much you already know about properties of real number. Answer the exercise below.

Exercise 1: *Click on the letter that you think best answers the question. Please answer all items. After taking this short test, click "Submit" to see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this lesson.*

1. - 4 + 4 = 0. Which property is illustrated by this equation?
A. Inverse Property
B. Identity Property
C. Commutative Property
D. Associative Property

2) Emy simplifies the expression (12+14)+16. What property allows her to add 14 and 16?
A. Commutative Property
B. Closure Property
C. Associative Property
D. Distributive Property

3) If four boys and 6 girls paid P50.00 for a concert ticket, what allows you to put the total amount spent as 4(P50.00) + 6(P50.00)?
A. Commutative Property
B. Closure Property
C. Associative Property
D. Distributive Property

4) Which statement is TRUE for Closure Property?
A. Shows how to multiply the sum of two numbers by a third number.
B. Assures that addition or multiplication of two real numbers can be done in any order.
C. States that real numbers can be regrouped with respect to addition or multiplication.
D. States that the result of doing basic operation on real numbers (except for division by 0) is also a real number.

5) Which of the following equations is FALSE?
A. (6 x 4) + (6 x 3) = 6 (4 + 3)
B. 3 + (5 + 4) = (3 + 5) + 4
C. (1/5) x (5) = 1

D. 5/6 + 0 = 0

6) Properties of real numbers guide us in solving mathematical problems correctly. Which of the
following statements will yield to an incorrect answer?

A. In multiplying the sum of two numbers by a third number, the addends maybe be added first or multiply first to the addends and add the partial products.
B. Division of real numbers, except division by 0, will yield a real number quotient.
C. Real numbers can be divided in any order.
D. The product of multiplicative inverses is always 1.

7) What property is used to simplify $7\left(\frac{1}{7}\sqrt{5}\right)$ to $\left(\sqrt{5}\right)$?

A. Commutative and Associative Property
B. Associative and Distributive Property
C. Associative and Inverse Property
D. Commutative Property and identity Property

8) 15(1/15) = 1. What property guarantees that statement is true?

A. Inverse Property for Addition
B. Inverse Property for Multiplication
C. Identity Property for Addition
D. Identity Property for Multiplication

9) What property allows you to express 8m + 24 as 8(m+3)?

A. Inverse Property
B.Commutative Property
C.Identity Property
D. Distributive Property

10) A soup kitchen feeds typhoon survivors. One tables can accommodate 16 persons and another can accommodate 20 persons. They have 6 seatings in a day. Using the distributive property, which expression below , represents the number of survivors they feed everyday?

A. 6+16+20
B. 6+(16)+6+(20)
C. 6(16) +6(20)
D. 6+(16+20)

Lesson 2.1 Properties of Real Numbers

EXPLORE

As you go through this topic, keep on thinking about these questions: *What do these properties show about real numbers?* ***How can the knowledge of real numbers help us solve problems in daily life?***

The real number system consists of a set of real numbers, relations between real numbers, operations on real numbers and the properties which gives the rules for manipulation of real numbers.

In this section you will investigate the properties of the real numbers. The two basic operations are addition and multiplication. The operation of addition is denoted by "+" and the operation of multiplication is denoted by "×" or "∗". If a and b are real number "a+b" is the sum of a and b where a and b are terms in the sum. The real number a ∗b is the product of a and b. This product can also be written as a × b, a(b), (a)(b) of ab.

Do the activities below to understand the properties of real numbers.

ACTIVITY 1. Real Numbers in Action

Read the problem below and answer the questions that follow:

Sports Club received a donation of P500.00 from Mr. Cruz and P320 from Mr. Nieles. They collected a membership fee of P10.00 this school year from their 30 members. How much money did they receive from donations? How much money did they collect from membership fee? How much money do they have in all?

Questions:

a. What arithmetic operations will you do to answer the questions?

_____

_____

_____

_____
_____

b. What rules do you need to observe to make sure that your answers are correct?

_____
_____
_____
_____
_____

c. What are your answers?

_____
_____
_____
_____
_____

To solve problems that involve numbers, we need to know rules on the different operations to ensure that our computation is correctly done. These rules for the different operations of real numbers are called its properties. In the next activity, investigate commutatively in real life.

ACTIVITY 2. Commutativity in Real Life

A commutative process is one which can be reversed with no change in result. Below are some processes in real life. Tell whether the process is commutative or non-commutative by putting a check mark on the appropriate column.

Process	Commutative	Non-commutative
1. putting rice and pouring water on the kettle before cooking		
2. putting on a pair of socks and shoes on ones feet		
3. washing and ironing of clothes		
4. cutting and measuring of cloth		

Questions:

1. Why is it important to know if a process is commutative or non-commutative?

   _____
   _____
   _____
   _____

2. Where else in real life is the concept of commutativity applied?

   _____
   _____
   _____
   _____

3. How is this concept applied in the operations of real numbers?

   _____
   _____
   _____
   _____

4. Other than commutativity, what other properties govern the operations of real numbers?

   _____
   _____
   _____
   _____

5. How can you differentiate one property from the other?

   _____
   _____
   _____
   _____

6. Why is there a need to know the properties real numbers?

   _____
   _____
   _____
   _____

   How can the knowledge of real numbers help us solve problems in daily life?

   _____
   _____
   _____
   _____

End of EXPLORE:

You learned from the previous activity that real numbers are important in real life. You also learned that there must be some rules or properties that need to be observed to ensure correct outcomes when doing certain operations. To further understand the properties of real numbers, do the activities and exercises in the next sections.

FIRM-UP

Your goal in this section is to identify the different properties of real number. By knowing the different properties, you will be guided on how to manipulate real numbers and use them to solve different kinds of real life problems involving real numbers.

In the next activity investigate the different properties of real numbers. The activity is composed of five parts, in each part you will investigate one property of real numbers.

Exercise 3. **The Properties of Real numbers**

The Commutative Property for Addition and Multiplication

Investigate if commutativity is a property of real numbers. In the envelope given to you, get two numbers and find the sum.

1. Write down the exact sequence of the numbers you added and the sum.

_____
_____
_____

2. Change the order of the numbers and add.

_____
_____
_____

3. Compare the results. Does the order in which you added numbers affect the results?

_____

_____
_____.4. Get another two numbers again. Do steps 1 to step 3.

Now, find the product of the two numbers that you have chosen.

1. Write down the exact sequence of the numbers you multiplied and the product.

_____
___

2. Change the order of the numbers and multiply.

---

3. Does the order in which you multiplied numbers affect the results?

_____
_____

4. Do step 1 to step 3 with your other two numbers.

Summarize your findings by completing the statements below.

If a and b are two numbers, then

$a + b =$ _____
$a \times b =$ _____

Now, extend the process to subtraction and division of real numbers, then answer the questions below.

Questions:

1. Is subtraction of real numbers commutative?

   _____

2. Give an example to illustrate your point.

   _____

3. Is division of real numbers commutative?

   _____

4. Give an example to illustrate your point.

   _____

The Associative Property of Addition and Multiplication.

Complete the tables below and answer the questions that follow.
Table 1

Given	Sum	Given	Sum
5 + (9+12)		(5+9)+12	
(13 + 8) + 20		13 +(8+20)	
15 + (11 + 32)		(15 +11) + 32	

Questions:

1. Compare sums.

   _____

2. Did the changing of the groupings of numbers affect their sum?

   _____

3. Write down your findings.

   _____ .

Table 2

Column A Given	Column B Sum	Column C Given	Column D Sum
3 (5 ×10)		(3×5)10	
(11 × 2) 7		11 × (2+7)	
4 × (6 + 9)		(4 ×6) + 9	

Questions:

1. Compare the products.

   _____

2. Did the changing of the groupings of numbers affect their product?

   _____

3. Write down your findings.

_____

_

Summarize your findings by completing the equations below.

If a, b and c are real numbers, then

a + (b+c) = _____

a(b×c) = _____

The Distributive Property

Complete the table below.

Given	Column B	Column C Results	Column D	Column E Results
3 (5 + 4)	3(9)		3(5) +3(4)	
4 (11 × 2)	4(13)		4(11)+4(2)	
2 (6 + 9)	2(6)		2(6)+2(9)	

Questions:

1. Compare the results shown in column C and E?
   _____
2. Did multiplying the number to each of the addends change the results?
   _____-_____
3. Write down your findings.
   _____

Summarize your findings by completing the equations below.

If a, b and c are real numbers, then

a (b+c) = _____

The distributive property comes into play when an expression involves both addition and multiplication. A longer name for it is, "the distributive property of multiplication over addition." It tells us that if a term is multiplied by terms in parenthesis, we need to "**distribute**" the multiplication over all the terms inside.

$3(5+6) = (3\times 5) + (3\times 6)$

Even though order of operations says that you must add the terms inside the parenthesis first, the distributive property allows you to simplify the expression by multiplying every term inside the parenthesis by the multiplier. This simplifies the expression.

Questions:

1. Can the distributive property be extended to more than two terms in the grouping symbol?

_____

2. Cite an example to illustrate your point.

_____
____

3. Is the distributive property also true for multiplication of a number to the difference of numbers?

_____.

4. Cite an example to illustrate your point._____

Exercise 1. Use the distributive property the results in the following operation

Given	Process	Result
1) 4(6+8)		
2) -3(5+12)		
3) 2(4 + 7+ 5)		
4) 5[6 +(-3)]		
5) -2(4+6)		

The Identity Property
You will be given an envelope containing real numbers.

1. Pick a number from the envelope, and add zero to it.

_____
2. Repeat this process with another number in the envelope.

_____
3. Choose a number of your own, and add zero to it.

_____
4. What happens when you add zero to a number?

_____
5. Is there another real number such that when added to another number , the result is the number itself?

_____
6. Pick a number from the envelope again, and multiply it by one. Record the

product.

_____

7. Repeat this process with another number in the envelope.

_____

8. Choose a number of your own, and multiply it by one.

_____

9. What happens when you multiply a number by one?

_____

10. Is there a number that possesses the same property as one? If there is, what is this number? _____.

Summarize your findings by completing the equation below.

If a is a real number, a + 0 = _____ 0 + a = _____

The identity property for addition tells us that zero added to any number is the number itself. Zero is called the "additive identity." The identity property for multiplication tells us that the number 1 multiplied to any number gives the number itself. The number 1 is called the "multiplicative identity."

Exercise 2. Complete the table below.

Value of a	Show that a+0 = a and o +a = a.	Show that a×1 = a and 1 × a =a.
6		
-4		
1/2		
0.5		

Inverse Property for Addition and Multiplication

1. Choose a number from the envelope, and add it to its opposite. Record the result.

_____

2. Choose another number from the envelope, and repeat step 1. Record the result.

_____

3. What sum do you get when you add a number and its opposite?

_____

4. Choose a fraction from the envelope, and multiply it by its reciprocal. Record the result.

_____

5. Choose another fraction from the envelope, and repeat step 1. Record the result.

_____

6. What product do you get when you multiply a fraction and its reciprocal?

_____

Summarize your findings by completing the equation below.

If a is a real number,

a + (-a) = _____ (-a) + a = _____

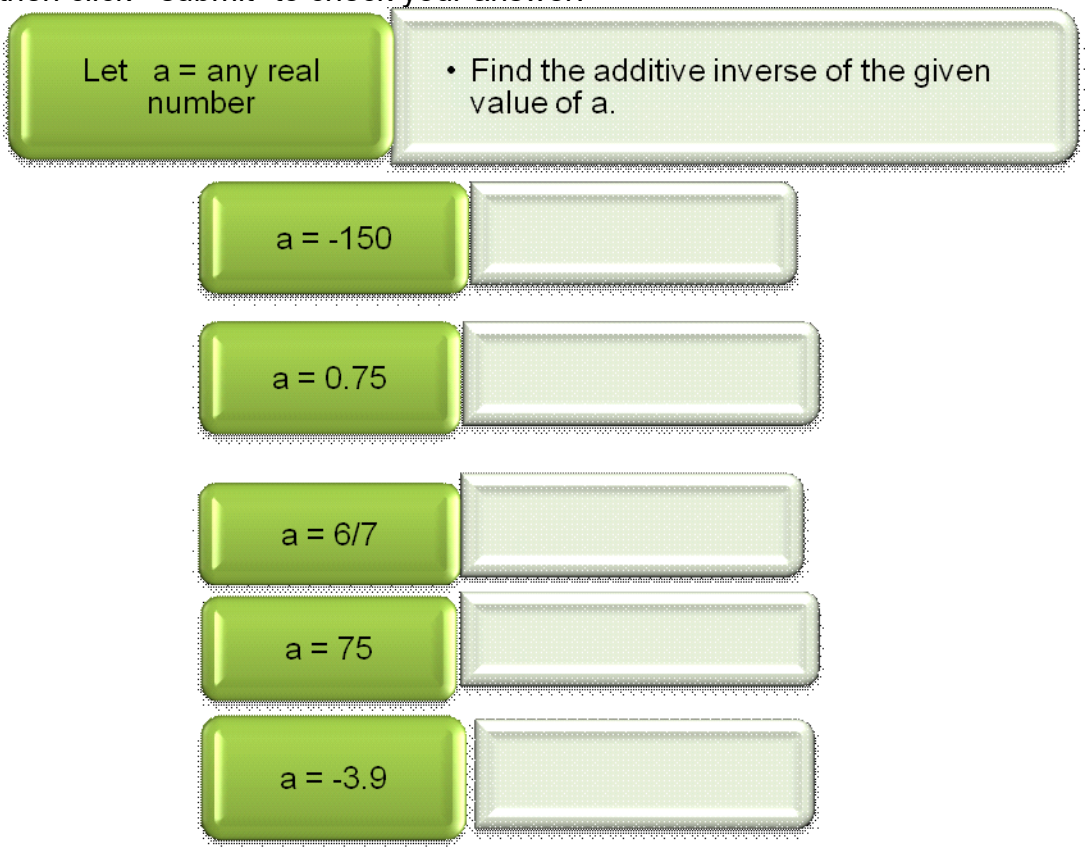
$a+\frac{1}{a}=$ _____ $\frac{1}{a}+a=$ _____

The property says that when you add a number to its additive inverse, the result is 0. Other terms that are synonymous with additive inverse are negative and opposite.
Example:
$5+(-5)=0$

It also says that when you multiply a number by its multiplicative inverse the result is 1. A more common term used to indicate a multiplicative inverse is the **reciprocal**. A multiplicative inverse or reciprocal of a real number *a* (except 0) is found by "flipping" *a* upside down. The numerator of *a* becomes the denominator of the reciprocal of *a* and the denominator of *a* becomes the numerator of the reciprocal of *a*.

When you take the multiplicative inverse , the sign of the original number remains the same. If you change the sign when you take the reciprocal, you would get a -1, instead of 1.

Exercise 3: Complete the diagram below by finding the additive and multiplicative inverses of the given real number. Write your final answer in the box provided then click "submit" to check your answer.



Questions:

1. In what way can your knowledge of the inverse property of real numbers help you in doing the operations of real numbers?
2. Is there a real number with no additive inverse? If there is, what is it?
3. Is there a real number with no multiplicative inverse? What is that number?

The Closure Property

Materials: Envelope containing real numbers.

1. Choose two numbers from the envelope, and add the numbers. Record the result. Is the sum also a real number?

_____

2. Are there real numbers whose sum is not a real number?

_____

3. Choose another two numbers, and multiply. Record the result. Is the product also a real number?

_____

4. Are there two real numbers whose product is not a real number?

_____

Summarize your findings by completing the statements below.

If a and b are real numbers, then
1) a+b is _____
2) ab is _____

Now extend. Is the set of real numbers closed under subtraction and division? Do the investigation by completing the table below.

a	b	Subtraction a-b	Division a/b
5	3		
4	-5		

-2	-7		
-6	9		
8	0		

Questions:

a. Is the difference of any two real numbers always a real number? _____

b. Is the quotient of any two real numbers always a real number? If not, under what condition is the quotient of two real numbers not a real number?_____

Summarize your findings by completing the statement below.

If a and b are real numbers, then	
a+ b	
a- b	
a b	
a/ b	

For an in-depth know-how on properties of real numbers, visit the following websites. Press Ctrl + Click on the following sites.

http://www.slideshare.net/sadiesattic/properties-real-numbers-basic-presentation-583181
Provides a powerpoint presentation on the different properties of real numbers.
(www.gooogle.com.ph)

http://www.math.com/school/subject2/lessons/S2U2L1GL.html
Gives further discussion and additional examples regarding properties of real numbers.

End of Firm Up

In this section, you acquired better understanding of the properties of real numbers for addition and multiplication. In the next section, you also learned how to use these properties in doing operations with real numbers.

DEEPEN

Your goal in this section is to take a closer look at the uses of the properties of real numbers.

ACTIVITY 3. Properties Challenge!

Test your understanding on the properties of real numbers with the following exercises.

Access the website below to test your understanding of the topic. Your goal is get 8 out of 10 questions correctly.

http://www.regentsprep.org/Regents/math/ALGEBRA/AN1/PropPracTami.htm

Provide an interactive practice test on the properties of real numbers.

Questions:

Try to answer the questions below before proceeding to the next activity.

1. How did you apply the different properties of real number in answering the given exercises?
2. How can you differentiate one property from the other?
3. What does each of the properties show about real numbers?

***a.* Commutative Property**
b. Distributive Property
c. Associative Property
d. Inverse Property
e. Identity Property
f. Closure Property

Exercise 4: **3-2-1 – Recording one's thoughts and feelings.**

Fill-out the given 3-2-1 diagram with regards to this lesson.

3 things I learned	2 things that interest me	1 question in mind
1) 2) 3)	1) 2)	

ACTIVITY 4. Mastering the Properties of Real Numbers

Access the website given below and do the practice test to self-assess your understanding of the properties of real numbers.

http://www.classzone.com/books/algebra_1/pdfs/1_02_6ec.pdf

Provides items for the test your understanding of the properties of real numbers.

For the questions that you still have, you may go back to the websites cited above and try to find the answer.

ACTIVITY 5. WHAT PROPERTY?

Name the property illustrated in each of the following. Write the property in the space provided for the answer then click "Submit" to check your answer.

1. 5 (90) is a real number →

2. (3/4) (4/3) = 1 →

3. -27 + 27 = 0 →

4. 3 (12) = 12 (3) → _____

5. 3 (9 – 6) = 3 (9) – 6 (3) → _____

6. (10/11) (1) = 10/11 → _____

7. 1/3 + (-1/3) = 0 → _____

8. 0 + 238 = 238 → _____

9. 10 + 1/3 = 1/3 + 10 → _____

10. (pq) r = p (qr) → _____

ACTIVITY 6. You-Complete-Me

Complete each equation to illustrate the indicated property. Write your answer on the space provided for the answer then click "Submit" to check your answer.

1) 4 + 10 = _____
, commutative property

2) 3 (4) + 9 (4) = _____
, distributive property

3) 4 (6b) = _____
, associative property

4) 13 + ____ = 13
, identity property

5) (13/15) (__) = 1
inverse property

6) 50 + (-44) = ,
closure property

7) (2 – 10) – 12 =
, associative property

8) 2 (20) =
commutative property

9) -1.25 + 1.25 =
, inverse property

10) -12 (1) =
, identity property

ACTIVITY 7. Solve Me with a Property!

Solve the following word problems using the appropriate property or properties of real numbers. Write your solution on the provided space then click 'Submit" to check your answer.

1) Julia collected aluminum cans for two days. On Friday morning she collected 30 cans and on Friday night she collected 35 cans. On Saturday morning Julia collected 35 cans and on Saturday night she collected 30 cans. Did she collect more on Friday than on Saturday?

What operations will you use to answer the question? Write your equation.	What property of real numbers justify your equation?	How did you know that your answer is correct?

2) Amy sells flashlights for P50.25 and batteries for P10.95. She offers 10% discount if you buy them together. On Saturday night she sold 17

flashlight/battery combinations and on Sunday she sold 19. What was her total sales for the weekend?

Questions:

a. What operations will you use to solve the problem? Write your equations.
b. What properties of real numbers justify your equations?
c. How did your knowledge of the properties of real numbers help you in solving this problem?

3) The senior class was selling tickets to their play. They had two prices, P5.00 and P8.00. The tickets were on sale during the week before the play. On Monday, they sold 23 tickets at P5.00 and 14 at P8.00. Tuesday, they sold 31 tickets at P5.00 and 22 at P8.00. On Friday, including sales at the door, they sold 22 at P5.00 and 56 at P8.00. How much money did they take in ticket sales?

Questions:

1. What operations will you use to solve the problem? Write your equations.
2. What properties of real numbers justify your equations?
3. How did your knowledge of the properties of real numbers help you in solving this problem?

ACTIVITY 8. Extra Challenge!

Answer each of the following. Write your answers on the appropriate box then click “Save”.

1. Why is division is not commutative?

Answer Box:

2. Describe two ways of calculating 3 (20 + 5). What properties were used?

Answer Box:

3. Provide an example to illustrate that division is not associative.

Answer Box:

4. Provide an example to illustrate that addition of real numbers is commutative.

Answer Box:

5. How can the knowledge of real numbers help us solve problems in daily life?

Answer Box:

Exercise 9: **Journal Writing – Recording one's thoughts and feelings**

Complete the sentence with a personal thought, feeling, idea or realization based on the topic "Properties of Real Number". Choose one and write your sentence then click "Save".

I discovered that…
I remember …
I'm not sure …
I was surprised …
I am now aware of …
It seems like …
I wonder …

End of DEEPEN:

In this section, you learned how properties of real numbers are used to solve problems in real life.

What new realizations do you have about the topic? What new connections have you made for yourself?

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section

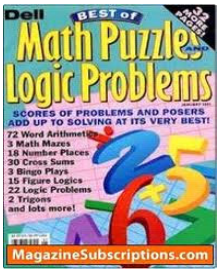
TRANSFER

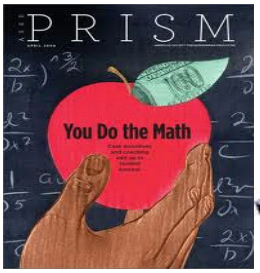
Before we begin this section, recall the questions asked at the start of the topic. What do these properties show about real numbers? ***How can the knowledge of real numbers help us solve problems in daily life?*** The transfer section of the topic will guide you in determining the best answer to the question.

Your goal in this section is to apply your learning to real life situation. You will be given a practical task that will demonstrate your understanding. How will you apply your knowledge and skills regarding properties of real numbers to real life situations or problems?

TASK

You will be given a practical task which will demonstrate your understanding.





Each member of Farmers Cooperative were given a grant of thirty thousand pesos to start their Sari-sari Store under the Dagdag Kabuhayan Program of the Department of Labor and Employment (DOLE). Your company, Businessmaker School was accredited to provided training to the farmers who are the beneficiaries of the program. As the Training Coordinator you are task to write an article on how to do inventory of goods. Your article should include explanation, illustrations and justification of the processes involved. Process includes how to find total goods available for sale and total cost. Your article will be presented to the Head of your school and the DOLE official for approval.

Your output will be rated based on the logical presentation of the process, mathematical justification of the process, practicality of the process, and clarity of presentation. Submit a written copy and prepare a powerpoint presentation of your article.

Write your article below. Refer to the rubric below to help you write your article then click “Submit”.

Before you submit your work, use the rubric below to assess your work. Your work should show the features listed under SATISFACTORY or 3. If your work has these traits, you are ready to submit your work.

If you aim for excellent rating, your work should show the features listed under EXCELLENT. If your work does not satisfy descriptions for “Satisfactory” , revise your work before submitting it.

RUBRIC: MATHINIK

CATEGORIES	**4 EXCELLENT**	**3 SATISFACTORY**	**2 DEVELOPING**	**1 BEGINNING**
Mathematical Concept	Demonstrates a thorough understanding of the topic and use it appropriately to solve the problem.	Demonstrates a satisfactory understanding of the concepts and use it to simplify the problem.	Demonstrates incomplete understanding and have some misconceptions.	Shows lack of understanding and has severe misconceptions.
Accuracy of Computation	All computations are correct and are logically presented.	The computations are correct.	Generally, most of the computations are not correct.	Errors in computations are severe.
Logical Reasoning	Process used is efficient and leads directly to the correct computation. Makes relevant math observations and connections.	Process used leads directly to the correct computation. Math reasoning and procedures are correct.	Process used is tedious. Some reasoning are correct but the right answer is not achieved.	Process used is illogical and inappropriate. There are many errors in reasoning and procedures that the right answer is not achieved.

Organization of Report	Highly organized. Flows smoothly. Observes logical connections of points.	Satisfactorily organized. Sentence flow is generally smooth and logical.	Somewhat cluttered. Flow is not consistently smooth, appears disjointed.	Illogical and obscure. No logical connections of ideas. Difficult to determine the meaning.

End of TRANSFER:

In this section, your task was to produce a written and oral report with the application of your knowledge and skills about properties of real numbers.

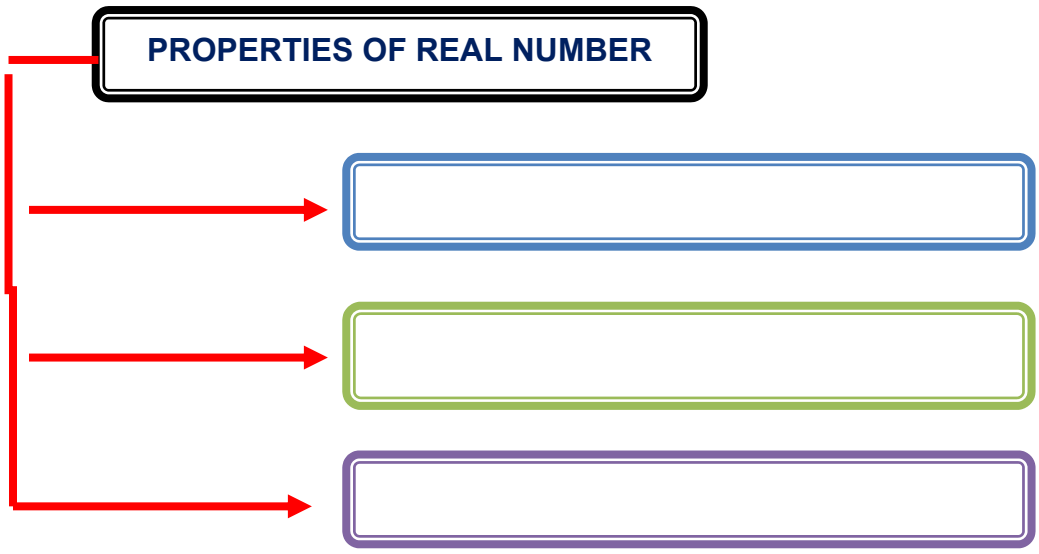
Exercise 5: **Synthesis Journal**

Complete the table below by answering the questions then click “Save”.

How did I find the performance task?	What are the values I learned from the performance task?	What made our task successful?	How will I use these learning/insights in my daily life?

Exercise 6: **Generalization Organizer**

Think of what you have learned in this lesson. Write these generalizations on the organizer below and “Save”.



You have completed this lesson. Before you go to the next lesson, you have to answer the following post-assessment.

POST-ASSESSMENT:

It's now time to evaluate your learning. Click on the letter of the answer that you think best answers the question. Your score will only appear after you answer all items. If you do well, you may move on to the next module. If your score is not at the expected level, you have to go back and take the module again.

***Exercise** : Click on the letter that you think best answers the question. Please answer all items. After taking this short test, click "Submit" to see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this lesson.*

1) Which of the following statements is TRUE?
A. Addition and multiplication of two real numbers can be done in any order.
B. Real numbers cannot be regrouped with respect to addition or multiplication.
C. If the product of two numbers is 1, the numbers are called additive inverses of each other.
D. Zero is one of the numbers that can be added to any number that gives the same number as the answer.

2) Which of the following statements is true?
A. The set of negative integers is closed under multiplication.
B. The set of integers is closed under division.
C. The set of whole numbers is closed under division.
D. The set of rational numbers is closed under addition.

3) Which expression represents distributive property?
A. $x + (y + z) = (x + y) + z$
B. $x (y + z) = xy + xz$
C. $x + y = y + x$
D. $(x)(1) = x$

4) Which statement is TRUE for Commutative Property?
A. Shows how to multiply the sum of two numbers by a third number.
B. Addition or multiplication of two real numbers can be done in any order.
C. Real numbers can be regrouped with respect to addition or multiplication.
D. Basic operations (except for division of 0) of any real number is also a real number.

5) Which of the following equations is TRUE based on properties of real numbers?
A. $(6 \times 4) + (6 \times 3) = 6 + (4 + 3)$
B. $3 + (5 + 4) = (3 \times 5) + (3 \times 4)$
C. $(4)(0.25) = 1$
D. $5/6 + 0 = 0$

6) A homeowner buys three air-conditioning units for P12,000.00 each, and each unit requires an additional of P500.00 for installation. Which one states the correct total amount to be paid using the distributive property?

A. 3+ P500.00+P12,000.00
B. 3+(P500.00 +P12,000.00)
C. 3(P12,000.00+P500.00)
D. (3+P12,000.00) P500.00

7) What property is used to simplify $12(\frac{3}{4}x)$ to 9x?

A. Associative Property
B. Distributive Property
C. Closure Property
D. Commutative Property

8) $\frac{3}{4}\left(\frac{4}{3}\right)=1$, what property supports the correctness of the statement?

A. Inverse Property
B. Associative property
C. Commutative Property
D. Distributive Property

9) If Perla can sew a dress for 3 hours. What property of real numbers is useful in finding her rate of sewing a dress?

A. Inverse Property
B .Identity Property
C. Commutative Property
D. Associative Property

10) Thelma works as cashier in a hospital. She works double shifts 4 days a week. The evening shift is 2 hours and the morning shift is 3 hours. Which expression best represents the total number of hours she works per week?

A. 2+3+4
B. 4(2 + 3)
C. 2(4+3)
D. 3(2+4)

WEBSITE RESOURCES AND LINKS IN THIS MODULE:

Reference: E-Math I, Elementary Algebra, Revised Edition by Orlando A. Oronce and Marilyn O. Mendoza,Lesson 2.2 pages 94-97,
Reference: E-Math I, Elementary Algebra, Revised Edition by Orlando A. Oronce and Marilyn O. Mendoza, page 100, Writing, no.s 1-4Reference: E-Math I, Elementary Algebra, Revised Edition by Orlando A. Oronce and Marilyn O. Mendoza, page 100, Investigation

http://www.studystack.com/matching-22974
Provides interactive game for properties of real numbers
http://www.slideshare.net/sadiesattic/properties-real-numbers-basic-presentation-583181
Provides discussion on properties of real numbers through www.slideshare .com
http://www.math.com/school/subject2/lessons/S2U2L1GL.html
Provides discussion on properties of real numbers through www.gooogle.com.ph
http://regentsprep.org/Regents/math/ALGEBRA/AN1/propPrac.htm
Provides interactive games on properties of real numbers through www.gooogle.com.ph
http://regentsprep.org/REgents/math/ALGEBRA/AN1/PropPracTami.htm
Provides interactive games on properties of real numbers through www.gooogle.com.ph
prism-magazine.org

419 552 - www.prism-**magazine**.org/apr09. APRIL 2009. FLIGHT TO ACHIEVEMENT
magazinesubscription.ca
250 329 - Logic Lovers **Math**Logic Problems **Magazine**
anniestromquist.blogspot.com
426 628 - More **Cover** Art From **Mathematics Magazine**
yupedia.com
Provides pictures at www.google.com

Lesson 2.2 Operation on Integers

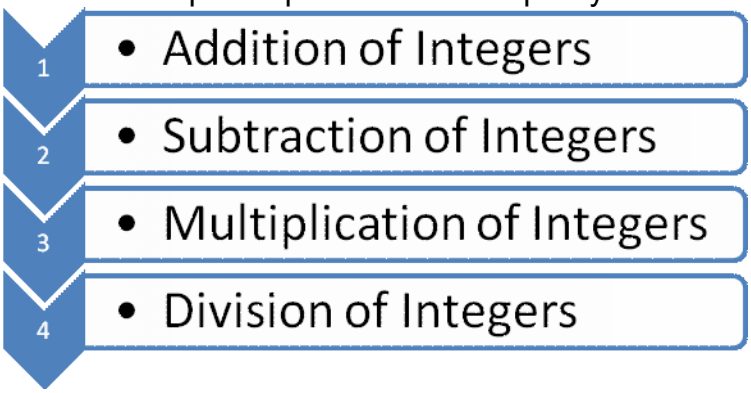
☑ LESSON INTRODUCTION AND FOCUS QUESTION(S):

Have you at a certain time asked yourself why integers exist? Where do we use them? ***How can integers help us solve problems in daily life?*** If they are used a lot, what kind of operations do we do and what are the steps involved. Find out the answer to these questions in this module.

☑ LESSON COVERAGE:

In this lesson, you will examine this question when you take the following topics:
Lesson 2.2.1: Addition of Integers
Lesson 2.2.2: Subtraction of Integers
Lesson 2.2.3: Multiplication of Integers
Lesson 2.2.4: Division of Integers

Here is a simple map of the above topics you will cover:



To do well in this lesson, you need to remember and do the following:
1. Read the concepts very well. Write your ideas on a sheet of paper or on your notebook. This will help you remember the ideas presented in each lesson.
2. Complete all the exercises.
3. Supplement yourself with other learning materials if available and necessary.
4. Keep in mind that success depends on how much effort you exert in learning this lesson.

PRE-ASSESSMENT:

Let's find out how much you already know about this module. Click on the letter that you think best answers the question. Please answer all items. After taking this short test, you will see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this module.

1. What is the sum of: -1 + 4?
A. 5
B. 4
C. 3
D. -3

2. What is (-1) – (-2) equal to?
A. -3
B. -2
C. 1
D. 2

3. Which is the product of (4)(-2)?
A. -8
B. -2
C. 2
D. 8

4. Which is the quotient of (-10) ÷ (-5)?
A. -50
B. -2
C. 2
D. 50

5. What is the result when you add two positive integers?
A. a small number
B. a big number
C. a negative number
D. a positive number

6. What is the sum of -5 and 6?
A. -11
B. -1
C. 1
D. 11

7. What should be the sign of the product of two negative integers?
A. Negative
B. Positive
C. Depends on the larger number
D. Depends on the smaller number

8. In subtracting integers, which should change sign?
A. Minuend
B. Subtrahend
C. Sign if larger number
D. Sign of smaller number

9. What is -16 + -23 equal to?
A. -39
B. -7
C. 7
D. 39

10. What is 70 ÷ 10 equal to?
A. 10
B. 7
C. -7
D. -10

11. Which integer shows a decrease of 5 units?
A. – 5
B. 5
C. 5x
D. 1/5 x

12. Which integer illustrates 10 meters above sea level?
A. 1/10
B. 10x
C. -10
D. 10

13. -5 + 12 = ?
A. -17
B. -7
C. 7
D. 17

14. (-15)(-4) = ?
A. -60
B. -20
C. -19
D. 60

15. 18 – 24 = ?
A. -42
B. -6
C. 6
D. 42

16. (-2)(6)(-3) = ?
A. -36
B. -11
C. 1
D. 36

17. Ana owes the candy store Php 45. Each of 5 friends will help her pay off her debt. How much will each friend pay?
A. 5
B. 7
C. 8
D. 9

18. Roman civilization began in 509 B.C. and ended in 476A.D. How long did Roman Civilization last?
A. 24 yrs.
B. 33 yrs.
C. 975 yrs.
D. 985 yrs.

19. Lally bought 4 pairs of shoes at Php 250 each. How much did she pay to the clerk?
A. Php 65
B. Php 840
C. Php 900
D. Php 1000

20. In the Sahara Desert one day it was 145°F. In the Gobi Desert a temperature of -42°F was recorded. What is the difference between the two temperatures?
A. -187°F
B. -103°F
C. 103°F
D. 187°F

EXPLORE

Let's start the lesson by answering the problem below:

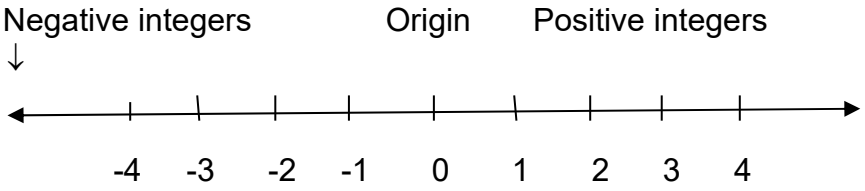
Early Monday morning, Ana, a grade 3 pupil, has 24 pesos in her wallet. Upon leaving for school, her mom gave her 50 pesos for the day's allowance. She spent 32 pesos during break time and 12 pesos during lunch. In the afternoon, her friend Amy paid Ana 25 pesos for the money she owed. On the way home, she spent 8 pesos for the fare. How much money does Ana have at the end of the day?

Show in the box how you will go about answering this problem.

Study Questions:

1. What is your initial idea on how to solve the problem?
2. What methods did you use?
3. How did the concept of integer help you in solving?
4. Do you think learning integers is important in our daily life? Why?

In your previous lesson, you learned about the subsets of real numbers. One of them is the set of integers. To illustrate this set of integers on the number line we have



Referring to the number line, what is the distance of 4 from zero? What is the distance of -4 from zero?

This distance of a number from zero on a number line (always a positive number) is the absolute value of the number, indicated by the two vertical lines. /4/ = 4 and /-4/ = 4. Opposites (like 4 and -4) have the same absolute values since they are of the same distance from zero.

END OF EXPLORE:
You just tried recalling the concept of integers. Let's now find out how to add, subtract, multiply and divide integers on the next part.

FIRM-UP

How can we use integers in our daily life? In this section you will learn the rules and
how integers are useful in everyday tasks.

ADDITION AND SUBTRACTION OF INTEGERS

RULES:

In ADDING INTEGERS, check the sign of the integers:
Rule 1: If the integers have the same sign, ADD, then COPY the COMMON SIGN.
Rule 2: If the integers have unlike signs, SUBTRACT, then COPY the SIGN of the LARGER integer.

EXAMPLES

SAME SIGNS	UNLIKE SIGNS
(3) + (6) = (+9)	(-3) + (5) = (+2)
(-3) + (-6) = (- 9)	(5) + (-7) = (-2)

*LARGER is used here as a quick way to describe the integer with the greater absolute value (distance from zero). In each of the examples above, the SECOND integer has a greater Absolute Value. Note that 3 is the same as +3

Practice adding integers

Worksheet # 1:

Perform the indicated operation

1. The sum of 4, 5 and 8	Ans. 17
2. (- 5) added to (-9) and (-10)	Ans. -24
3. (- 18) more than (-22)	Ans. -40
4. (-12) + (- 14) + (4) =	Ans. -22
5. (-42) + (7) + (12) =	Ans. -23
6. (-3) + (-7) + (-8) +(- 3) =	Ans. -21
7. (-12) + (-13) +(32) + (21) =	Ans. 28
8. (-9) + (14) + (-20) + (17) =	Ans. 2
9. (15) + (29) + (-46) + (-21) =	Ans. -23
10. (56) + (-67) + (-43) + (-43) =	Ans. -97

We experience adding integers in many instances in our daily life – buying and selling, payment of bills and the like. At times we are not aware that these are application of integers.

Try this!

Teresa, a working mom, has to pay the following bills every second Friday of the month:

water – P360.00
electricity – P1500.00
rental fee (house) – P3000.00
salary (helper) – P1800.00

How much should she prepare to pay these bills?

What operation of integers will you use to answer the problem? Can integers help us solve problems in our daily life?

Now, let us recall **SUBTRACTION of INTEGERS:**
In SUBTRACTING INTEGERS,

RULES:

STEP 1: Change the sign of the subtrahend (the one written after the minus sign).
STEP 2: FOLLOW the RULES of ADDITION

For example:
(-8) - (+ 2)

First copy the problem exactly	(-8) + (+2) =
1. The first number stays the same	(-8)
2. Change the operation	(-8) +
3. Change the sign of the subtrahend	(-8) + (-2)
4. Follow the rules for addition	(-8) + (-2) = - 10

Now, try this on your own!

Worksheet # 2

I. Perform the indicated operation.

1. 4 – 9 =	Ans. -5
2. 9 – (-5) =	Ans. 14
3. -12 – (-6) =	Ans. -6
4. -8 – 7 =	Ans. -15
5. 27 – 56 =	Ans. -29
6. The difference of -12 and 15	Ans. 3
7. -35 subtracted from 23	Ans. 58
8. 45 less (-34)	Ans. 79
9. Subtract -37 from -23	Ans. 14
10. 8 less than 10	Ans. -2

How did you find the practice exercises? Great! Continue reading the lesson.

Read the following phrases often used in daily conversations.

a loss of 15 pounds
a gain of 15 pounds
a decrease of 5 points
an increase of 5 points
5 feet below sea level
5 feet above sea level
a 5% depreciation of land
a 5% appreciation of land
a 10% decline in enrollment
a 10% raise in enrollment

Think about this…

1. What is common about the underlined words on the left? on the right?
2. If integers will be used to represent these phrases to mathematical phrases which set of words represent negative integers? Positive integers?
3. Are integers helpful in daily life? Why do you say so?

Worksheet #3

I. Perform the indicated operation

1. 4 + 6 – 8 =

2. – 5 + 3 – 9 =

3. 12 + (-6) + (-5) =

4. -14 – (-5) + (-6) =

5. 2 - 5 + 7 – 6 =

6. -22 – 43 + 25 =

7. – 8 – 9 – 11 – 19 =

8. -6 – 23 + 43 =

9. – 75 – 82 + 83 + 54 =

10. 67 – (-56) – 45 + 49 =

Visit the following websites to enhance your understanding of addition and subtraction of integers. Click addition and subtraction of integers.

1. http://www.mathsteacher.com.au/year8/ch03_integers/03_addsub/integers.htm
The website provides review the rules of addition and subtraction of integers.
2.http://www.kutasoftware.com/FreeWorksheets/PreAlgWorksheets/Adding+Subtracting%20Integers.pdf
The website provides exercises on adding and subtracting integers.

Read then solve the following word problems using integers. Then, justify your answer by citing the key words in the problem which signal to you a specific operation.

.

1. A submarine was situated 800 feet below sea level. If it ascends 250 feet, what is its new position?

Solution:

-800 feet + 250 feet = - 550 feet

Click here to see keyword and related operation
Keyword : ascend. Related operation: addition

2. From 400 meters above sea level, Belle took off in her helicopter and ascended 100 meters. Which integer represents Belle's elevation now?

Solution:

400 meters + 100 meters = 500 meters.

Click here to see keyword and related operation.
Keyword: ascended. Related operation: addition.

3. Vincent ended round one of a game show with 500 points. In round two, he lost 300 points. What was his final score?

Solution:

500 points + (-300) points = 200 points

Click here to see keyword and related operation
Keyword : lost. Related operation: subtraction

4. Dominique started the week with Php9,000.00 in her bank account. Then she spent Php7,000.00 on a diamond ring. Which integer represents the final balance of the bank account?

Solution:

Php9,000.00 – Php7,000.00 = Php2,000.00

Click here to see keyword and related operation

Keyword : spent. Related operation: subtraction

5. During the Silver Lake Golf Tournament, Timothy scored 0 under par the first day. The second day, he scored 1 over par. Relative to par, what was Timothy's overall score?

Solution:

0 + 1 = 1

Click here to see keyword and related operation

Keyword : scored. Related operation: addition

How did you find the exercises? Were you able to identify the keywords and the related number operation? If you did, then you are doing very well.

In the next lesson, you will learn further other operations of integers that are very useful in solving problems that you encounter in your daily experiences.

MULTIPLICATION AND DIVISION OF INTEGERS

Consider the situations below.

Jorge, a 7th grader is given a daily allowance of Php 100.00. He spent Php 25.00 for the burger, Php 12.00 for the drinks and Php 60.00 for the lunch. How much is saved for the day?

How will you answer the problem? What operation/s of integers will you use? How can integers help us solve problems in our daily life? Can you cite your own examples related to your personal experiences?

At times we encounter problems that can be solved conveniently using another operation. In the following situations, think of an easier way of answering the problem. Will addition and subtraction of integers still be a convenient way of answering these problems?

Your mother tells you, this week your daily allowance increases to Php 60.00.
How much will you receive in 5 days? What integer operation will you use? Which one is the faster way of getting the answer?

Ana owes 5 pesos to each of 4 friends. How much money does she owe?
What is the key word in the problem? What sign represents this keyword? What integer operation will you use? What do you think is the sign of the result? When will this operation yield a positive result? When will this operation yield a negative result?

This means (-5) is multiplied by (4) which gives a product of -20. This is interpreted as Ana owes a total amount of 20 peso. Likewise, any positive number multiplied by a negative number the result is negative. Therefore, multiplication does not always mean making the number bigger. In this case, it makes the number smaller since any negative number is smaller than any positive number.

From the bus terminal, Cory and her 3 friends took a taxi cab to their destination. The driver charged them 120 peso. How much should each pay for the taxi fare? What operation will you use?

If you subtract 4 from 120, the result is 116. How many times more can you subtract 4 from 116? This means you can subtract 4 from 120 thirty times. This implies that 4 times 30 equals 120 and 120 divided by 4 equals 30.

Earlier, when we multiply (-5) and (4), the product is -20. This means when we divide -20 by 4 the result is -5 or if we divide -20 by -5, the result is 4.

What is (-100) divided by (-25)? What is (-20) divided by (-4)? Therefore, division does not always mean making the number smaller. In this case, it makes the number bigger since any positive number is bigger than any negative number.

Just like addition and subtraction of integers, multiplication and division of integers has many real life applications and a faster way adding the same figures or what we call repeated addition. When you buy ten pieces of eggs at 5 peso per piece, instead of adding ten fives, simply multiply 10 and 5. Same concept applies with division of integers. If you want to know how many eggs were bought out of your 50 peso at 5 peso per piece, just count how many times you can subtract 5 from 50. Conveniently, simply divide 50 by 5.

Up to what extent can operation of integers help us solve real-life problems?

Hence, **in Multiplying Integers,**

RULE 1: If the integers have like signs, then the PRODUCT or QUOTIENT is a positive integer.

RULE 2: If the integers have unlike signs, then the PRODUCT or QUOTIENT is a negative integer.

For example:

LIKE SIGNS	UNLIKE SIGNS
(8) (9) = 72	(-8) (9) = -72
(-72)÷(-9) = 8	(-72) ÷ (9) = -8

Activity: Find the following product/quotient:

1. (3)(6)
2. (-8)(4)
3. (-9)(-7)
4. (5)(-7)
5. (18) ÷ (3)
6. (-72)) ÷ (8)
7. (-56) ÷ (-7)
8. (100)) ÷ (-20)
9. (-3)(4)(6)
10. (-2)(5)(-6)(-3)

Try this!

Click on the link below and practice multiplying and dividing integers.

1. http://www.onlinemathlearning.com/multiply-integers.html
This website provides review of the rules of multiplying integers and exercises on multiplication of integers.
Fill in all the gaps, then press "Check" to check your answers. Use the "Hint" button to get a free letter if an answer is giving you trouble. You can also click on the "[?]" button to get a clue. Note that you will lose points if you ask for hints or clues!

2. http://www.onlinemathlearning.com/dividing-integers.html
This website provides review of the rules of dividing integers and exercises on division of integers.
Fill in all the gaps, then press "Check" to check your answers. Use the "Hint" button to get a free letter if an answer is giving you trouble. You can also click on the "[?]" button to get a clue. Note that you will lose points if you ask for hints or clues!

Activity: **Answer the following word problems using integers.**
Type in the box the integer that makes the following sentence true. Hit ENTER after typing your answer.

1. Type the integer that makes the following sentence true:

☐ **x -4 = -36**
ENTER
Type in the box the integer that makes the following sentence true. Hit ENTER after typing your answer.

2. Type the integer that makes the following sentence true:

-8 ÷ ☐ = 1
ENTER

3. Mr. Johnson usually eats three meals a day. How many meals does he eat in a normal ☐

Solution:
3 meals x 7 days = 21 meals

4. Mommy bought four egg cartons, and each had six eggs. Two of the eggs were bad. How many good eggs did Mommy get? ☐

Solution:
4 egg cartons x 6 eggs each = 24 eggs – 2 bad eggs = 22 good eggs

5. On a family dinner table there are two plates for everybody, and only one plate for little Hannah. 10 people and Hannah came to the dinner . How many plates were on the table?

Solution:
0 people x 2 plates each = 20 plates + 1 plate for Hanna = 21 plates

END OF FIRM UP

In this section you have learned the rules in operating integers. What operations of integers did you use to answer the problems? What keywords helped you determine the proper operation? What realizations have you made for yourself with regard to the usefulness of integers? Can you cite your own experience where operations of integers are applied?

DEEPEN

In this section, you will further learn how integers can help solve daily problems. Click on the following link to start your practice.

1. Integer Word Problems .Click take the quiz now.
http://www.thatquiz.org/tq/previewtelow not ok forest?CKVU7766

2. Challenge Exercises
http://www.mathgoodies.com/lessons/vol5/challenge_vol5.html

Answer the following questions:

1. **What are the skills needed to correctly answer the questions?**
2. **What were the difficulties you encountered while answering the exercises? How would you overcome these difficulties?**

3. **Are the concepts of integers useful to answer real-life problems? To what extent are they useful in our daily life**?

Try This!

Answer the following problems. Identify the operation/s used to answer the problem.

1. Michael is allowed to have an initial capital of Php 297.00 by his class adviser for a mini entrepreneur fund raising project during the school fair. If a cola drink can be purchased at 9 peso each, how many bottles can he buy for the project? At 2 peso gain per cola drink, what is the selling price per bottle? With this price, how much is his total gain?

Click here to see the answer.
Answer: He can buy 33 bottles. Selling price: 11 peso. Total gain: 66 peso
What operation/s did you use?

2. **Teddy spent 4 hours for his internet game. If he is charged of 12 peso per hour, how much should he pay for the use?**

Click here to see the answer.
Answer: Php 48.00
What operation/s did you use?

3. **Toby's room has a floor area of 40 ft^2. If a square foot tile costs Php 38.00, how much should he pay for the tiles?**

Click here to see the answer.
Answer: Php 1520.00
What operation/s did you use?

4. Rita bought the following items at the school canteen during her break. 2 pcs of ball pen at 6 peso each, 3 chocolate bars at 15 peso each, 3 bottles of drinks at 12 peso each, and 2 hamburgers at 20 peso each. How much did she pay at the cashier? If she gave 500 peso bill, how much was her change?

Click here to see the answer.
What operation/s did you use?

5. Roy, a 7^{th} grader, has the following scores in his 3 Math quizzes: 88, 94,& 86. What score should he get in the 4^{th} quiz to get an average of 90?

Click here to see the answer
What operation/s did you use?

REFLECT!: In what way can integers help us solve real life problems?

END OF DEEPEN

Now that you have learned how integers are useful in solving daily problems, in what areas do you still see the application of integers? Write about this in the box below.

Now that you have deeper understanding of the topic, you are ready to do the tasks in the next section.

TRANSFER

How do integers help in solving daily problems? In this section, you will widen the application of integers by doing a given task. Are you ready?

PERFORMANCE TASK

TASK

How wide is the scope of the application of integers? Construct at least two word problems involving integers for each situation. Present and justify a solution for each problem.

1. In the market
2. In the school
3. In a department store
4. In a resort
5. In a business meeting

Write your answer here.

RUBRIC of the Performance Task (Evaluation tool)

	4 (Excellent)	3 (Satisfactory)	2 (Progressing)	1 (Needs Improvement)
Accuracy (40 %)	Demonstrated close attention to accuracy, providing a justification or explanation for each problem	Demonstrated close attention to accuracy in all (most) problems	Demonstrated close attention to accuracy in some problems but lacked precision in others	Demonstrated no concern for accuracy in this task
Relevance/ Appropriateness (30%)	Problems constructed applies varied number operations in a non routine way (extensively the concepts of integers)	Problems constructed applies different number operations (the concepts of integers)	Problems constructed applies number operations but uses some of them in an incorrect way (few concepts of integers)	Problems constructed applies all number operations in an incorrect way (limited concepts of integers)
Realistic (30%)	Problems appear realistic, and formulated reflecting students' experience	Problems appear realistic	Problems are somewhat realistic	Problems are confusing

END OF TRANSFER

In this section, your task was to apply the operations of integers to real life problems. How did you find it? Can you now say that Integers is an important matter to learn? Explain your answer.

POST ASSESSMENT

It's now time to evaluate your learning. Click on the letter of the answer that you think best answers the question. Your score will only appear after you answer all items. If you do well, you may move on to the next module. If your score is not at the expected level, you have to go back and take the module again.

1. What is the sum of: -2 + 6?
A. 8
B. 4
C. -4
D. -8

2. What is (-1) – (-3) equal to?
A. -4
B. -2
C. 2
D. 4

3. Which is the product of (4)(-3)?
A. -12
B. -1
C. 1
D. 12

4. Which is the quotient of (-15) ÷ (-5)?
A. -75
B. -3
C. 3
D. 75

***5.* What is the result when you add two negative integers?**
A. a small number
B. big number
C. a negative number
D. a positive number

6. What is the sum of -5 and 7?
A. -12
B. -2
C. 2
D. 12

7. In subtracting integers, which should change sign?
A. Minuend
B. Subtrahend
C. Sign if larger number
D. Sign of smaller number

8. What should be the sign of the product of two positive integers?
A. Negative
B. Positive
C. Depends on the larger number
D. Depends on the smaller number

9. What is -16 + -24 equal to?
A. -40
B. -7
C. 7
D. 40

10. What is 50 ÷ (-10) equal to?
A. 10
B. 5
C. -5
D. -10

11. Which integer shows an expense of 6 pesos?
A. – 6
B. 6
C. 6x
D. 1/6 x

12. Which integer illustrates 8 meters below sea level?
A. 1/18
B. 18x
C. -8
D. 8

13. -6 + 13 = ?
A. -17
B. -7
C. 7
D. 17

14. (-20)(-3) = ?
A. -60
B.-20
C. -19
D. 60

15. 18 – 25 = ?
A. -43
B. -7
C. 7
D. 43

16. (-2)(6)(-4) = ?
A. -48
B. -12
C. 2
D. 48

17. Ann has a 24 cm chocolate bar. She wants to share this fairly among her 3 friends. How long a piece should each one get?
A. 6 cm
B. 8 cm
C. 12 cm
D. 21 cm

18. Alice gave her Php 100.00 to the cashier for the pair of earrings which cost
Php 48.00. How much was her change?
A. Php 50
B. Php 51.00
C. Php 52.00
D. Php 53.00

19. Dante took an elevator from the 2^{nd} floor to the 12^{th} floor and took the same 5 floors down. On what floor did Dante stop?
A. 5^{th}
B. 6^{th}
C. 7^{th}
D. 8^{th}

20. Faye bought 5 pcs of eggs at 6 pesos each. How much did she pay to the clerk?
A. Php 25.00
B. Php 30.00
C. Php 35.00
D. Php 40.00

GLOSSARY OF TERMS USED IN THIS MODULE:

Integer. A subset of real numbers which can be positive or negative.
Positive. A sign that indicates above or greater than 0.
Negative. A sign that indicates below or less than 0.

WEBSITE RESOURCES AND LINKS IN THIS MODULE:

http://www.mathsteacher.com.au/year8/ch03_integers/03_addsub/integers.htm
http://www.kutasoftware.com/FreeWorksheets/PreAlgWorksheets/Adding+Subtracting%20Integers.pdf
These two websites provides review of the rules and exercises on addition and subtraction of integers.

http://www.mathgoodies.com/lessons/vol5/challenge_vol5.html
This website provides challenging application of integers to word problems.

http://www.onlinemathlearning.com/multiply-integers.html
This website provides review of the rules and exercises on multiplication of integers.

http://www.onlinemathlearning.com/dividing-integers.html
This website provides review of the rules and exercises on division of integers.

http://www.thatquiz.org/tq/previewtest?CKVU7766
This website provides quiz on word problems involving integers.

Lesson 2.3: RATIONAL AND IRRATIONAL NUMBERS

☑ TOPIC INTRODUCTION AND FOCUS QUESTION

Have you ever wondered what is between 1 and 2? Is there a need for us to know the values between them? What use is there to know about these values? How can the knowledge of these values help us solve problems in daily life?

Think about the following situations that you may encounter in daily life:

If a car can run 12 kilometers in 1 liter of gasoline, at least how many liters of gasoline is needed for it to run 18 kilometers?

If a tailor has to divide a 4-meter long cloth into 3 equal parts, how long should each part be?

If a pharmacist mixes 3 ounces of water for every 2 grams of a medicine, how many ounces of water should he mix if he needs 3 grams of the medicine?

If a manufacturer needs to make wrappers for ice cream cones which are 4 inches long (diagonally) and 2 inches in diameter, how much paper (area in terms of square inches) would he need for each cone?

If an engineer has to construct a ½-meter tall ramp with a 30-degree slope, how long should the ramp be horizontally?

These are just some of situations in real-life that we cannot solve using only integers. In these situations, we need to use **rational** and **irrational numbers**.

In this module, we will try to answer the question, “How useful are rational and irrational numbers in real life?”

☑ LESSON COVERAGE

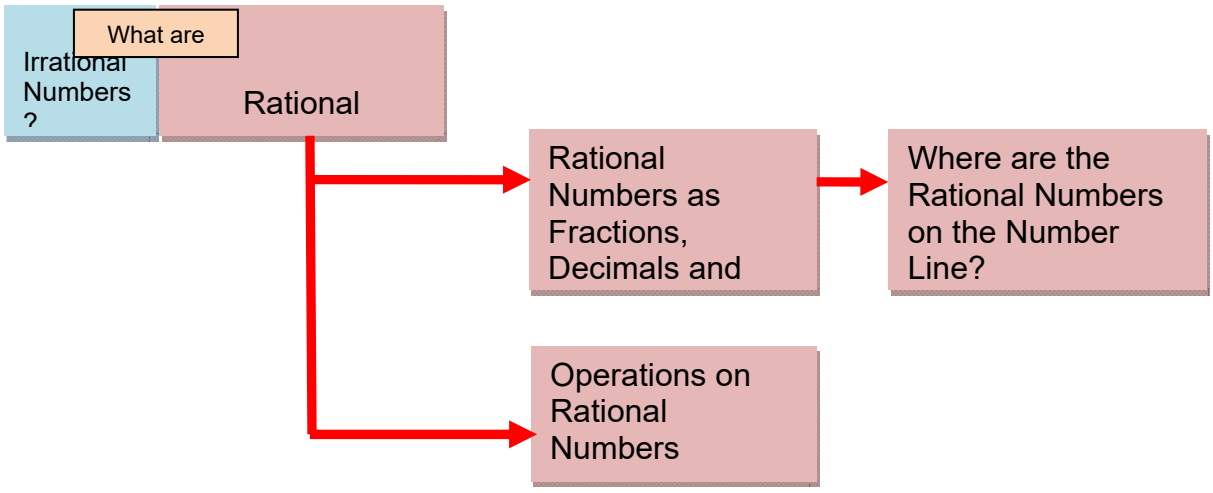
This lesson has the following topics:

Topic No.	Title	You’ll learn to…	Estimated Time
Topic 1	What are Rational and Irrational Numbers?	Differentiate rational numbers from irrational numbers	30 minutes
Topic 2	Rational Numbers as Fractions,	Express rational numbers as	30 minutes

	Decimals and Percents	fractions, to percents	
Topic 3	Where are the Rational Numbers on the Number Line?	Illustrate rational numbers and arrange them on a number line	1 hour
Topic 4	Operations on Rational Numbers	Add, subtract, multiply and divide rational numbers	1 hour

☑ Concept Map of the Module

Here is a simple map of the above lessons you will cover:



☑ Expected Skills

To do well in this topic, you need to remember and do the following:

1. Read and re-read. Try your best to really understand what you have read before proceeding.
2. Write down notes. This will help you recall faster what you have studied.
3. Don't skip. Answer all the exercises, including those in hyperlink. These exercises have been designed to help you fully understand the topic.
4. Correct your own mistake. Should you have wrong answers in some items in the exercises, go back to the explanation, find out your mistakes and answer them again until you get them right.
5. Supplement yourself. There are numerous resources, printed and online, that can help you in finishing this module.

6. Keep at it. Keep in mind that success depends on how much effort you exert in learning this topic.

PRE-ASSESSMENT:

Let's find out how much you already know about rational and irrational numbers.

Exercise 1: *Click on the letter that you think best answers the question. Please answer all items. After taking this short test, click "Submit" to see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this lesson.*

1). Which of the following statements is TRUE? (A)
A. Zero is an irrational number.
B. Fractions are irrational numbers.
C. Negative integers are rational numbers.
D. Only counting numbers are rational numbers.

2) Which two fractions are equal? (A)
A. ½ and 2/3
B. ¾ and 6/8
C. 4/6 and 1/2
D. 10/20 and ¾

3) Which of the following orders is from the greatest to least? (M)
A. -1, ½, 0.2
B. 0.2, -1, 1/2
C. ½, -1, 0.2
D. ½, 0.2, -1

4). What is 4/5 expressed in percent? (A)
A. 4%
B. 5%
C. 45%
D. 80%

5) Which of the following numbers is equivalent to 0.75 ? (A)
A. 2/3
B. 3/4
C. 4/3
D. 3/5

6) Which of the following numbers is equivalent to 4/5? (A)
A. 0.08
B. 0.18
C. 0.8

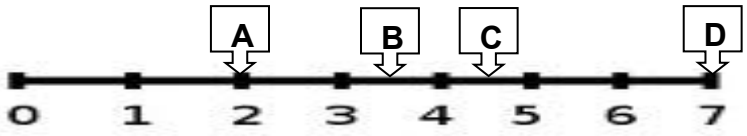
D. 0.45

7) 2/9 + 3/9 = ? (A)
A. 1/9
B. 5/9
C. 6/9
D. 5/18

8) ½ + ¼ = ? (A)
A. 1/6
B. 2/6
C. 3/4
D. 2/8

9) 8/10 – 2/10 = ? (A)
A. 3/5
B. 4/5
C. 3/10
D. 6/20

10) Where is 7/2 located on this number line? (A)



A. A
B. B
C. C
D. D

11). ¾ ÷ 2 ½ = ? (M)
A. 3/10
B. 3/5
C. 4/5
D. 15/8

12) 1 2/5 x 3/7 =? (A)
A. 3/5
B. 4/5
C. 21/30
D. 6/35

13) 6 x 4.2 = ? (A)
A. 2.42

B. 2.52
C. 24.2
D. 25.2

14) 6.51 ÷ 7 =? (A)
A. 0.93
B. 0.97
C. 9.7
D. 97

15) 8.27 + 4.35 = ? (A)
A. 3.92
B. 12.52
C. 12.62
D. 12.72

16. What is $2.\overline{22}$ expressed in fraction form? (M)
A. 2/9
B. 20/9
C. 2/22
D. 22/2

17) ½ + ¼ = ? (M)
A. 1/6
B. 2/6
C. 3/4
D. 2/8

18) 8/10 – 2/10 = ? (M)
A. 3/5
B. 4/5
C. 3/10
D. 6/20

19) 9/10 - I/2 = ? (M)
A. 1/5
B. 2/5
C. 3/5
D. 4/5

20). ¾ ÷ 2 ½ = ? (M)
A. 3/10
B. 3/5
C. 4/5
D. 15/8

WHAT ARE RATIONAL AND IRRATIONAL NUMBERS?

EXPLORE

Let us start this topic by trying to classify rational and irrational numbers. As you go through this part, keep in mind these questions:

- ***How do you differentiate rational numbers from irrational numbers?***
- ***How useful are rational and irrational numbers in real-life?***

ACTIVITY 1. Anticipation/Reaction Guide

Instruction: Determine if the given number is rational or irrational by clicking on the correct button. Click only in the columns under "Response Before Lesson". After you have answered all 10 items, click "SAVE" to save your responses. Then proceed to answer the process questions. (Don't answer "Response After Lesson" yet. You will go back to that at the latter part of the topic.)

Response Before Lesson		Topic: What are Rational and Irrational Numbers?	Response After Lesson	
Rational Number	Irrational Number	Given Number	Rational Number	Irrational Number
		$\frac{3}{5}$		
		4		
		100/3		
		0.25		

		2.5		
		4		
		$-\frac{15}{2}$		
		0		
		0.151515		
		$\frac{\sqrt{3}}{2}$		
SAVE			SUBMIT	

PROCESS QUESTIONS: Answer these questions by completing the sentence. Click "SAVE" after you have completed them.

1. How did you decide whether the given number is rational or irrational?

   I think rational numbers are _____
   _____
   while irrational numbers are _____
   _____

2. How useful are rational and irrational numbers in real life?

   I think rational and irrational numbers are useful because _____
   _____
   _____

END OF EXPLORE:

You have given your initial ideas regarding rational and irrational numbers. You will now recheck your ideas by going to the next session!

FIRM-UP

Let us now learn more about rational numbers.

Your goals in this section are:

1. differentiate rational numbers from irrational numbers
2. to express fractions as decimals and decimals as fractions
3. locate rational numbers on the number line.

As you go through this part, keep on thinking about these questions:

- ***How do you convert fractions to decimals and decimals to fractions?***
- ***What process do you need to do to locate rational numbers in the number line?***
- ***How useful are rational numbers in real-life?***

***Important concept/idea:**

A **rational number** is any number which can be written as a quotient of two integers where the divisor is not zero. The word “rational” comes from the word *ratio* which means quotient.

Here are some examples:

$\frac{4}{5}$ is a rational number (4 divided by 5)

$\frac{1}{3}$ is a rational number (1 divided by 3)

0.5 is a rational number (1/2)

25 is a rational number (25/1)

-10 is a rational number (-10/1)

3.45 is a rational number (345/100)

-5.8 is a rational number (-58/10)

$0.\overline{66}$ is a rational number (2/3)

$0.\overline{23}$ is a rational number (23/99)

A rational number is

$\frac{a}{b}$ where $b \neq 0$

- All fractions are rational numbers (except with zero denominator). Example: $\frac{5}{7}$
- All terminating decimals are rational numbers. Example: 0.8
- All repeating non-terminating decimals are rational numbers. Example: $0.\overline{3}$

Let us now watch this short video on rational numbers. Click on the link below.

http://www.youtube.com/watch?v=pIRb7F7tKEM&feature=related

Process Questions: Write your answers below and click on "SAVE".

1. Aside from the recipe of doughnut glaze, Can you think of one or two other uses of rational numbers?

   _____
   _____
   _____

2. How useful are rational numbers in real life?

   _____
   _____
   _____

An **irrational number** is a number which **cannot** be written as a quotient (or ratio) of two integers.
Here are some examples:

Many square roots are irrational, like
$\sqrt{2}$ = 1.414213562373095048801688 7… (and more)

$\sqrt{3}$ = 1.732050807568877293527446341505 9… (and more)

(But not all square roots are irrational. Some are rational like $\sqrt{4} = 2$.)
Other irrational numbers are
pi (π) = 3.14159265358979323846264338327 95 (and more...)

Euler's Number (*e*) = 2.71828182845904523536028747135 27 (and more ...)

Golden Ratio (φ) = 1.61803398874989484820... (and more ...)

This video supplements real world use of irrational numbers. How useful are irrational numbers in real life?
http://www.youtube.com/watch?v=oORCAz-V_Bg&feature=related

L

Therefore, if a number can be written as a fraction or quotient of two integers, then it is a rational number. If it cannot be done, then it is an irrational number.

Process Questions: Write your answers below and click on "SAVE".

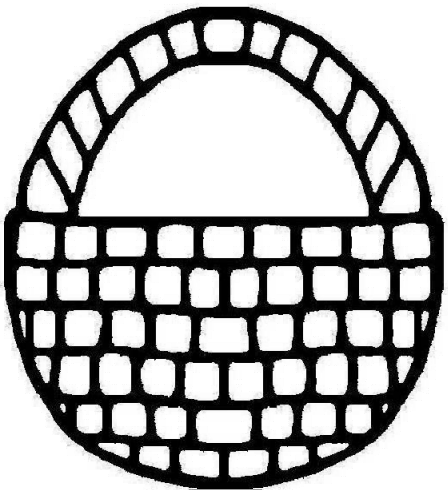
1. Aside from that shown in the video, can you think of one or two other uses of irrational numbers?
   _____
   _____

2. How useful are irrational numbers in real life?
   _____
   _____

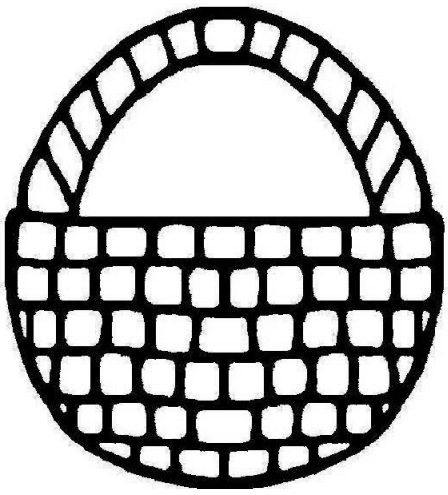
Now try your hand at this:

Instructions: Click and drag the given numbers to the basket where they belong. Click “SUBMIT” after you have finished to find out if you got them right!

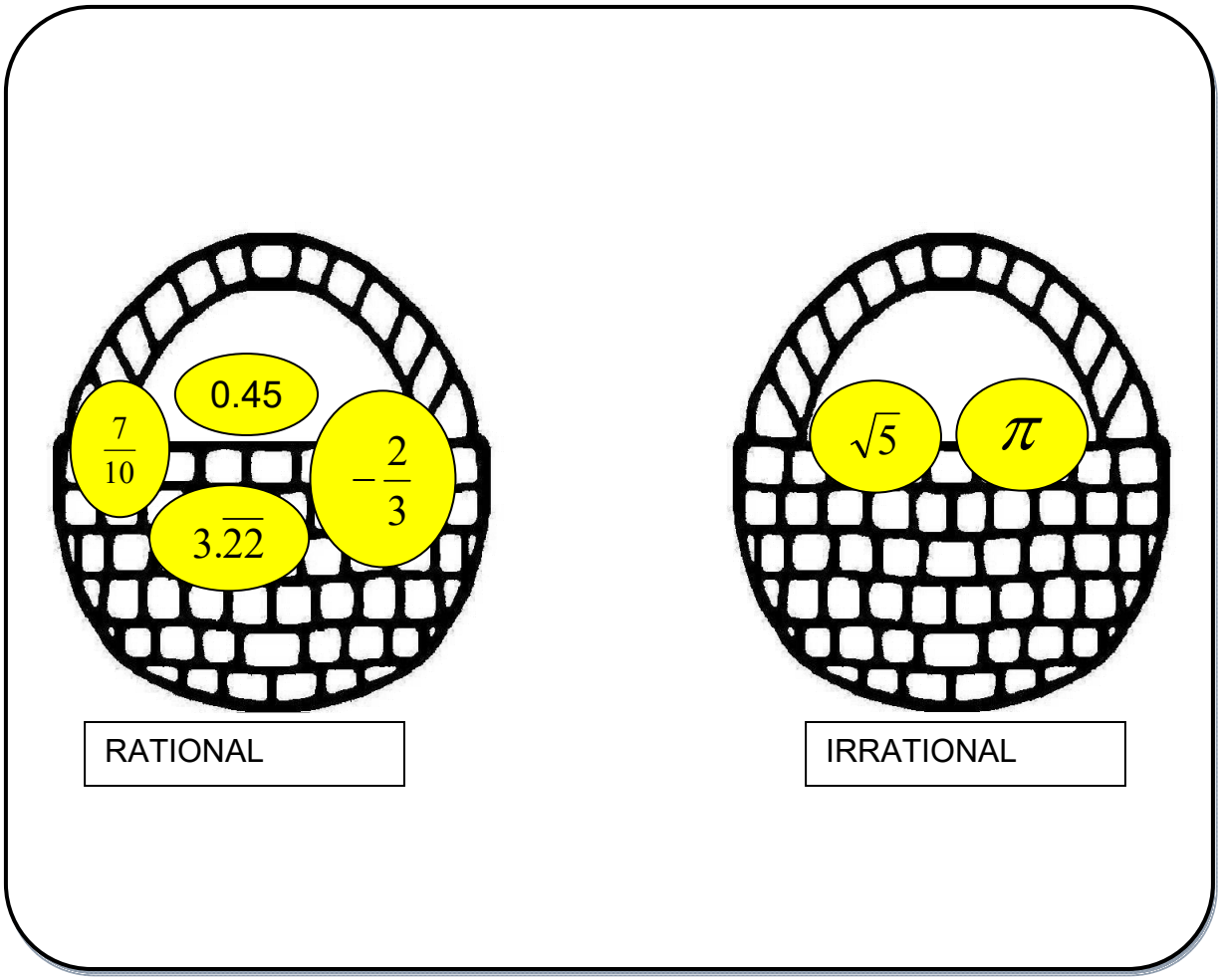
$\frac{7}{10}$ $\sqrt{5}$ $3.\overline{22}$ $-\frac{2}{3}$ 0.45 π



RATIONAL



IRRATIONAL



SUPPLEMENT: For more explanation on classifying rational and irrational numbers, visit this website:

http://www.phschool.com/atschool/academy123/english/academy123_content/wl-book-demo/ph-107s.html
This is a video explaining the rules in classifying rational and irrational numbers. After watching the video, do the next activity for some fun!
Visit this website, play the game and try your best to get the perfect score!
http://www.math-play.com/rational-and-irrational-numbers-game/rational-and-irrational-numbers-game.html
Rational and Irrational Numbers Game is an interactive and fast-paced game. The object of this game is to quickly classify given numbers as rational or irrational numbers by dragging them in the correct bin in less than 3 minutes.

ACTIVITY 2. Anticipation/Reaction Guide

Let's go back to the Anticipation/Reaction Guide that you have answered at the start of this topic. Once again, determine if the given number is rational or irrational by clicking on the correct button. But this time, click only in the columns under "Response After Lesson". After you have answered all 10 items, click "SUBMIT" to find out if you got them right.

If you still have 2 or more mistakes, it would be best to go over the lessons again. Find out why you made those mistakes and correct your understanding of the lesson.

Read again your answers to the process questions. Is there anything you need to change now that you have learned to classify rational and irrational numbers?

Response Before Lesson		Topic: Rational and Irrational Numbers	Response After Lesson	
Rational Number	Irrational Number	Given Number	Rational Number	Irrational Number
		$\frac{3}{5}$		
		4		
		100/3		
		0.25		
		2.5		
		4		
		$-\frac{15}{2}$		
		0		

		0.151515		
		$\frac{\sqrt{3}}{2}$		

PROCESS QUESTIONS: Answer these questions by completing the sentence. Click "SAVE" after you have completed them.

1. How do you determine whether the given number is rational or irrational?

   I learned that rational numbers are _____
   _____
   while irrational numbers are _____
   _____

2. How useful are rational and irrational numbers in real life?

   I think rational and irrational numbers are useful because _____
   _____
   _____

RATIONAL NUMBERS AS FRACTIONS, DECIMALS AND PERCENTS

Converting Fractions to Decimals

Let us start by visiting the website given below. After reading on the 3 methods of converting fractions to decimals given in the website, answer the exercises that follow. Make sure to answer all 50 items as they are designed step-by-step to help you understand more clearly the 3 methods. After you have finished the exercises, check your overall score at the bottom of the webpage. If your overall score is below 80%, refresh the webpage and answer the exercises again. You should only be satisfied if your overall score has reached 80% or above. Always take note of your mistakes and scroll back to find out how you can correct them.
http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i17/bk7_17i2.htm

For more help in converting fractions to decimals, watch this video.
http://www.youtube.com/watch?v=DiBwg5cNP84

To convert fractions to decimals, divide the numerator by the denominator.
The result could be:

- an integer (example: 10/2 = 5, -24/8 = -3)
- a terminating decimal (example: 1/5 = 0.2, 5/8 = 0.625, 15/4 = 3.75)
- a repeating non-terminating decimal (example: 1/3 = 0.333…, 11/6 = 1.8333…)

ACTIVITY 3.

Now let us have a short quiz to check your understanding of the lesson.
Instruction. Convert the Fractions to Decimals. After you have answered all items, click on "SUBMIT" to check your answers.

FRACTION	DECIMAL
1. $\frac{4}{5}$	
2. $\frac{15}{3}$	
3. $\frac{1}{9}$	
4. $\frac{7}{6}$	
5. $\frac{15}{8}$	

FRACTION	DECIMAL
1. $\frac{4}{5}$	0.8
2. $\frac{15}{3}$	5
3. $\frac{1}{9}$	0.111… or $0.\overline{11}$
4. $\frac{7}{6}$	1.1666… or $1.1\overline{66}$
5. $\frac{15}{8}$	1.875

Rational Numbers Expressed as Percent

Many applications of rational numbers is in the form of percent. To express rational numbers as percent is easy! All you need to do multiply the decimal by 100%. Take a look at these examples.

FRACTION	DECIMAL	Multiplied by 100%	PERCENT
$\frac{1}{5}$	0.2	X 100%	20%
$\frac{2}{3}$	0.666…	X 100%	66.67% (rounded-off)
$1\frac{5}{8}$	1.625	X 100%	162.5%

ACTIVITY 4.

Now try doing this yourself. Fill out the table and click on “SUBMIT” after you’re done to check your answers.

FRACTION	DECIMAL	PERCENT
$\frac{1}{2}$	0.5	
$\frac{2}{5}$	0.4	
$\frac{13}{20}$		
$\frac{4}{9}$		
$\frac{2}{11}$		
$2\frac{7}{10}$		
$3\frac{5}{6}$		

FRACTION	DECIMAL	PERCENT
$\frac{1}{2}$	0.5	50%
$\frac{2}{5}$	0.4	40%
$\frac{13}{20}$	0.65	65%
$\frac{4}{9}$	0.444…	44.44% (rounded-off)
$\frac{2}{11}$	0.1818…	18.18%(rounded-off)
$2\frac{7}{10}$	2.7	270%
$3\frac{5}{6}$	3.8333…	383.33%(rounded-off)

Next, let’s learn how convert decimals to fractions.

Converting Decimals to Fractions

There are two approaches that you have to learn. The first approach is for terminating decimals, the second is for repeating non-terminating decimals.

A. Converting Terminating Decimals into Fractions

Let us do some reading! Visit the website below.
http://www.coolmath.com/prealgebra/02-decimals/05-decimals-converting-decimal-to-fraction-01.htm

Questions:

1. How are terminating decimals expressed as fractions?
2. Under what situations is it more advantageous to write decimals as a fraction?

ACTIVITY 5.

Let's apply what have just learned from the website. Convert the following terminating decimals into fractions. Click "SUBMIT" when you are done to check your answers.

DECIMAL	FRACTION
1. 0.3	
2. 0.8	
3. 0.44	
4. 0.264	

DECIMAL	FRACTION
1. 0.3	$\frac{3}{10}$
2. 0.8	$\frac{4}{5}$
3. 0.44	$\frac{11}{25}$
4. 0.264	$\frac{33}{125}$

Let's learn some more! Watch this video explaining how to convert terminating decimals into fractions.
http://www.youtube.com/watch?v=qyTFvx_ZVOs

ACTIVITY 6.

Let's apply what we have just learned! Convert the terminating decimals into fractions. Click on "SUBMIT" when you are done to check your answers.

DECIMAL	FRACTION
1. 0.48	
2. 0.345	
3. 12.248	

DECIMAL	FRACTION
1. 0.48	$\frac{12}{25}$
2. 0.345	$\frac{69}{200}$
3. 12.248	$\frac{11}{25}$

B. Converting Repeating Non-Terminating Decimals into Fractions

Let's do some reading! Visit the website below.
http://www.basic-mathematics.com/converting-repeating-decimals-to-fractions.html

Questions:

a. How are non-terminating decimals expressed as a fraction?

b. What is the advantage of expressing non-terminating decimals as a fraction? Cite an example to support your answer.

ACTIVITY 7.

Let's apply what you have just learned from the website. Convert the repeating non-terminating decimals into fractions.

DECIMAL	FRACTION
1. 0.4444…	
2. 0.858585…	
3. 2.161616…	
4. 10.848484…	

DECIMAL	FRACTION
1. 0.4444…	$\frac{4}{9}$
2. 0.858585…	$\frac{85}{99}$
3. 2.0161616…	$2\frac{16}{99}$
4. 10.848484…	$10\frac{28}{33}$

Let's learn some more! Watch this video explaining how to convert non-terminating decimals into fractions.
http://www.youtube.com/watch?v=xX1sqV1nSAQ&feature=relmfu

ACTIVITY 8.

Let's apply what you have just learned! Convert the repeating non-terminating decimals into fractions. Click on "SUBMIT" when you are done to check your answers.

DECIMAL	FRACTION
1. 0.625625625…	
2. 1.142857142857…	

DECIMAL	FRACTION
1. 0.625625625…	$\frac{5}{8}$
2. 1.142857142857…	$1\frac{1}{7}$

Now that you have had several exercises on converting fractions to decimals and vice versa, try your skills in this website. Click on the link below and answer at least 20 questions. If you make an incorrect answer, be sure to read the explanation and learn from your mistake.
Here's a challenge. Answer correctly as many items as you can in 20 minutes! (Timer and score tally is at the right side of the webpage.)
http://www.ixl.com/math/grade-7/convert-between-decimals-and-fractions-or-mixed-numbers

For more exercises on expressing rational numbers as fractions, decimals or percent, visit this website:
http://www.mathgoodies.com/lessons/vol4/challenge_vol4.html
Now it's time for us to check how well you have learned the skill of expressing rational numbers in fraction form, in decimal form and in percent form.

ACTIVITY 9. QUIZ.

Complete the table. Round off non-terminating decimals to the nearest hundredths when converting to percent. Click on "SUBMIT" after you are done to check your answers.

NO.	FRACTION	DECIMAL	PERCENT
1	$\frac{3}{8}$		
2		0.1875	
3	$\frac{5}{22}$		
4			30%
5		0.35	
6	$1\frac{4}{5}$		
7		2.666…	
8	$1\frac{3}{11}$		

NO.	FRACTION	DECIMAL	PERCENT
1	$\frac{3}{8}$	0.375	37.5%
2	$\frac{3}{16}$	0.1875	18.75%

3	$\frac{5}{22}$	0.227272…	22.73% (rounded-off)
4	$\frac{3}{10}$	0.3	30%
5	$\frac{7}{20}$	0.35	35%
6	$1\frac{4}{5}$	1.8	180%
7	$2\frac{2}{3}$	2.666…	266.67%(rounded-off)
8	$1\frac{3}{11}$	1.272727…	127.27% (rounded-off)

ACTIVITY 10.

Now that you have learned how to express rational numbers as fractions, decimals and percents, try to fill out this 3-2-1 reflection guide. Click on “SUBMIT” after you are done.

3-2-1 Reflection

3 I learned statements…

1. I learned

_____

_____

2. I learned

_____

_____

3. I learned

2 usefulness of rational numbers ***1. Rational numbers are useful in_____*** _____ __ ***2. Rational numbers are useful in*** _____ _____
1 Question I have is… _____ _____ _____ _____

Let us now proceed to the next topic which is locating rational numbers on the number line.

WHERE ARE THE RATIONAL NUMBERS ON THE NUMBER LINE?

An easy way to locate rational numbers on the number line is to express them first as integers or decimals. Check out these examples!

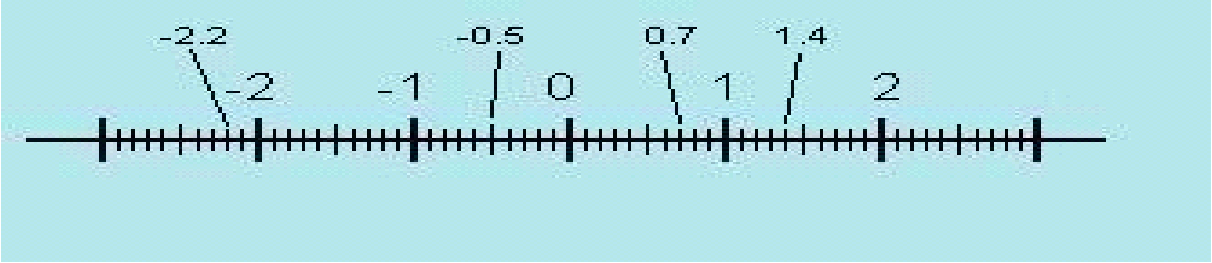


Image source: http://www.physicsforidiots.com/complex.html

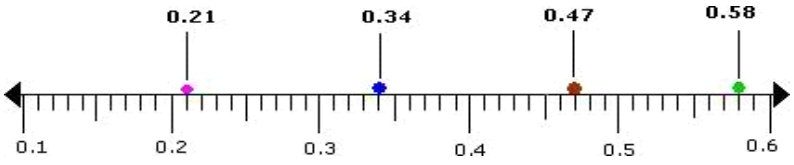


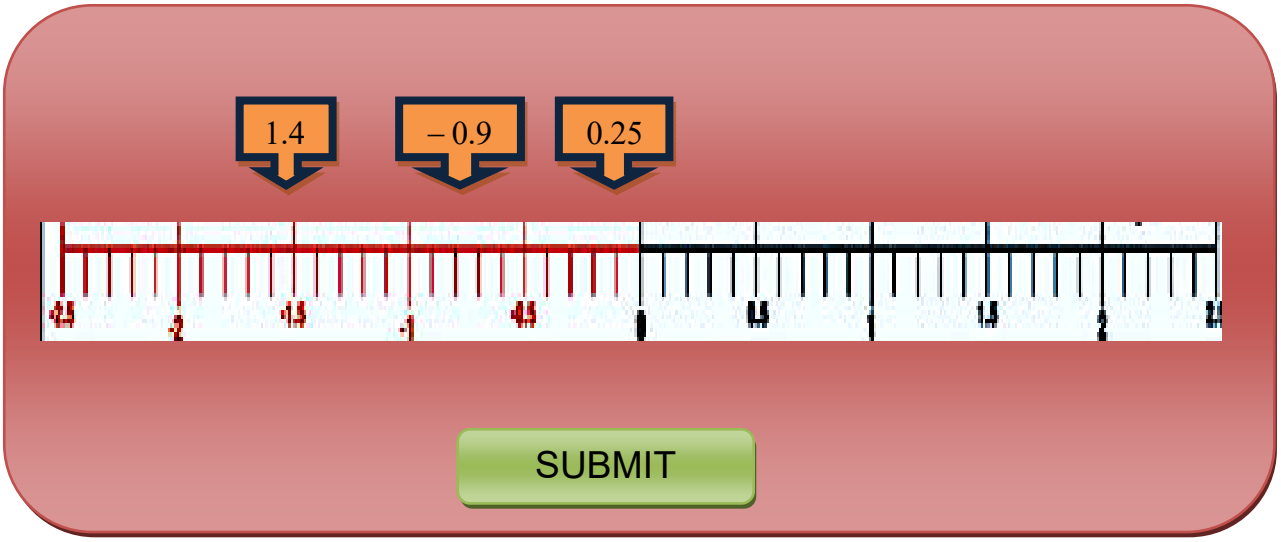
Image source: http://www.icoachmath.com/math_dictionary/Number_Sense.html
Watch this video to get a better idea.
http://www.youtube.com/watch?v=zqLSFflYTDM&feature=related
Now answer the questions:

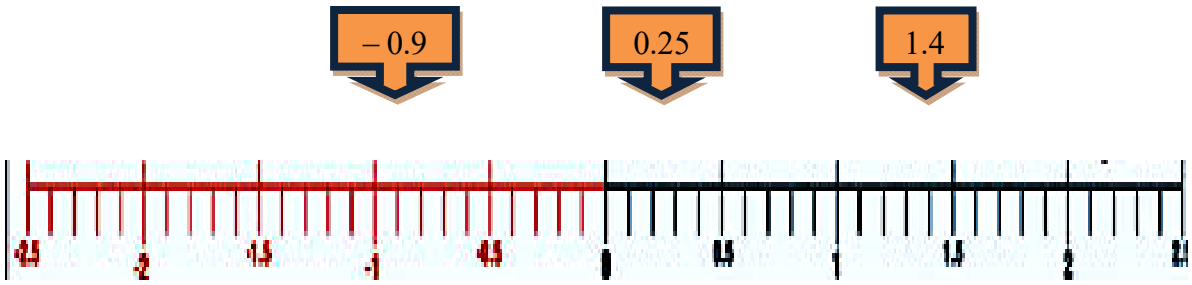
1. How are rational numbers located in the number line?
2. In what way can you use this skill in real life?

Let's apply what you have just learned from the video.

ACTIVITY 11.

Click and drag the rational numbers to their correct location on the number line. Click on "SUBMIT" after you have finished locating them.

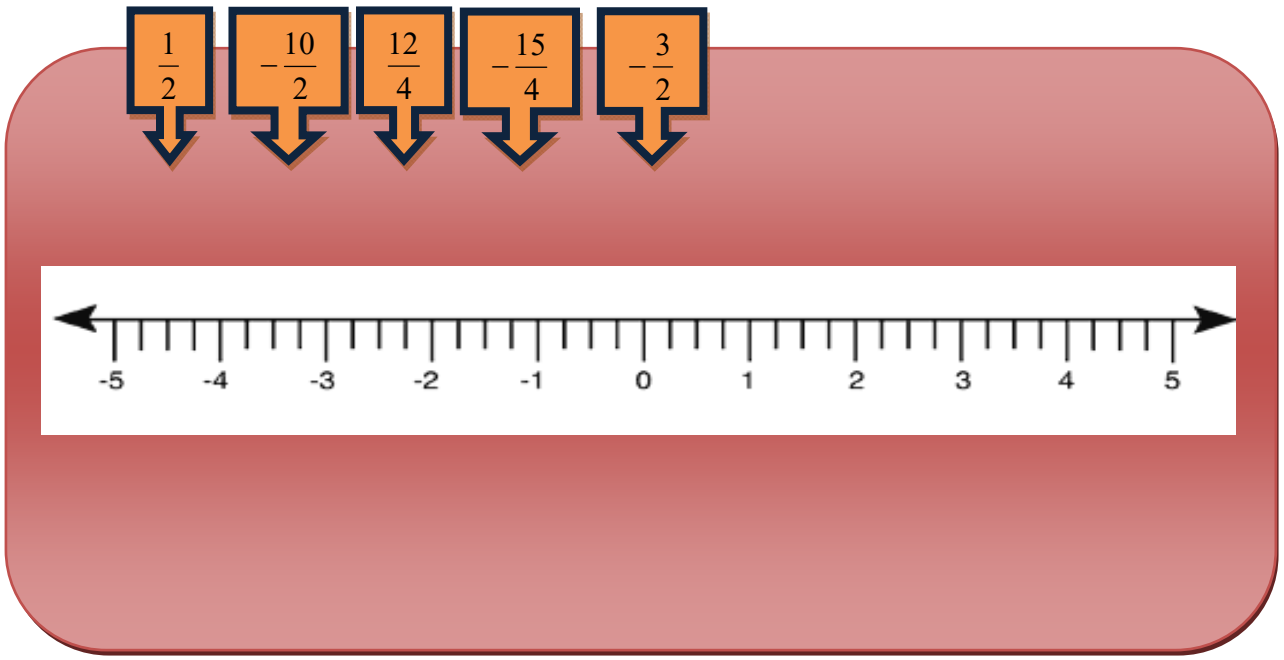


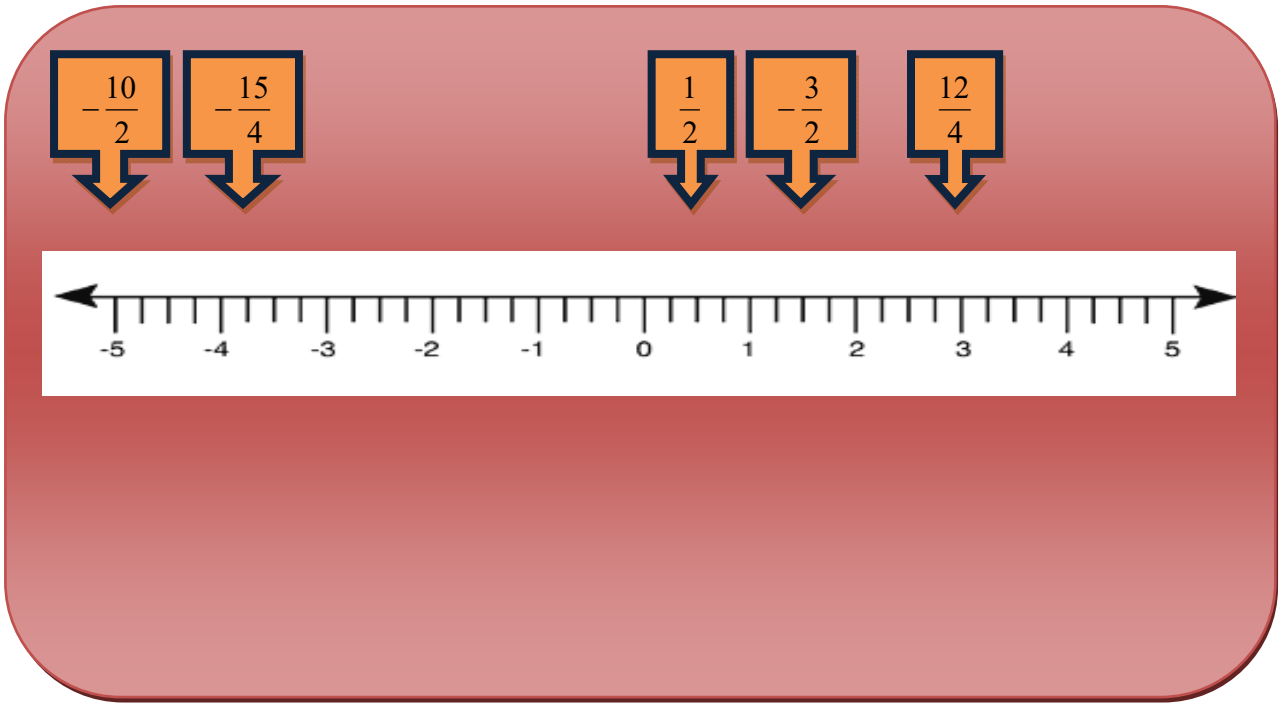


Let's watch this video again (specifically at the 2:14 - 2:48 mark) to recall the idea.
http://www.youtube.com/watch?v=DiBwg5cNP84&feature=relmfu

ACTIVITY 12.

Click and drag the rational numbers to their correct location on the number line. Click on “SUBMIT” after you have finished locating them.



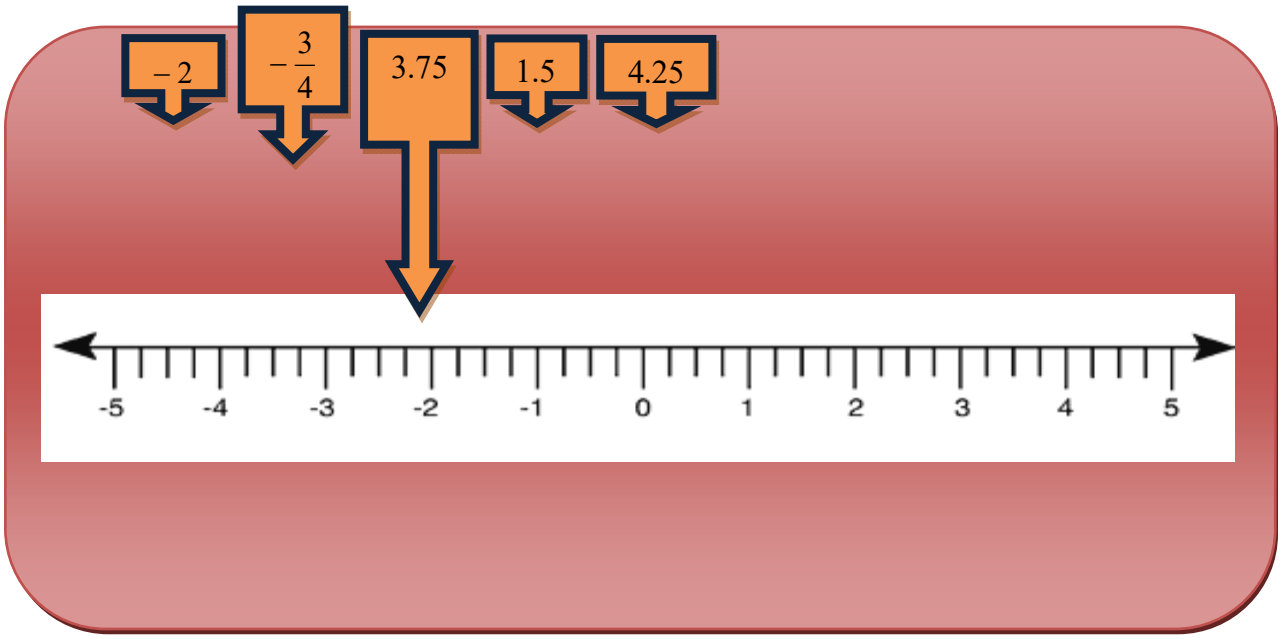


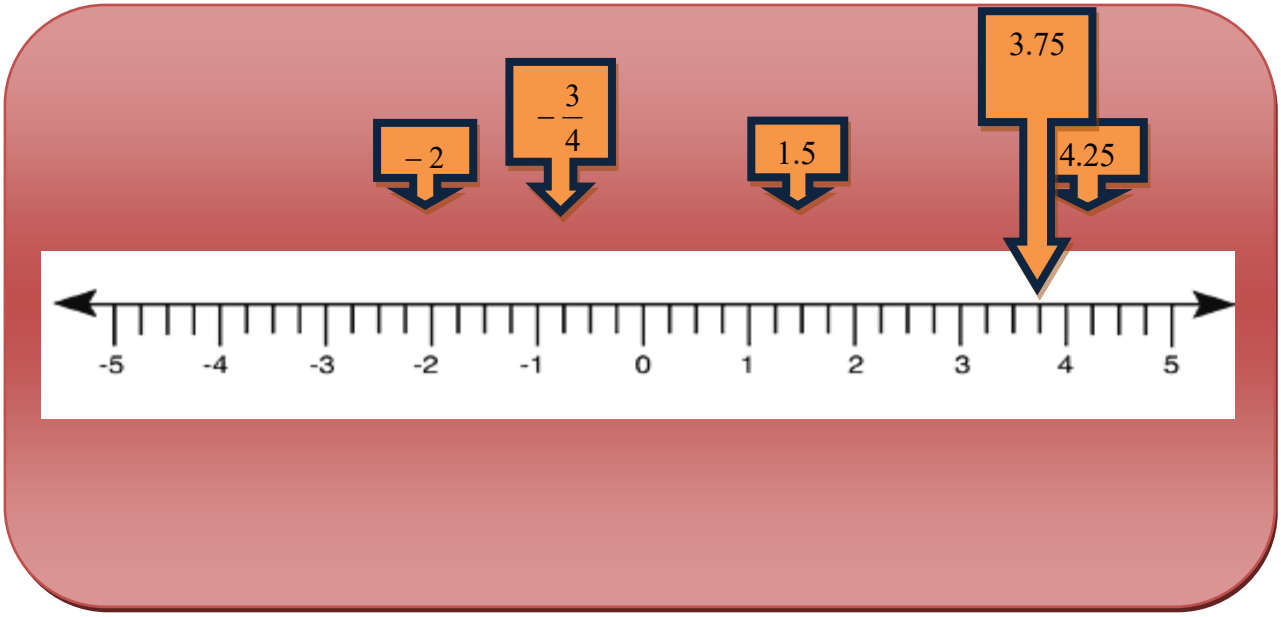
Let's watch another video to see a different approach in locating rational numbers. Click on the link below.

http://www.youtube.com/watch?v=xz6ahTCmSKM (specifically at the 1:00 – 2:14 mark)
Let's apply what you have just learned from the video.

ACTIVITY 13.

Click and drag the rational numbers to their correct location on the number line. Click on "SUBMIT" after you have finished locating them.

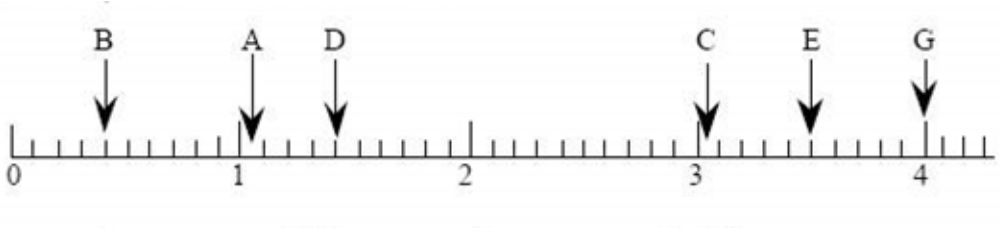




ACTIVITY 14. QUIZ.

Take this quiz to check how well you have understood the lesson. Click "SUBMIT" to check your answers.

For numbers 1- 4, write the letter that corresponds to each of the rational number below.



1. 3.1 _____
2. 1.04 _____
3. 7/2 _____
4. 0.4 _____
5. Which graph represents 7/6?

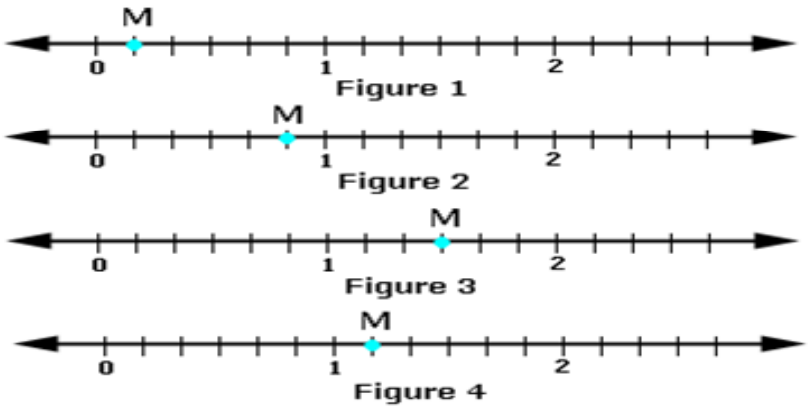


Image source: http://worksheets.tutorvista.com/fraction-worksheets.html#

A. Figure 1
B. Figure 2
C. Figure 3
D. Figure 4

6. In which number line is the arrow pointing at 0.4?

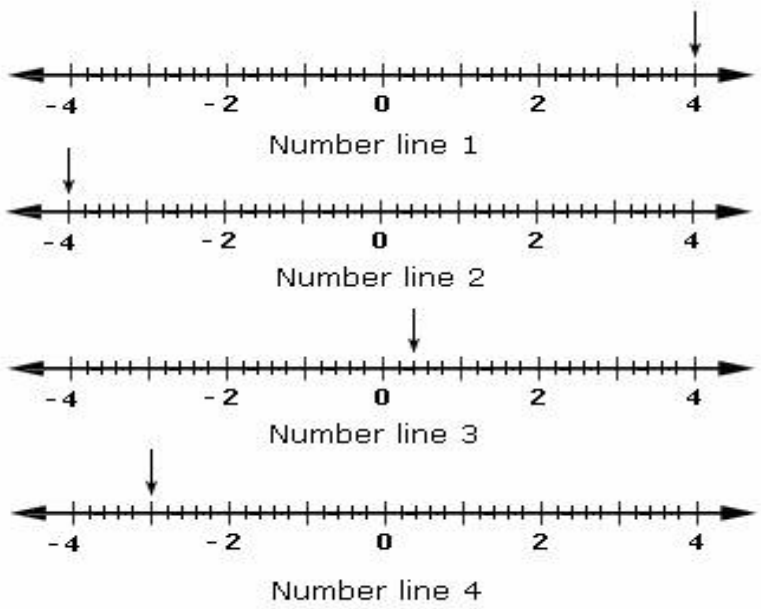


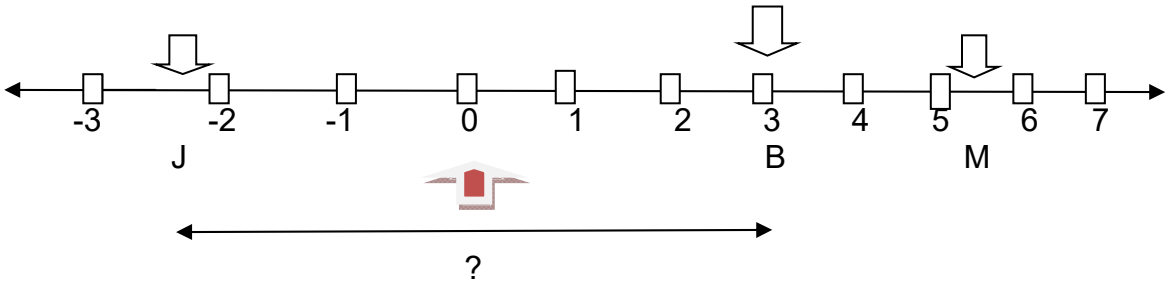
Image source: http://www.icoachmath.com/math_dictionary/Negative_Integer.html

A. Number line 1
B. Number line 2
C. Number line 3
D. Number line 4

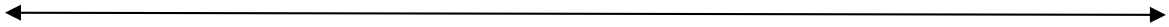
How well did you do in the quiz? If you got a perfect score, you may proceed answering the reflection questions. But if you made a mistake, find out first how to correct your mistake before answering the reflection questions.

Try this: Some real life problems can be solved using the number line. Try using this in each of the following problems.

1. Marsha lives 5 ½ blocks from school. Bert is 3 blocks closer. Jean lives 2 ¼ blocks from school in the opposite direction. How far apart do Bert and Jean live?



2. Carlos is making a change purse for his mother. He needs two 3 ½ inch piece of leather. Can he cut both pieces from one 7 ¾ inch piece? How will you illustrate this on the number line?



3. How useful are rational and irrational numbers are in daily life?

_____
_____
_____

ACTIVITY 15. REFLECTION QUESTIONS

Now that you have learned how to locate rational numbers on the number line, reflect on these questions:

1. In the process of locating rational numbers on the number line, which do you find the most difficult?

_____
_____
_____

2. What new ideas do you have regarding the usefulness of rational numbers in real-life?

_____
_____
_____

END OF FIRM UP

In this section, you found out how to express fractions into decimals and vice versa. You also learned where the rational numbers are on the number line. Now, what if you were asked to operate on these rational numbers? How will you do it?

Let's go deeper by moving on to the next section.

DEEPEN

Your goal in this section is to perform operations on rational numbers. Here you will find more ideas on how useful rational numbers are in real-life.

Dealing with rational numbers in the form of decimals requires skill in operations on decimals combined with the rules of signed numbers.
For a quick review on operating on decimals, visit this website.
http://www.youtube.com/watch?v=Hct1iFJV6GM&feature=related

For a quick review on the rules of signed numbers, visit this website.
http://www.youtube.com/watch?v=sEU5uaf-Tu4

Let's try combining what you just reviewed from the 2 videos. Check out these examples.
Example 1. Addition of Positive and Negative Decimals

0.56 + 0.35 = 0.91
-0.22 + -0.76 = -0.98
-1.75 + 0.45 = -1.3

Questions:
1. How are decimals with like signs added?
2. How are decimals with unlike signs added?

Example 2. Subtraction of Positive and Negative Decimals

0.12 – 0.48 = -0.36
-0.35 – (-35) = 0
-0.9 – 0.25 = -1.15
2.57 – (-0.4) = 2.97

Questions:

1. How are with like signs subtracted?
2. How are decimals with unlike signs subtracted?

Example 3. Multiplying and Dividing Positive and Negative Decimals

Like Sign
0.33 x 0.5 = 0.165
$0.95 \div 0.2 = 4.75$
-0.15 x -0.82 = 0.123
$-12.5 \div -0.25 = 50$

Unlike Signs
-0.9 x 0.22 = -0.198
$-4.8 \div 3.2 = -1.5$
0.45 x -0.67 = -0.3015
$0.75 \div -1.25 = -0.6$

Questions:
1. How are decimals with like signs multiplied?
2. How are decimal with unlike signs multiplied?

Now check your understanding on the operations by doing the next activity.

ACTIVITY 16.

Try doing these on your own. Click on "SUBMIT" after you are done to check your answers.
1. 0.25 + (-0.75) =
2. -1.25 + (-2.5) =
3. 4.1 – 2.3 =
4. 5.33 – (-0.14) =
5. -10.54 – 2.54 =
6. -5.5 – (-4.5) =
7. 2.42 x -3.12 =
8. -12.3 x -0.5 =
9. $-0.65 \div (-0.5) =$
10. $4.9 \div (-2.2) =$

How well is your performance in Activity 17? Which item did you find difficult? Why?

_____
_____
_____

If you buy a kilo of rice at ₱34.50 a kilo and a kilo of cooking oil at ₱68.25. How much should you pay for both items? This means 34.50 + 68.25 which is ₱102.75. Suppose you pay ₱200.00. to the cashier, how much change should you have? This means 200.00 – 102.75 which is ₱97.25. Suppose one piece of egg costs ₱4.75 how much will you pay for a dozen? Here you multiply 4.75 and 12. But if a dozen eggs costs ₱64.20 and you would like to know how much each piece costs, you divide ₱64.20 by 12.

Cite your own real-life experiences where you applied the operations or rational numbers. Decimals can be expressed in fraction form. If we multiply two fractions like ½ times 2/3, is the product 1/3 bigger or smaller? This means a fraction of a fraction implies a smaller value. Thus 1/3 is smaller than 2/3. Is the product of two fractions that are both less than 1 always less than one and greater than zero? How is multiplying by 1/5 x ½ like multiplying 0.2 x 0.5? How is it different?

If we divide two fractions like ½ ÷ 2/3 , the quotient is ¾; 4/3 ÷ ½ gives a quotient of 8/3. This means when a bigger fraction is divided by a smaller one, the quotient is bigger while dividing a smaller fraction by a bigger one, the quotient is smaller. Will this hold true when 4 is divided by 1/2and when ½ is divided by 4?

Can you think of a real-life situation where you can use what you just learned?

_____

Dealing with rational numbers in the form of fractions requires skill in operations of fractions combined with the rules of signed numbers.

To continue your lesson on operations of rational numbers, visit this website:
http://www.mathsisfun.com/algebra/rational-numbers-operations.html

This website gives brief explanations on operations of rational numbers (fractions) in a more algebraic form. Be sure to click on Q1 to Q8 at the bottom of the webpage for your exercise.

Question:
1. How are fractions multiplied?
2. How are fractions divided?
3. How are fractions added?
4. How are fractions subtracted?

Let's apply what you have just learned from the website!

ACTIVITY 17.

Perform the indicated operation. Click "SUBMIT" after you have answered all the items.

1. $\frac{2}{5} \bullet \frac{3}{4} =$
2. $\frac{1}{3} \div \frac{2}{7} =$
3. $\frac{4}{7} + \frac{1}{2} =$
4. $\frac{6}{5} - \frac{2}{3} =$
5. $1\frac{1}{2} + \frac{3}{4} =$

Let's further sgarpen or skills in adding and subtracting rational numbers (fractions) with negative signs. Let's watch this video.
http://www.youtube.com/watch?v=X2Tk2nTsPOQ&feature=related

Now apply what you have learned.

ACTIVITY 18.

Perform the addition and subtraction of positive and negative fractions. Click on "SUBMIT" after you have answered all items to check your answers.
Add these fractions with same denominators.

1. $\frac{2}{3} + \frac{1}{3} =$

2. $\frac{7}{8}+\left(-\frac{3}{8}\right)=$
3. $-\frac{7}{9}+\frac{2}{9}=$
4. $\left(-\frac{1}{4}\right)+\left(-\frac{1}{4}\right)=$

Add these fractions with different denominators.

1. $\frac{1}{3}+\frac{1}{2}=$
2. $\frac{4}{5}+\left(-\frac{1}{2}\right)=$
3. $-\frac{2}{3}+\frac{8}{9}=$
4. $\left(-\frac{5}{6}\right)+\left(-\frac{1}{4}\right)=$

Subtract these fractions with same denominators.

1. $\frac{2}{3}-\frac{1}{3}=$
2. $\frac{7}{8}-\left(-\frac{3}{8}\right)=$
3. $-\frac{7}{9}-\frac{2}{9}=$
4. $\left(-\frac{1}{4}\right)-\left(-\frac{1}{4}\right)=$

Subtract these fractions with different denominators.

1. $\frac{1}{3}-\frac{1}{2}=$
2. $\frac{4}{5}-\left(-\frac{1}{2}\right)=$
3. $-\frac{2}{3}-\frac{8}{9}=$
4. $\left(-\frac{5}{6}\right)-\left(-\frac{1}{4}\right)=$

How did you do in Activity 19? Remember to take note of your mistakes and learn from them.

The following examples apply the real world use of the addition and subtraction of integers.

1. Ana is designing a flower using a ribbon. She has ¾ yard of blue ribbon and 7/8 yard of red ribbon. How many yards of material does she have in all?

Here, you add ¾ and 7/8 = (3(2) + 7)/ 8 = 13/8 or 1 5/8 yards of ribbons.

2. John had a piece of wood that was 2/3 foot long. He cut off 1/6 foot to use as a pedestal for a model car. How much is left?

Here, you subtract 2/3 – 1/6 = (2(2) – 1) / 6 = 3/6 = ½ foot long.

3. A recipe lists 1 ¾ cup milk, and another recipe lists 1 ½ cup milk. You measure the milk in your refrigerator. You have about 3 cups. Do you have enough milk for both recipes?

Here add 1 ¾ and 1 ½ . Is the sum smaller than or equal to 3 cups? Is this enough for both recipes?

4. Lynn recycled ¾ kilo of news papers, ½ kilo of aluminum cans and 7/8 kilo of clear glass. How many kilos of material did she recycle?

Here add ¾, ½ and 7/8. The LCD is 8. Thus (3(2) + 1(4) + 7) / 8 which is equal to 17/8 or 2 1/8 kilos of material.

5. Will Lynn's practice of recycling these materials manifests her care for the environment? How else can you show your care for the environment?

Will the sum of many fractions less than ¼ ever be greater than 1? Support your answer.

How useful are rational and irrational numbers in real-life?

For the next activity, you will hone your skills in adding and subtracting rational numbers some more.

ACTIVITY 19.

For your first challenge, answer 20 problems and try to get the highest score that you can. Be sure to read the explanation whenever you make a mistake. For

your second challenge, try to get as many correct answers (and the least mistakes) as you can in 10 minutes!
http://www.ixl.com/math/grade-7/add-and-subtract-rational-numbers
(This is an interactive website on adding and subtracting rational numbers with accompanying explanation.)

Now that you have honed your skill in adding and subtracting rational numbers, let's try multiplying rational numbers. Watch this video on multiplying positive and negative rational numbers (with mixed fractions). Pause the video while you try your hand at the examples. Don't forget to take some notes.
http://www.youtube.com/watch?v=_vluGKOZjYM&feature=results_main&playnext=1&list=PLC37FB7E17127107A

Let's apply what you have just learned!

ACTIVITY 20.

Perform the multiplication of positive and negative fractions. Click on "SUBMIT" after you have answered all items to check your answers.

1. $5 \bullet \frac{1}{2} =$
2. $-\frac{3}{7} \bullet -\frac{1}{6} =$
3. $\frac{5}{6} \bullet -\frac{2}{5} =$
4. $5\frac{1}{2} \bullet 2\frac{2}{3} =$
5. $1\frac{2}{5} \bullet -2\frac{1}{2} =$
6. $-3 \bullet -4\frac{1}{3} =$
7. $\frac{1}{4} \bullet -2\frac{1}{2} \bullet -1\frac{1}{6} =$

How did you do in Activity 21? Remember to take note of your mistakes and learn from them.

Study the sample word problems below.

1. Nathan has 20 pets. Of the pets, 2/5 are rabbits, ½ are fish and 1/10 are dogs. How many of each does he have?

Here 2/5 of 20 will give the number of rabbits which is 2/5 • 20 = 8. There are 8 rabbits. How many fish and how many dogs does he have?

2. Daniel earned 400.00 php. He saved ¼ of it. He plans to donate ½ of what he saved to a charity. How much will he donate?

To answer this problem, you may ask what is ¼ of 400. Then take ½ of this result?

3. Samuel is cutting canvas into pieces. The canvas is ¾ yard long. How many 1/8 yard pieces can he cut?

Here, you divide ¾ by 1/8. This is equal to ¾ • 8/1 = ¾ • 8. Therefore he can cut 6 pieces of 1/8 yard pieces.

4. Rex budgeted their class fund of ₱4000.00 as follows: ¾ - food; 1/5 – prizes; the rest for the charity. How much is left for the charity?

Here, you solve ¾ of 4000; 1/5 of 4000. Get the sum of these two amount. What will you do with the sum to answer the problem?

How useful are rational and irrational numbers in real –life?

Next, let's hone your skill in dividing negative and positive rational numbers (with mixed fractions). Watch this video on dividing positive and negative rational numbers (with mixed fractions). Pause the video while you try your hand at the examples. Don't forget to take some notes.
http://www.youtube.com/watch?feature=endscreen&v=b6Jup7mSjr4&NR=1

Let's apply what you have just learned!

ACTIVITY 21.

Perform the division of positive and negative fractions. Click on "SUBMIT" after you have answered all items to check your answers.

1. $6 \div \frac{1}{4} =$
2. $-\frac{2}{3} \div \frac{2}{5} =$

3. $-\frac{7}{9} \div -\frac{2}{15} =$
4. $1\frac{2}{3} \div 2\frac{1}{5} =$
5. $\left(-4\frac{1}{2}\right) \div \left(-1\frac{1}{4}\right) =$
6. $8\frac{1}{3} \div \left(-\frac{1}{10}\right) =$
7. $1\frac{1}{2} \div \left(-1\frac{2}{3}\right) \div 2\frac{1}{3} =$

For the next activity, we will hone your skills in multiplying and dividing rational numbers some more.

ACTIVITY 22.

For your first challenge, answer 20 problems and try to get the highest score that you can. Be sure to read the explanation whenever you make a mistake. For your second challenge, try to get as many correct answers (and the least mistakes) as you can in 10 minutes!
http://www.ixl.com/math/grade-7/multiply-and-divide-rational-numbers
(This is an interactive website on multiplying and dividing rational numbers with accompanying explanation.)

Next, let's learn how to perform multiple operations on rational numbers.
Check out these examples:

Example 1: $1\frac{1}{9}-\left(\frac{2}{9}+\frac{5}{9}\right)$

First, we perform the operation inside the grouping symbol which is the parenthesis. (Note: If there is no grouping symbol given, you have to follow the order of operations.)

Next, we express the first fraction as improper. (Note that the parenthesis has been removed.)

Next, since they have the same denominator, we can proceed with the subtraction. Simplify (or reduce to its lowest term)

$\rightarrow 1\frac{1}{9}-\frac{7}{9}$

$\rightarrow \frac{10}{9}-\frac{7}{9}$

$\rightarrow \frac{3}{9}$

$\rightarrow \frac{1}{3}$

Example 2: $\left(\frac{1}{2}\bullet\frac{2}{3}\right)-\left(2\frac{1}{2}\div\frac{3}{4}\right)$

First, we perform the operation inside the grouping symbols. (Take note of using improper fraction and reciprocal fraction when dividing in the 2nd parenthesis.)
Next, since they have the same denominator, we can proceed with the subtraction.

Lastly, simplify.

$$\rightarrow \frac{1}{3} - \frac{10}{3}$$

$$\rightarrow -\frac{9}{3}$$

$$\rightarrow -3$$

Example 3: $\left[\left(\frac{1}{3}+\frac{1}{3}\right)-\frac{1}{2}\right]\left(\frac{1}{4}\div -\frac{1}{2}\right)$

First, we perform the operation in the innermost grouping symbol. (Take note that the bracket symbol has been changed to parenthesis after performing the operation.)
Next, we perform the operations inside the parentheses. (Take note of using the reciprocal fraction when dividing in the 2nd parenthesis.) The parentheses were not removed to denote multiplication.
Lastly, we perform the multiplication.

$$\rightarrow \left(\frac{2}{3}-\frac{1}{2}\right)\left(\frac{1}{4}\div -\frac{1}{2}\right)$$

$$\rightarrow \left(\frac{1}{6}\right)\left(-\frac{1}{2}\right)$$

$$\rightarrow -\frac{1}{12}$$

Let's apply what you have just learned!

ACTIVITY 23.

Perform the indicated operations on rational numbers. Click on "SUBMIT" after you have answered all items to check your answers.

1. $\frac{4}{5}-\left(\frac{2}{5}+\frac{1}{5}\right)=$
2. $\left(\frac{5}{6}\div\frac{2}{3}\right)+\left(\frac{4}{5}\bullet\frac{3}{8}\right)=$
3. $\left[\left(-\frac{4}{9}+\frac{1}{9}\right)-\frac{3}{4}\right]\left(-\frac{6}{7}\div\frac{2}{3}\right)=$

1. $\frac{4}{5}-\left(\frac{2}{5}+\frac{1}{5}\right)=\frac{1}{5}$
2. $\left(\frac{5}{6}\div\frac{2}{3}\right)+\left(\frac{4}{5}\bullet\frac{3}{8}\right)=\frac{31}{20}\,or\,1\frac{11}{20}$
3. $\left[\left(-\frac{4}{9}+\frac{1}{9}\right)-\frac{3}{4}\right]\left(-\frac{6}{7}\div\frac{2}{3}\right)=\frac{39}{28}\,or\,1\frac{11}{28}$

Now that you have done enough exercises on operations of rational numbers, it's time to check how well you have understood the lesson.

ACTIVITY 24. QUIZ.

Perform the indicated operations. Click "SUBMIT" to check your answers.

1. $-3\frac{7}{8}+\frac{5}{8}=$
2. $\frac{5}{6}+1\frac{2}{5}=$
3. $-\frac{7}{8}-1\frac{1}{8}=$
4. $\left(-2\frac{3}{4}\right)-\left(-2\frac{1}{3}\right)=$
5. $10\frac{1}{2}\bullet 2\frac{1}{10}=$
6. $-\frac{3}{10}\bullet 1\frac{5}{6}=$

7. $3\frac{1}{4} \div -\frac{13}{16} =$

8. $-5\frac{2}{3} \div -1\frac{1}{5} =$

9. $\left(\frac{2}{5} \bullet \frac{3}{4}\right) + \left(\frac{4}{5} \div 1\frac{1}{4}\right) =$

10. $\left(-\frac{1}{4} - \frac{3}{4}\right) \div \left[-\frac{3}{4} + \left(-\frac{1}{2} \bullet \frac{1}{2}\right)\right] =$

Study the samples below.

1. Leo made 30 cups of soup. How many 1 ¼ cup servings of soup does he have?
Here divide 30 by 1 ¼. This becomes 30 ÷ 5/4 = 30 x 4/5 = 24. There are 24 1 ¼ cup servings.

2. Suppose you use 2 ¾ yard of felt on the top of the bulletin board display. Then you use another 4 2/3 yard on the bottom of the display. How much felt do you use altogether?

Here add 2 ¾ and 4 2/3. This becomes (2 + 4) (3/4 + 2/3) . Using LCD 12, 6 (3(3) + 2(4) / 12 = 6 (9+8)/12 = 6 17/12 = 7 5/12 felt.

3. Mr. Castillo is making leather belts. He has a design that is 1 ¾ inches long and one that is 2 ½ inches long. Will both designs fit in a space on the belt that is 4 inches long?

Here , add 1 ¾ and 2 ½ . This becomes 7/4 + 5/2 = (7 + 5(2))/4 = 17/4 = 4 ¼ . inches. Will these fit in a space on the belt? Why?

4. Peter is making a paper collage. He has covered 1/3 of his sheet of paper with left over wall paper and another ½ of the sheet of paper with magazine pictures. How much of the sheet of paper is left to cover?

Here , add 1/3 and ½. Subtract the result from 1. So, 1- 5/6 = 6/6 – 5/6 = 1/6 of the sheet of paper is left to cover.

ACTIVITY 25. REFLECTIVE LESSON LOG

Now that you have learned how to operate on rational numbers, reflect on these questions:

1. What keys ideas have you gathered while learning how to operate on rational numbers?

_____
_____
_____

2. How can you apply these ideas to your own life?

_____
_____
_____

3. What other question/s do you have on operations on rational numbers?

_____
_____
_____

4. How can the knowledge of rational and irrational numbers help us solve problems in daily life?

You have now learned how to add, subtract, multiply, divide and perform multiple operations on rational numbers. Let's now learn some more on how rational numbers are used in real-life as we solve more word problems. You will be dealing with fractions, decimals and percents, negative and positive rational numbers.

To learn a strategy in solving word problems, watch this video as it shows examples of word problems involving percentages and how to solve them.
http://www.youtube.com/watch?v=KewfKIXRRtI&feature=relmfu

Now, let's answer some problems similar to what you just learned.

ACTIVITY 26.

Solve these problems on a piece of paper. After you are done, click on "ANSWER" to check your answer.

1. What is 12% of 40,000? _____
   answer: 4,800
2. 3,600 is what percent of 60,000? _____
   answer: 6%
3. 4,000 is 8% of how much? _____
   answer: 50,000

4. Tony invested Php 60,000 at 12% interest rate, Php 50,000 at 8% interest rate and Php 40,000 at 6% interest rate. How much will Tony earn in all from the interests?

Answer: 12,400

Let's look at more applications of rational numbers. Visit this website.
http://www.studyzone.org/mtestprep/math8/d/decwordp.cfm

Now, let's answer some word problems similar to those shown in the previous website
.

ACTIVITY 27.

Solve these problems on a piece of paper. Click on "ANSWER" to check your answer.

1. Three siblings are sharing the cost of a gift for their mother. The gift costs Php 137.25. how much money must each sibling contribute?

Answer: Php 137.25

2. You have a savings account with a balance of Php 2,580.50. You withdrew Php 550.75 the next day. How much would be your balance left?

Answer: Php 2029.75

3. Jenny wants to buy 3 bananas for Php 4.50 each and 4 mangoes for 24.25 each. If Jenny has Php 110, does she have enough money to buy the 3 bananas and 4 mangoes?

Answer: No. The total cost would be Php 110.50.

Watch this short video for an example of solving word problem involving managing income.
http://www.youtube.com/user/EducatorVids?v=KdtD9tAHI3A&feature=pyv&ad=8642527028&kw=multiplying%20rational%20numbers

Now, let's answer a word problem similar to that shown in the previous website.

ACTIVITY 28.

Solve this problem on a piece of paper. Click on "ANSWER" to check your answer.

Mario spends 1/4 of his monthly income on house rent, 1/5 on utilities (water, electricity, etc), 3/8 on food, and the rest as savings. Mario makes Php 20,000 a month. How much of his income is spent on rent, utilities and food? How much is his monthly savings?

Answer: rent – ₱5,000
Utilities – ₱4,000

Food – ₱7,500
Savings – ₱3,500

Practice some more in solving word problems involving fractions applied in different aspects. Visit this next website. Be sure to check the explanation if you get an incorrect answer.
http://www.ixl.com/math/grade-7/add-subtract-multiply-and-divide-fractions-and-mixed-numbers-word-problems

Here are more word problems that have real-life applications.

Exercise: **Journal Writing – Recording one's thoughts and feelings**

Complete the sentence with a personal thought, feeling, idea or realization based on the topic "Rational and Irrational Numbers". Choose one and write your sentence then click "Save".

I discovered that…
I remember …
I'm not sure …
I was surprised …
I am now aware of …
It seems like …
I wonder …

End of DEEPEN:

In this section, you learned how rational and irrational numbers are used to solve problems in real life.

What new realizations do you have about the topic? What new connections have you made for yourself?

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section

TRANSFER

After you have solved all the previous word problems which are similar to many life situations, it is time for you to independently apply what you have learned. You will be given a practical task which will demonstrate your understanding on rational numbers. As you go through accomplishing this task, keep asking yourself this question*: **How useful are rational numbers in real-life situations?***

ACTIVITY 29. Performance Task

You are a school researcher and you want to know how students spend their weekly allowance. Survey 50 students then present this to the parents' association in written and oral form. You are required to give recommendations based on your findings. The parents would like to see appropriately organized data, accurate computation, practical recommendations and a well-written report.

STANDARDS	Excellent 4	Satisfactory 3	Developing 2	Needs Improvement 1
Organization of Data	The report uses the appropriate method and aesthetically pleasing. It also uses the three forms of rational numbers.	The report uses the appropriate way of organizing the data. It also uses the three forms of rational numbers.	The report uses the appropriate method of organizing the data. However, it uses limited form/s of rational numbers.	The report did not use the appropriate method of organizing the data. It also uses limited form/s of rational numbers.
Accuracy of Computation	Data of the survey have been computed accurately without any error. It also shows the step-by-step computations that are easy to follow.	Data of the survey have been computed accurately without any error.	Data of the survey have slight errors in the computation.	Data of the survey have numerous errors in the computation.

Practicality of the Recommendation/s	The recommendations are beneficial to the students, feasible and cost-effective. It also details how to undertake the recommendations.	The recommendations are beneficial to the students, feasible and cost-effective.	The recommendations are beneficial to the students but not very feasible or costly.	The recommendations are not beneficial at all, unlikely to be feasible and quite costly.
Proper Grammar	The report has no grammatical error and content is rich, interesting and highly convincing.	The report has no grammatical error.	The report has several grammatical errors.	The report has numerous glaring grammatical errors.

Write your out-put here.

PROCESS QUESTIONS

1. Which part of the performance task did you find most challenging? Why?

_____

_____

2. What step/s did you have to remember to do in order to solve the problem/s?

_____

_____

3. What do you think would have happened if you have forgotten to do the proper steps?

_____

_____

4. What do you think is the best way to avoid errors in solving problems?

_____

_____

5. How did accomplishing the performance task help you see the real world use of rational numbers?

_____

_____

You have just learned how to use rational numbers in daily life. As you continue learning, the application of rational numbers will become even clearer to you. And as you continue with life, you will now be more conscious of the rational numbers all around you.

END OF TRANSFER:

Congratulations! You have now completed this lesson! But before you can proceed to the next module, you have to answer the following post-assessment.

POST-ASSESSMENT:

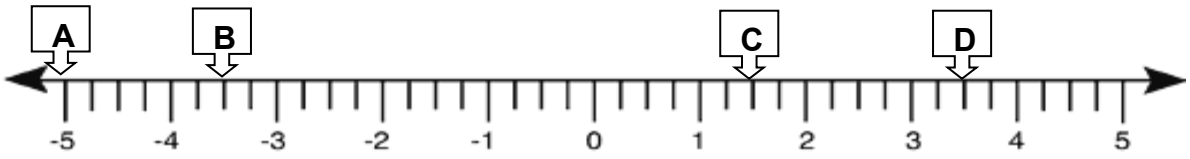
It is now time to evaluate your learning. Click on the letter of the answer that you think best answers the question. Your score will only appear after you answer all the items. If you do well, you may move on to the next module. If your score is not at the expected level, you have to go back and take the module again.

Click on the letter that you think best answers the question. Please answer all items. After answering all the items, click "Submit" to see your score.

1. Which of the following statements is TRUE? (A)

a. Decimals are rational numbers.
b. Negative fractions are irrational numbers.
c. Repeating non-terminating decimals are irrational numbers.
d. Irrational numbers can be expressed as fractions.

2. Where is -7/2 located on this number line? (A)



A. A
B. B
C. C
D. D

3. What is 1/8 expressed in decimal form?(A)

A. 0.18
B. 1.8
C. 0.125
D. 1.25

4. What is 4/25 expressed in percent? (A)

A. 4%
B. 16%
C. 25%
D. 45%

5. What is $0.\overline{81}$ expressed in fraction form? (M)

A. 1/9
B. 8/9
C. 81/99
D. 9/1

6. Perform the indicated operations: [(1/5 + 2/5) – 1/10][-1/4 ÷ 1/2] (M)
A. 1/4
B. 1/9
C. -1/4
D. -1/9

7) Which of the following numbers is an irrational number? (A)
A. 5
B. – 1/5
C. $\sqrt{3}$
D. $\sqrt{4}$

8) 7/12 - 2/6 = ? (A)
A. 1/4
B. 1/3
C. 3/12
D. 4/12

9) What is 5/8 expressed in decimal form? (A)
A. 0.58
B. 5.8
C. 1.6
D. 0.625

10). What is 3/4 expressed in percent? (A)
A. 0.75%
B. 7.5%
C. 70%
D. 75%

11). What is $3.\underline{66}$ expressed in fraction form?(M)
A 3/6
B. 9/3
C. 10/3
D. 11/3

12). Perform the indicated operations: [(1/4 + 1/4) – 1/8][1/3 ÷ 1/2] (M)
A. 1/4
B. 1/9
C. 1/12
D. 1/48

13) Which of the two fractions are equal? (A)

A. ½ and 2/3
B. ¾ and 9/12
C. 4/5 and 8/15
D. 5/6 and 10/18

14) Which is equivalent to 0.35? (A)
A. 3/5
B. 4/5
C. 7/20
D. 8/20

15) 2/3 ÷ 3 ¼ = ? (M)
A. 2/13
B. 8/16
C. 8/39
D. 26/12

16) 0.25 x 3.2 = ? (M)
A. 0.8
B. 0.08
C. 0.008
D. 0.0008

17) 5/12 + 7/12 = ? (A)
A. 0
B. 1
C. 2
D. 11/12

18) 1/3 + 1/5 = ? (M)
A. 1/8
B. 2/8
C. 8/15
D. 15/8

19) 3/15 – 8/15 = ? (A)

A. -5/15
B. -1/3
C. 1/3
D. 5/15

20) 2 ¼ - 1 4/5 = ? (M)
A. 0
B. 1/9
C. 9/20
D. 18/20

GLOSSARY OF TERMS USED IN THIS MODULE:
Capital - Cash or goods used to generate income either by investing in a business or a different income property.
Decimals - A representation of a real number using the base ten and decimal notation, such as 201.4, 3.89, or 0.0006.
Denominator - that term of a fraction, usually written under the line, that indicates the number of equal parts into which the unit is divided; divisor
Fractions - a number usually expressed in the form a/b.
Integers - one of the positive or negative numbers 1, 2, 3, etc., or zero.
Interest rate - A rate which is charged or paid for the use of money.
Irrational numbers - Irrational numbers
Invest - To commit (money or capital) in order to gain a financial return
Non-repeating non-terminating decimal - A decimal that neither terminates nor repeats; non-repeating decimals are also called as non-periodic decimals or non-recurring decimals. An irrational number is a non-terminating and non-repeating decimal.
Number line - A line that graphically expresses the real numbers as a series of points distributed about a point arbitrarily designated as zero and in which the magnitude of each number is represented by the distance of the corresponding point from zero.
Numerator - A number written above or to the left of the line in a common fraction to indicate the number of parts of the whole.
Percent - figured or expressed on the basis of a rate or proportion per hundred (used in combination with a number in expressing rates of interest, proportions, etc.). Symbol: %
Rational numbers - a number that can be expressed exactly by a ratio of two integers.
Repeating non-terminating decimal - Decimals with repeating digits; that is, the digits that repeat infinitely
Terminating decimal - a decimal numeral in which, after a finite number of decimal places, all succeeding place values are 0; also called finite decimal
Venn diagram - a diagram in which mathematical sets or terms of a categorical statement are represented by overlapping circles within a boundary representing the universal set, so that all possible combinations of the relevant properties are represented by the various distinct areas in the diagram

References :
http://dictionary.reference.com/
This is an online dictionary.

http://mathandmultimedia.com/
This is an online dictionary of mathematical terms

http://www.icoachmath.com/math_dictionary/
This is an online dictionary of mathematical terms

http://www.thefreedictionary.com/
This is an online dictionary.

http://www.investorwords.com/
This is an online dictionary on investing and business

WEBSITE RESOURCES AND LINKS IN THIS MODULE:

http://www.youtube.com/watch?v=pIRb7F7tKEM&feature=related
this is a short video on the use of rational numbers

http://www.phschool.com/atschool/academy123/english/academy123_content/wl-book-demo/ph-107s.html
This is a video explaining the rules in classifying rational and irrational numbers.

http://www.math-play.com/rational-and-irrational-numbers-game/rational-and-irrational-numbers-game.html
Rational and Irrational Numbers Game is an interactive and fast-paced game. The object of this game is to quickly classify given numbers as rational or irrational numbers by dragging them in the correct bin in less than 3 minutes.

http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i17/bk7_17i2.htm
This website shows how to convert fractions to decimals. It also has a 50-item exercise with over-all score

http://www.youtube.com/watch?v=DiBwg5cNP84
this is a video showing how to convert fractions to decimals

http://www.coolmath.com/prealgebra/02-decimals/05-decimals-converting-decimal-to-fraction-01.htm
This website explains how to convert terminating decimals to fractions.

http://www.youtube.com/watch?v=qyTFvx_ZVOs
This video explains how to convert terminating decimals to fractions.

http://www.basic-mathematics.com/converting-repeating-decimals-to-fractions.html
this is a website explaining how to convert repeating non-terminating decimals into fractions

http://www.youtube.com/watch?v=xX1sqV1nSAQ&feature=relmfu
This video explains how to convert non-terminating decimals to fractions.

http://www.ixl.com/math/grade-7/convert-between-decimals-and-fractions-or-mixed-numbers
This is an interactive website with exercises on converting decimals to fractions and vice versa

http://www.mathgoodies.com/lessons/vol4/challenge_vol4.html
This website has exercises on expressing rational numbers as fractions, decimals or percents.

Image source: http://www.physicsforidiots.com/complex.html

Image source: http://www.icoachmath.com/math_dictionary/Number_Sense.html

http://www.youtube.com/watch?v=zqLSFflYTDM&feature=related
This is a video on locating decimals on the number line

Image source:
http://www.google.com/imgres?hl=en&biw=1214&bih=600&gbv=2&tbm=isch&tbnid=C-BwPO-Pc83mnM:&imgrefurl=http://www.enasco.com/product/TB24604T&docid=_1AWk85nm8e9YM&imgurl=http://www.enasco.com/prod/images/products/5E/AC111016l.jpg&w=600&h=600&ei=GIKTT6T6B9HUmAWt6P3qAQ&zoom=1&iact=hc&vpx=124&vpy=257&dur=5822&hovh=225&hovw=225&tx=85&ty=96&sig=111088177573868644810&page=2&tbnh=135&tbnw=164&start=18&ndsp=24&ved=1t:429,r:0,s:18,i:113

http://www.youtube.com/watch?v=xz6ahTCmSKM
This is a video on locating rational numbers on the number line.

Image source: http://math247.pbworks.com/w/page/20517248/4NS1-2

Image source: http://worksheets.tutorvista.com/fraction-worksheets.html#

Image source:
http://www.icoachmath.com/math_dictionary/Negative_Integer.html

http://www.youtube.com/watch?v=Hct1iFJV6GM&feature=related
This website shows how to operate on decimals.

http://www.youtube.com/watch?v=sEU5uaf-Tu4
This website shows the rules of signed numbers.

http://www.mathsisfun.com/algebra/rational-numbers-operations.html
This website gives brief explanations on operations of rational numbers (fractions) in a more algebraic form.

http://www.youtube.com/watch?v=X2Tk2nTsPOQ&feature=related
This is a video on adding and subtracting rational numbers (fractions) with negative signs.

http://www.ixl.com/math/grade-7/add-and-subtract-rational-numbers
This is an interactive website on adding and subtracting rational numbers with accompanying explanation.

http://www.youtube.com/watch?v=_vluGKOZjYM&feature=results_main&playnext=1&list=PLC37FB7E17127107A
This is a video on multiplying positive and negative rational numbers (with mixed fractions).

http://www.youtube.com/watch?feature=endscreen&v=b6Jup7mSjr4&NR=1
This is a video on dividing positive and negative rational numbers (with mixed fractions).

http://www.ixl.com/math/grade-7/multiply-and-divide-rational-numbers
This is an interactive website on multiplying and dividing rational numbers with accompanying explanation.

http://www.youtube.com/watch?v=KewfKIXRRtI&feature=relmfu
This video shows examples of word problems involving percentages and how to solve them.

http://www.studyzone.org/mtestprep/math8/d/decwordp.cfm
This website shows applications of rational numbers.

http://www.youtube.com/user/EducatorVids?v=KdtD9tAHI3A&feature=pyv&ad=8642527028&kw=multiplying%20rational%20numbers
This is a short video with an example of word problem involving income and expenses.

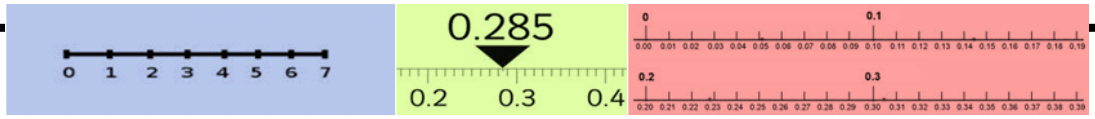
http://www.ixl.com/math/grade-7/add-subtract-multiply-and-divide-fractions-and-mixed-numbers-word-problems
This is an interactive website on operations of fractions and mixed numbers. It also has explanation if answer is incorrect.

Lesson 3: Square Root

☑ **LESSON INTRODUCTION AND FOCUS QUESTION(S):**

(Initial motivational statements and questions will be given for students to focus on.)

We know all counting numbers consecutively such as 1, 2, 3, 4, 5, 6, and so on. What are the numbers between 1 and 2? How about the numbers between 3 and 4? What are square roots of numbers? How are they represented? ***Have you ever wondered if you can apply your knowledge and skills in square root to real life situations? How can the knowledge of square roots help us solve problems in daily life? Find out the answers in this lesson.***



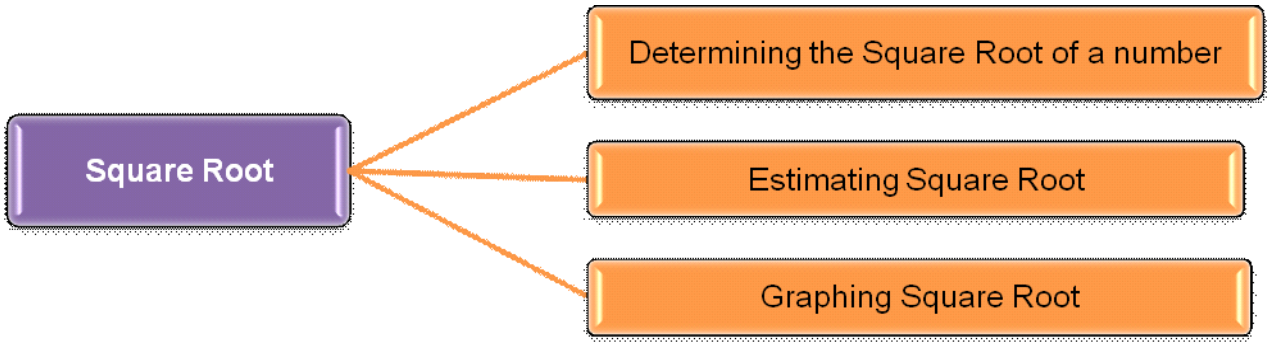
☑ **LESSON COVERAGE:**

This lesson has the following topics:

TOPIC NO.	Title	You will learn to…	Estimated time
3.1	Square Root of a Number	Determine the square root of a given real number.	**1 hour**
3.2	Estimating Square Roots	Approximate the square root of a real number.	**1 hour**
3.3	Graphing Square Roots	Graph of rational and irrational square roots.	**1 hour**

☑ Concept Map of the Lesson

Here is a simple illustration of the topics you will cover in this lesson:



☑ Expected Skills

To do well in this module, you need to remember and do the following:

1. Complete all the given exercises properly.
2. Read and follow directions carefully.
3. Take note of important details, processes and methods in each lesson.
4. Go back to the lesson if you can't answer the given exercises.
5. Be persevering and study hard.

PRE-ASSESSMENT:

Let's find out how much you already know about square roots.
Answer the exercise below.

Exercise 1: *Click on the letter that you think best answers the question. Please answer all items. After taking this short test, click "Submit" to see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this lesson.*

1. Which of the following is the combination of a radical sign together with a number under?
A. index
B. radical number
C. radicand
D. square root

2. Which one is the simplified form of $\sqrt{196}$?
A. 11
B. 12
C. 13
D. 14

3. Which of the following indicates the positive root of a number?
A. Radical number
B. Square Root
C. Radicand
D. Cube Root

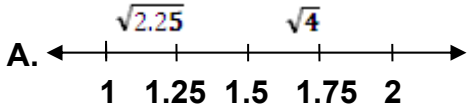
4. Which of the following square roots is irrational?
A. $\sqrt{8\,100}$
B. $2\sqrt{100}$
C. $\sqrt{90}$
D. $\sqrt{1}$

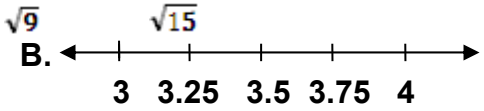
5. Which of the following square roots has an approximate value of 3.2?
A. $\sqrt{10}$
B. $\sqrt{11}$
C. $\sqrt{12}$
D. $\sqrt{13}$

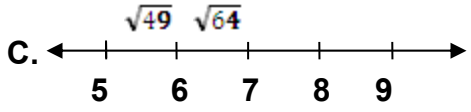
6. Which of the expressions below is equivalent to 20^2?
A. 20 + 20

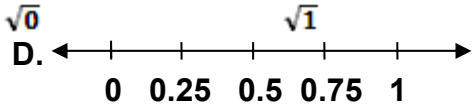
B. 20 – 20
C. 20 ÷ 20
D. 20 x 20

7. Which of the following graph is NOT correct?

A.


B.


C.


D.


8. Which statement is NOT true about square root?
A. A square root of a number *a* is a number *y* such that $y^2 = a$.
B. Every positive number *a* has two square roots: $\sqrt{a}$ and $-\sqrt{a}$.
C. Square roots of positive whole numbers that are not <u>perfect squares</u> are always irrational numbers.
D. Every negative number has only one square root, $-\sqrt{a}$.

9. Between which consecutive integers does $\sqrt{300}$ lie?
A. 15 and 16
B. 16 and 17
C. 17 and 18
D. 18 and 19

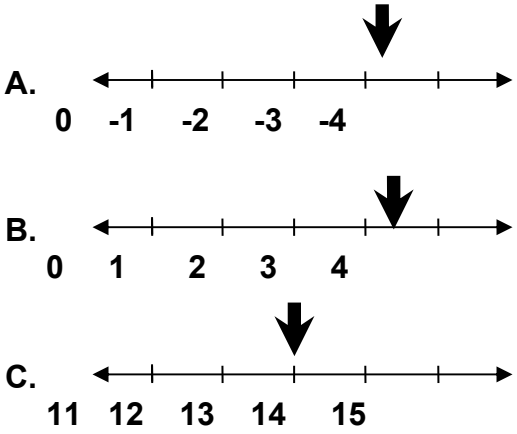
10. Which symbol will make the given expression "$\sqrt{16}$ + $\sqrt{25}$ ____ $\sqrt{16+25}$? TRUE?
A. $>$
B. $<$
C. $=$
D. None of the Above

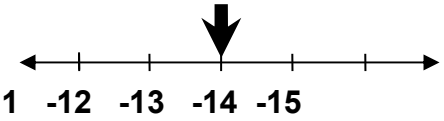
11. Which of the following real number has no real square root?
A. Positive number
B. Negative number
C. Fraction
D. Decimal

12. What is ($\sqrt{121}$ - $\sqrt{81}$) equal to ?
A. $1\frac{2}{9}$
B. 2
C. 20
D. 99

13. What is the approximate square root of 70?
A. 8.4
B. 8.8
C 9.1
D. 9.5

14. Where in the number line is "$-\sqrt{36}$ - $\sqrt{49}$" located?



D. 

15. Which symbol will make the given expression "$\sqrt{16} + \sqrt{9}$ ____ $\sqrt{16 \times 9}$" TRUE?

A. $>$
B. $<$
C. $=$
D. None of the Above

Lesson 3.1: Square Root of a Number

EXPLORE

Why do we need to know how to calculate the square root of a number? Are square roots really needed in life outside math studies? ***How can you determine the square root of a given real number? How can the knowledge of square roots help us solve problems in daily life?***

In this lesson we will address these questions and look at some important real-life application of square roots.

Let us start by doing the activity below.

ACTIVITY 1. Read and solve the problem below.

Mrs. Morena asked the carpenter to cover a patch on the floor which is 2.56 sq. m. in area with square tiles. She asked the carpenter to recommend tile size that would exactly fit the area without cutting any of the tiles. Available tile sizes are the following: 20 cm , 25 cm, 30 cm and 35 cm. Help the carpenter determine the size of the tiles to be used to cover the patch.

Questions:

1. What math concept will help you solve the problem?

2. How will the knowledge of perfect square numbers and square roots help you in determining the correct size of the tile?

3. Is there another way of solving the problem?

You see from the activities that finding square roots are useful in real life. What are square roots? How do we get the square root of a number?

Exercise 1: **IRF SHEET**

Below is an IRF Sheet. It will help check your understanding of the topics in this lesson. You will be asked to fill in the information in different sections of this lesson. For now you are supposed to complete the first row with what you know about the topic. Click on “Save” to save your response.

INITIAL *What are your initial ideas about square roots?*	REVISE	FINAL
	DO NOT ANSWER THIS PART YET	**DO NOT ANSWER THIS PART YET**

End of EXPLORE:
After giving your initial ideas regarding square roots using the IRF Sheet . Let's now look into what square roots of real numbers are and how to determine square roots of numbers.

FIRM-UP

Your goal in this section is to understand what a square root is, how it is denoted, how it is simplified and approximated. As you go through this part, keep on thinking about this question: ***How can you determine the square root of a given real number? Where and how are square roots used in real life?***

ACTIVITY 2. Squaring vs Extracting Square Roots

A. Complete the table below by giving the square of a given number

Number	Process	Square of the Number
3	3x3	9
4	4x4	16
5	5x5	25
6	6x6	36

Question: How did you get the square of a number? Can you use your knowledge on finding squares of numbers in finding the square root?

B. Now complete the table below by giving the square root of a number.

Number	Factored form of the Number	Square Root of the Number
9	3x3	
16	4x4	
25	5x5	
36	6x6	

Questions:
1. How did you find the square of the numbers?
2. How did you find the square roots of number?
3. What are square roots of numbers?

You see from the activity that finding the square of a number and finding the square root of a number are inverse process. What then is square root of a number?

The square root of a number, n, written below is the number that gives n when multiplied by itself. That is . $\sqrt{n} = a, \quad a^2 = n$.

- **the symbol $\sqrt{\square}$ is called radical sign or the square root sign**
- ***n* is called radicand it is the number inside the radical sign**

Example: $\sqrt{144} = 12,$ because 12X12 =144

Use this definition to answer the exercises below.

ACTIVITY 3. Taking Square Roots

Analyze and complete the table below.

Find:	Process	Answer
$\sqrt{81}$	$\sqrt{9 \times 9} = \sqrt{9^2}$	9
$\sqrt{25}$	$\sqrt{5 \times 5} = \sqrt{5^2}$	
$\sqrt{64}$	$\sqrt{8 \times 8} = \sqrt{8^2}$	
$\sqrt{100}$	$\sqrt{10 \times 10} = \sqrt{10^2}$	
$\sqrt{121}$	$\sqrt{11 \times 11} = \sqrt{11^2}$	
$\sqrt{20}$	$\sqrt{20 \times 20} = \sqrt{20^2}$	
$\sqrt{2\,500}$	$\sqrt{50 \times 50} = \sqrt{50^2}$	

Find:	Process	Answer
$\sqrt{81}$	$\sqrt{9 \times 9} = \sqrt{9^2}$	9
$\sqrt{25}$	$\sqrt{5 \times 5} = \sqrt{5^2}$	5
$\sqrt{64}$	$\sqrt{8 \times 8} = \sqrt{8^2}$	8
$\sqrt{100}$	$\sqrt{10 \times 10} = \sqrt{10^2}$	10
$\sqrt{121}$	$\sqrt{11 \times 11} = \sqrt{11^2}$	11
$\sqrt{20}$	$\sqrt{20 \times 20} = \sqrt{20^2}$	20

$\sqrt{2\,500}$	$\sqrt{50 \times 50} = \sqrt{50^2}$	50

Question:
1. What kind of numbers are the radicand?
2. How did you find the square root of the numbers?
3. What kind of numbers are the square roots of the given number?

For an in-depth know-how of finding the square roots, visit the following websites.

Click the given site below to read the discussion on square roots.

http://www.algebra-class.com/square-roots.html

The site will deal with further discussions on square roots. It offers additional examples and definitions of important terms related to square roots.

http://www.youtube.com/watch?v=Ymcf14wC9Ck

The site will deal with further discussions on square roots. Some strategies will be shown to strengthen your knowledge on simplifying square roots.

http://www.youtube.com/watch?v=CN1l81Suuks&feature=related

The site will deal with further discussions on square roots. Some strategies will be shown to strengthen your knowledge on simplifying square roots. The site provides a video that shows more examples together with techniques of simplifying square roots.

http://www.slideshare.net/veggie189/square-roots-and-perfect-squares

The site will deal with further discussions on square roots. The site gives a powerpoint presentation that deals with introduction to perfect squares and square roots.

Exercise 2: Try to play this interactive game about solving the square root of the given real number. You may reset the game to play again.

http://www.aplusmath.com/Flashcards/sqrt.html

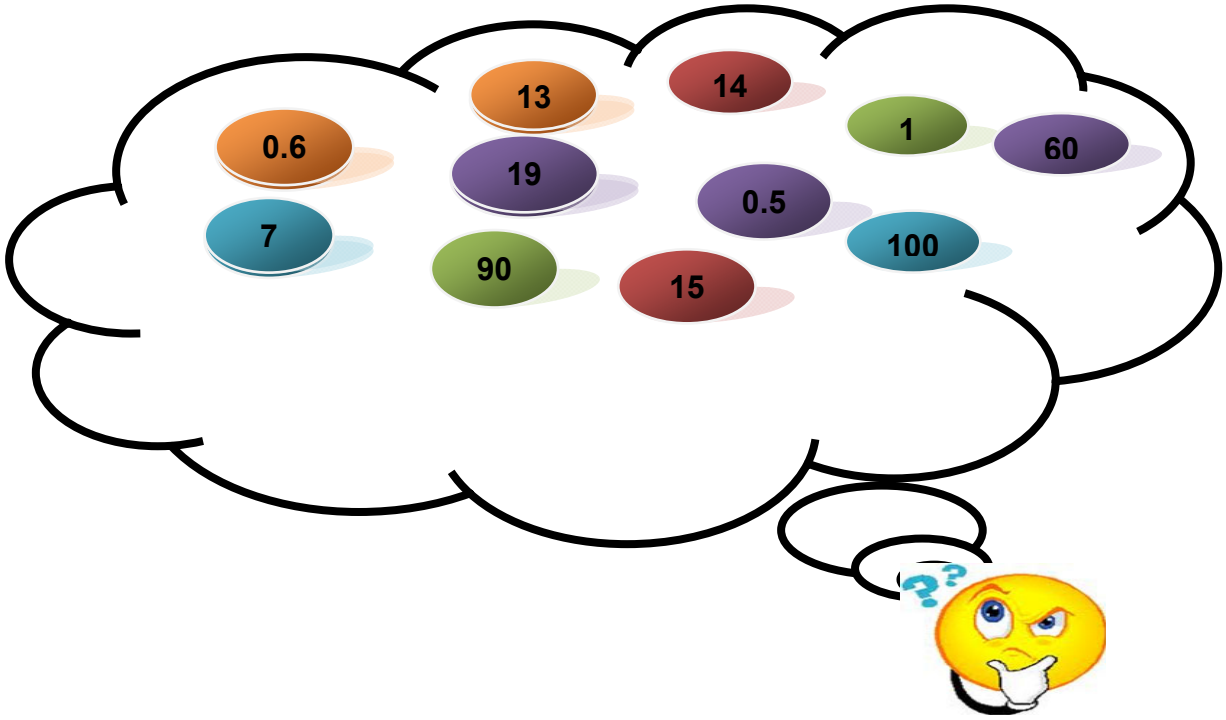
Provides interactive game about solving the square root of the given real number.

Doing this exercise will support your skill in finding the square root of a real number.
Now that you have done a number of exercises you are ready to assess yourself. Find how well you can perform.

ACTIVITY 4.

Complete the table below by finding the correct value of the given square root. Pick your answer from the choices below and drag it on the space provided for each number. Click on "Submit" to check your answers.

SQUARE ROOT	VALUE	SQUARE ROOT	VALUE
$\sqrt{169}$		$\sqrt{3\,600}$	
$\sqrt{49}$		$\sqrt{225}$	
$\sqrt{1}$		$\sqrt{10\,000}$	
$\sqrt{196}$		$\sqrt{0.25}$	
$\sqrt{8\,100}$		$\sqrt{0.36}$	



SQUARE ROOT	VALUE	SQUARE ROOT	VALUE
$\sqrt{169}$	13	$\sqrt{3\,600}$	60
$\sqrt{49}$	7	$\sqrt{225}$	15
$\sqrt{1}$	1	$\sqrt{10\,000}$	100
$\sqrt{196}$	14	$\sqrt{0.25}$	0.5
$\sqrt{8\,100}$	90	$\sqrt{0.36}$	0.6

You learned that when the numbers are perfect square numbers, the square roots are always integers. How are the square roots of non-perfect square numbers determined?

Irrational Numbers: Square Roots That Are Not Integers

In the previous lesson we saw that a perfect square is a number that has a positive integer as a square root. Most numbers are not perfect squares. How do we determine square of numbers that are perfect squares? What kind of numbers do they have for their roots?

How can we use the concept of perfect squares in approximating square roots of positive rational numbers? How are the square roots of decimal numbers determined?
Now look at the examples below.

Example 1. What is the square root of 12?
Since 12 is a non-perfect integer, its square root is not a rational number. So, we only approximate the value. How? By finding two consecutive perfect square integers between which the given number lies.
Which two consecutive integers will the square root of 12 fall between? 12 is between 9 and 16.

$$9 < 12 < 16$$

$$\sqrt{9} < \sqrt{12} < \sqrt{16}$$

$$Thus, \quad 3 < \sqrt{12} < 4$$

This implies that the square root of 12 is a number greater than 3 but less than 4.
Sharpen your skills in approximating the square root of a non-perfect square numbers by determining two integers between which the square root of the given number lies.

ACTIVITY 5.

Find two integers between which the square root of the given number lies.

First Integer	Square root of	Second Integer
4	8	9
	24	
	45	
	54	
	120	

Questions:

1. How can we determine the two consecutive integers between which the square root of the given number lies?
2. In what way can we use this skill in mathematical computations?

In the activity, we only give the two integers between which the square root of a number is located. But what single value can we express the given square root?

Approximating Square Roots of Irrational numbers.

One simple way to find a decimal approximation to the square roots of non-perfect square numbers is by guess and check. How?

Let's analyze the example below.

Example: What is $\sqrt{6}$ to the tenths place?

6 is between 4 and 9. So, $\sqrt{4} < \sqrt{6} < \sqrt{9}$. This gives $2 < \sqrt{6} < 3$.

Then its the time to make a guess, for example 2.3. Square that, and see if the result is over or under $\sqrt{6}$, and improve your guess based on that. Repeat the process until you have the desired accuracy (amount of decimals).

Guess	Square of guess	High/low
2.30	5.29	Too low
2.35	5.523	Too low
2.40	5.760	Too low
2.5	6.250	Too high
2.44	5.954	Too low, but real close

2.45	6.003	High, so between 2.44 and 2.45
2.447	5.988	Low, but close
2.449	5.998	Low, but very close

Thus, rounding to the nearest tenth, $\sqrt{6}$ = 2.449 ≈2.5.

ACTIVITY 6. Find the square roots up to the tenths place.

Number	Square Root	Number	Square Root
14		62	
28		95	
48		140	

Questions:

1. Describe the process you used to find the square root of a number without using a calculator.

   _____
   ___
   _____
   ___

2. Why do we need to use paper and pencil method to find the square root when this could easily be derived using the calculator?

   _____
   ___
   _____
   ___

3. In what real life situation is the skill in approximation useful?

   _____
   ___
   _____
   ___

4. Is there another way of approximating square roots of numbers?

   _____
   ___
   _____
   ___

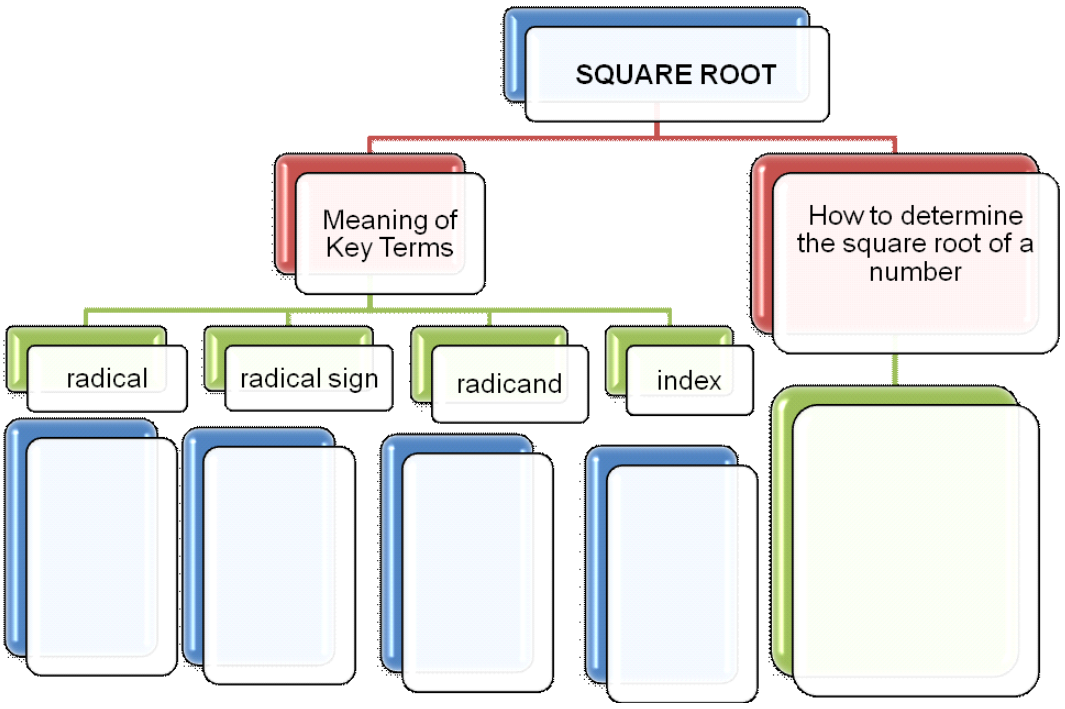
Let's go back to the question raised before the activity.

How can you determine the square root of a given real number?
How can the knowledge of square roots help us solve problems in daily life?

Keep in mind or take note of your answer to this question.

Exercise 3: **System Chart**

Complete the chart below by filling-out the correct information.



End of FIRM UP:

In this section, the discussion was about determining the square root of a number. You also learned that squaring a number and getting the square root are inverse process.

Now that you know the important ideas about this topic, let's go deeper by moving on to the next section.

DEEPEN

Your goal in this section is to extend your understanding of finding the square roots of a real number to real life situations. Use your knowledge and skills in solving the problem below.
Try to answer the given exercise below.

ACTIVITY 7. Read and solve the problem below. Show your process.

Try to solve this problem by answering the questions below.




You want to make a square pillow. You have 729 square inches of material for the front of the pillow. If you use all the material, what is the length of one side of the pillow? How can you solve his problem?

Answer the following questions.

1. What is required in the problem?
2. How will find the length the side of the square pillow?
3. What is the length of one side of the pillow?
4. How can your skill in finding square roots of a real number be applied to solve real life problems?

Jot down your answers to the given questions above.

Knowledge and skills in square root can be use to solve real life problems or situations. Go back to your answers in the questions from Exercise 3 as we solve the given problem.

1. What is the problem?
You were required to find the length of the pillow.

2. What must be done to solve this problem?
Use the formula for solving the area of a square which is; $A = s^2$

3. How will you able to solve for the length of the side of the square pillow?
Using the formula $A = s^2$, where "A" stands for the area of the square while "s" represents the measurement of its side, the given value of the area may be substituted to "A" then solve for the side as shown in the solution below.
$A = s^2$
$729\ in^2 = s^2$
$\sqrt{729\ in^2} = \sqrt{s^2}$
27 in = s

4. What is the length of the side of the pillow?
Therefore the length of the one side of the sides of the square pillow is 27 in.

Questions:

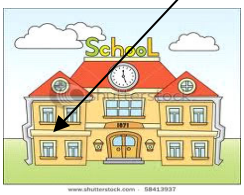
1. What is the significance of your skill in finding the square root of a real number?
2. How can the knowledge of square roots help us solve problems in daily life?

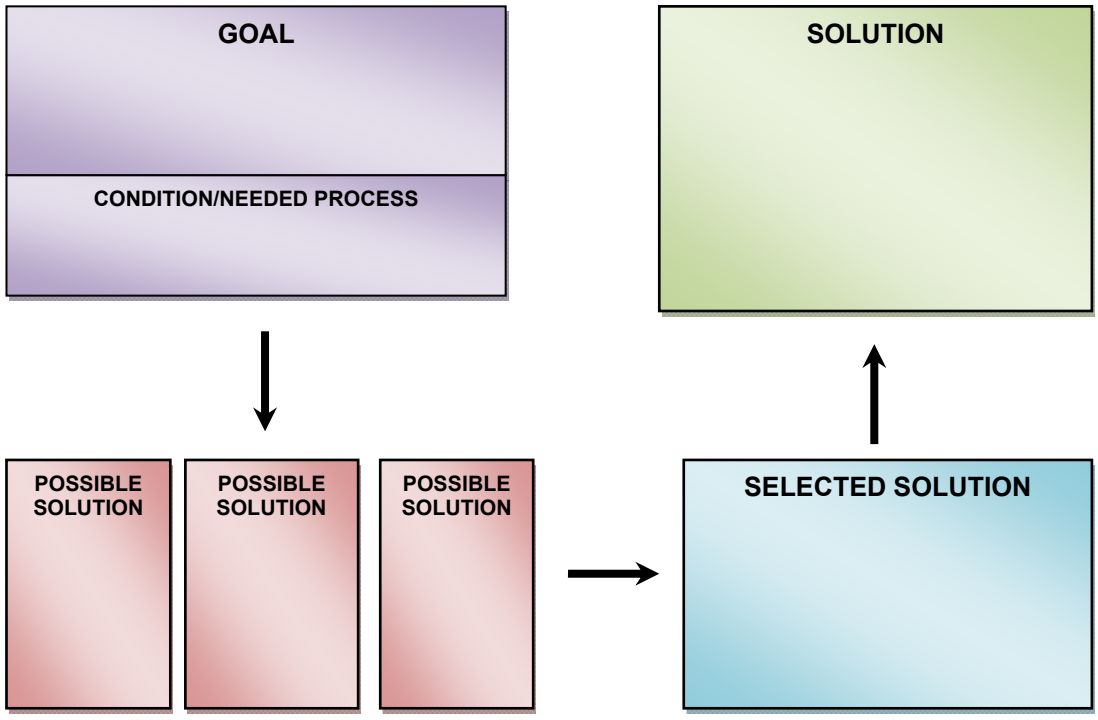
Assess your problem solving skills by doing the activity below.

ACTIVITY 8. Problem-Solving

Solve the given problem. Fill-out the graphic organizer by writing your answer in the answer box then click “Submit” to check your answer.

A man walks 4 kilometers to the east in going to school and then walks 9 kilometers northward going to the church. How far is he from the starting point which is his house?





Jot down your answer to the question below.

How can the knowledge of square roots help us solve problems in daily life?

Exercise 5: Go back to the previous section and compare your initial ideas with the discussion. How much of your initial ideas are found in the discussion? Which ideas are different and need revision?

Let's go back to the IRF Sheet. Now fill-out the second column and click "Save".

IRF SHEET

INITIAL *What are your initial ideas about square roots?*	**REVISE** *Write the revised initial ideas.*	**FINAL**
		DO NOT ANSWER THIS PART YET

End of DEEPEN:

In this section, the discussion was about the application of the knowledge and skills of finding the square root.

Now, you are ready to do your final task to show case your knowledge and skills developed in this lesson.

TRANSFER

Your goal in this section is to apply your learning to real life situation. You will be given a practical task that will demonstrate your understanding. How will you apply your knowledge and skills in square root to real life situations or problems?

ACTIVITY 9. Performance Task.

You are an architect in a well-known establishment. You were tasked by the CEO to give a proposal on the diameter of the establishment's water tank design. The tank should hold a minimum of 750 cm^3 and 30 cm long. You were required to have a proposal presented to the Board. The Board would like to see the concept used, practicality, accuracy of computation and organization of report.

.

Write your proposal below. Refer to the rubric to help you write you plan the proposal then click "Submit".

Now that you are done with your work, use the rubric below to check your work. Your work should show the traits listed under SATISFACTORY or 3. If your work shows these traits, you are ready to submit your work.

If you want to do more, you work should show the traits listed under EXCELLENT or 4.

If your work does not have any traits under 3 or 4, revise your work before submitting it.

RUBRIC

CATEGORIES	4 EXCELLENT	3 SATISFACTORY	2 DEVELOPING	1 BEGINNING
Mathematical Concept	Demonstrate a thorough understanding of the topic and use it appropriately to solve the problem.	Demonstrate a satisfactory understanding of the concepts and use it to simply the problem.	Demonstrate incomplete understanding and have some misconceptions.	Shows lack of understanding and has severe misconceptions.
Accuracy of Computation	All computations are correct and are logically presented.	The computations are correct.	Generally, most of the computations are not correct.	Errors in computations are severe.
Practicality	The output is suited to the needs of the client and can be executed easily. Ideas presented are appropriate to solve the problem.	The output is suited to the needs of the client and can be executed easily.	The output is suited to the needs of the client and cannot be executed easily.	The output is not suited to the needs of the client and cannot be executed easily.
Organization of Report	Highly organized. Flows smoothly. Observes logical	Satisfactorily organized. Sentence flow is generally smooth and logical.	Somewhat cluttered. Flow is not consistently smooth, appears disjointed.	Illogical and obscure. No logical connections of ideas. Difficult to

	connections of points.			determine the meaning.

Exercise 6: **Synthesis Journal**

In this section, the discussion was about determining the square root of a real number. Fill-out the synthesis journal with regards to this lesson then click "save".

Synthesis Journal		
What I did.	**What I learned.**	**How can the knowledge of square roots help us solve problems in daily life?**

End of TRANSFER:
In this section, your task was to produce a written and oral report with the application of your knowledge and skills about square root.

You have completed the first topic. Now let's go to the next.

http://www.homeschoolmath.net/teaching/why_need_square_roots.php
Provides a column that shows the importance of square roots and its application to other fields.

http://gwenellenmorett.suite101.com/the-pythagorean-theorem-a21010
Provides a column that shows the importance of square roots and its application to other fields.

http://www.dailymotion.com/video/xeak7k_how-to-apply-square-roots_tech
Provides a video that shows the application of finding the square roots in solving real life word problems.

http://www.dailymotion.com/video/xeak7g_how-to-apply-estimation-of-square-r_tech
Provides a video that shows the application of estimating square roots in solving real life word problems.

Lesson 3.2: Approximating square root.

EXPLORE

As you go through this topic, keep on thinking about these questions:
How can you approximate the square root of a given real number?
How can the knowledge of square roots help us solve problems in daily life?

ACTIVITY 1. Table Completion

Complete the table below by identifying the perfect squares where the given perfect square number lies in-between. The first given is set as an example. Write your answer on the space then click "Submit" to check your answer.

(Before)	The following perfect squares are in between the other perfect square numbers	(After)
4	9	16
	16	
	81	
	100	
	144	
	196	
	441	

	900	
	2, 500	
	10, 000	

Try to take note of your answer to these preliminary questions before we further explore on approximating the square root of a number.

1) **Based on activity, how did you by identifying the perfect squares where the given perfect square number lies in-between.**
2) **Did you somehow, use the skill of "approximation"?**
3) **How can you approximate the square root of a number?**
4) **How can the knowledge of square roots help us solve problems in daily life?**

Exercise 7: **KWL CHART**

Below is the KWL Chart. It will help check your understanding of the topics in this lesson. You will be asked to fill in the information in different sections of this topic. For now you are supposed to complete the first two rows with what you know about the topic. Click on "Save" to save your response.

What I Know	What I Want to know	What I Learned
		DO NOT ANSWER THIS PART YET

After giving your initial ideas regarding identifying the perfect squares where the given perfect square number lies in-between . Let's now look into what square roots of real numbers are and how to determine square roots of numbers.

FIRM-UP

Your goal in this section is to learn and understand key concepts on approximating/estimating square roots of a real number.
Try to recall perfect square numbers and how will you identify them.
As you go through this section keep on thinking this question: ***How can you approximate the square root of a real number?***

*Important concept/idea:

- **Finding the square root of a real number is also called <u>extracting</u> the root of a real number.**
- **<u>Divide and average method</u> is used to estimate square root.**

- **It will be very helpful knowing as many perfect squares and their square root.**

ACTIVITY 2.

Analyze the table below then answer the given questions.

These are perfect squares	because _____	and square root of _____	is equal to _____.
4 =	$2 \times 2 = 2^2$	$\sqrt{4}$ =	2
9 =	$3 \times 3 = 3^2$	$\sqrt{9}$ =	3
36 =	$6 \times 6 = 6^2$	$\sqrt{36}$ =	6
81 =	$9 \times 9 = 9^2$	$\sqrt{81}$ =	9
25 =	$5 \times 5 = 5^2$	$\sqrt{25}$ =	5
64 =	$8 \times 8 = 8^2$	$\sqrt{64}$ =	8
100 =	$10 \times 10 = 10^2$	$\sqrt{100}$ =	10
121 =	$11 \times 11 = 11^2$	$\sqrt{121}$ =	11
400 =	$20 \times 20 = 20^2$	$\sqrt{400}$ =	20
2 500 =	$50 \times 50 = 50^2$	$\sqrt{2\,500}$ =	50

Answer these questions before we deal with approximating square root.

1) **How can you say that a number is perfect square?**
2) **As we get the square root of a perfect square number, what do you notice with the answer?**
3) **Give other examples of a perfect square number.**

*Important concept/idea:

- **Here are the examples on how to estimate square roots of real numbers.**
- **Let us now deal with approximating/estimating square root.**

Estimate/ approximate the following real numbers

Example 1: Estimate $\sqrt{49}$

Example 2: Estimate $\sqrt{361}$

Example 3: Estimate $\sqrt{8}$

- For PERFECT SQUARE NUMBERS

Example 1: Estimate $\sqrt{49}$

Step 1: Think of a perfect square number that is close to the given radical.

Since $\sqrt{49}$ is close to $\sqrt{36}$, so $\sqrt{49} > 6$

Step 2: Divide 49 by 6. Disregard the reminder

$$\begin{array}{r} 8 \\ 6\overline{)\,49} \\ \underline{-\,48} \\ 1 \end{array}$$

Step 3: Find the average of the factors

$$\frac{6+8}{2} = \frac{14}{2} = 7$$

Step 4: Use 7 as the new divisor.

$$\begin{array}{r} 7 \\ 7 \overline{)\,49} \\ \underline{-\,49} \\ 0 \end{array}$$

Step 5: The factors are equal. Therefore $\sqrt{49} = 7$. If the factors are not equal, repeat c and d.

ACTIVITY 3.

Try to estimate the given square roots by completing the provided steps. Write your answer in the box then click "Submit" to check your answer.

1) Approximate $\sqrt{64}$

Step 1: Think of a perfect square number that is close to the given radical.

Since $\sqrt{64}$ is close to $\sqrt{\square}$ so $\sqrt{64}$ $\square$

Step 2: Divide 64 by . Disregard the reminder

Step 3: The average of the two factors is

Step 4: Use as the new divisor.

Step 5: The factors are equal. Therefore $\sqrt{64}$ =

2) Approximate $\sqrt{81}$

Step 1: Think of a perfect square number that is close to the given radical

Since $\sqrt{81}$ is close to , so $\sqrt{81}$

Step 2: Divide 81 by . Disregard the reminder

Step 3: The average of the two factors is

Step 4: Use as the new divisor.

Step 5: The factors are equal. Therefore $\sqrt{81}$ =

Try to take note of your answer to these questions before we proceed on approximating the square root of a number.

1) **Based on the exercise, how did you identify the root of the perfect square number less than 100 that will be used as the divisor?**
2) **Did you somehow, use the skill of "approximation"?**
3) **Which of the steps did you find difficult or confusing? Why? How do you plan to overcome this difficulty?**
4) **How can you approximate the square root of a number?**

Let us now proceed to the next example.

Example 2: Estimate $\sqrt{361}$

Step 1: Think of a perfect square number that is closest to the given radical.

Since $\sqrt{361}$ is close to $\sqrt{400}$, so $\sqrt{361} < 20$

Step 2: Divide 361 by 20. Disregard the reminder

```
      18
20   361
   - 20
     161
     160
       1
```

Step 3: Find the average of the factors.

$$\frac{20 + 18}{2} = \frac{38}{2} = 19$$

Step 4: Use 19 as the new divisor.

```
      19
19   361
   - 19
     171
     171
       0
```

ACTIVITY 4.

Try to estimate the given square roots by completing the provided steps. Write your answer in the box then click "Submit" to check your answer.

1) Approximate $\sqrt{841}$

7

Step 1: Think of a perfect square number that is close to the given radical.

Since $\sqrt{841}$ is close to , so $\sqrt{841}$ >

Step 2: Divide 841 by . Disregard the reminder

Step 3: The average of the two factors is

Step 4: Use as the new divisor.

Step 5: The factors are equal. Therefore $\sqrt{841}$ =

2) Approximate $\sqrt{9,801}$

Step 1: Think of a perfect square number that is close to the given radical.

Since $\sqrt{9,801}$ is close to , so $\sqrt{9,801}$ >

Step 2: Divide 9, 801 by . Disregard the reminder

Step 3: The average of the two factors is

Step 4: Use as the new divisor.

Step 5: The factors are equal. Therefore $\sqrt{9,801}$ =

Try to take note of your answer to these questions before we proceed on approximating the square root of a number.

1) **Based on the exercise, how did you identify the root of the perfect square number greater than 100 that will be used as the divisor?**
2) **Did you somehow, use the skill of "approximation"?**
3) **Which of the steps did you find difficult or confusing? Why? How do you plan to overcome this difficulty?**
4) **How can you approximate the square root of a number?**

Let us now proceed to the next example.

For NOT PERFECT SQUARE NUMBERS

- **Here are the examples on how to estimate square roots of real numbers.**
- **Let us now deal with approximating/estimating square root. The root must be round-off to the nearest tenths place,**

Example 1: Estimate $\sqrt{8}$

Step 1: Think of TWO closest perfect square numbers before and after the given radical.

Since $\sqrt{8}$ is close to $\sqrt{4}$ and $\sqrt{9}$, then $\sqrt{4} < \sqrt{8} < \sqrt{9}$,

so $2 < \sqrt{8} < 3$

Step 2: Divide 8 by 2. Disregard the reminder

```
    4
 2  8
-   8
    0
```

Step 3:Get the average of the factors.

$$\frac{2+4}{2} = \frac{6}{2} = 3$$

..

Step 4: Divide 8 by 3. Consider the reminder

```
    2.6
 3  8.0
  - 6
    20
    18
     2
```

Step 5:Get the average of the factors.

$$\frac{3 + 2.6}{2} = \frac{5.6}{2} = 2.8$$

Step 6: Divide 8 by 2.8. Consider the reminder

```
      2.85
28  80.00
  - 56
    240
    224
      160
      140
```

Step 7: Get the average of the factors.

$$\frac{2.8 + 2.85}{2} = \frac{5.65}{2} = 2.825$$

You may stop dividing at this point.

Step 8: Round-off the average to the nearest tenths place.
2.825 will become 2.8

Step 9: Check your answer 2.8
2.8 x 2.8 or $(2.8)^2 = 7.84$
We can see that 7.84 is close to 8. Hence, a close estimate for $\sqrt{8}$ is 2.8.

Activity 8: Try to estimate the given square roots by completing the provided steps. Write your answer in the box then click "Submit" to check your answer.

1) Estimate $\sqrt{20}$

Step 1: Since $\sqrt{20}$ is close to _____ and _____, then $\square < \sqrt{8} <$ _____,

so _____ $< \sqrt{20} <$ _____

Step 2: Divide 20 by _____. Disregard the reminder

Step 3: The average of the factors is _____.

Step 4: Divide 20 by _____. Consider the reminder

Step 5: The average of the factors is _____.

Step 6: Divide 20 by . Consider the reminder

Step 7 The average of the factors rounded-off to the nearest tenths is .
You may stop dividing at this point.

Step 8: Hence, a close estimate for $\sqrt{20}$ is .

2) Estimate $\sqrt{500}$

Step 1: Since $\sqrt{500}$ is close to and , then $\square < \sqrt{8} <$,
so $< \sqrt{20} <$

Step 2: Divide 500 by . Disregard the reminder

Step 3: The average of the factors is .

Step 4: Divide 500 by . Consider the reminder

Step 5: The average of the factors is .

Step 6: Divide 500 by . Consider the reminder

Step 7 The average of the factors rounded-off to the nearest tenths is .
You may stop dividing at this point.

Step 8: Hence, a close estimate for $\sqrt{500}$ is .

Try to take note of your answer to these questions before we proceed on approximating the square root of a number.

1) **Based on the exercise, how did you identify the root of the not perfect square number that will be used as the divisor?**
2) **Did you somehow, use the skill of "approximation"?**
3) **Which of the steps did you find difficult or confusing? Why? How do you plan to overcome this difficulty?**
4) **How can you approximate the square root of a number?**

5) **How can rounding-off to the nearest tenths help you to approximate the square root of a number?**

- **For an in-depth know-how of estimating/approximating square roots, visit the following websites.**

Click the given site below that will deal with discussion on estimating square roots. Have your headset or speaker if possible. (www.youtube.com)
http://www.youtube.com/watch?v=I106o7lE-sk
Provides discussion on estimating square roots

Click the given site below that will deal with another discussion on estimating square roots. Have your headset or speaker if possible. (www.youtube.com)
http://www.youtube.com/watch?v=EFVrAk61xjE&feature=relmfu
Provides discussion on estimating square roots

Answer the following questions below. Try to remember or jot down your answer.

1) **Based on the discussion, how can you approximate square roots?**
2) **Can we apply approximation on all square roots?**
3) **What do you notice with the answer after approximating not perfect square number?**
4) **What do you call with this type of number?**
5) **Do you think there are numbers between counting numbers? Why?**
6) **How can the knowledge of square roots help us solve problems in daily life?**

ACTIVITY 5. Approximating Square Roots

Answer the following activity then click on "Submit" to check your answers.

I. State the two consecutive integers between which the number lies.

1. $\sqrt{47}$ → and
2. $-\sqrt{105}$ → and
3. $\sqrt{68}$ → and
4. $\sqrt{3}$ → and

5. $\sqrt{77}$ → and

Approximate each square root to the nearest tenths.

1. $\sqrt{109}$
2. $\sqrt{700}$
3. $\sqrt{17}$
4. $-\sqrt{33}$
5. $\sqrt{7}$

I. State the two consecutive integers between which the number lies.

1. $\sqrt{47}$ → 6 and 7
2. $-\sqrt{105}$ → and -11
3. $\sqrt{68}$ → 8 and 9
4. $\sqrt{3}$ → 1 and 2
5. $\sqrt{77}$ → 8 and 9

II. Approximate each square root to the nearest tenths.

1. $\sqrt{109}$ 10.44
2. $\sqrt{700}$ 26.46
3. $\sqrt{17}$ 4.12
4. $-\sqrt{33}$ -5.74

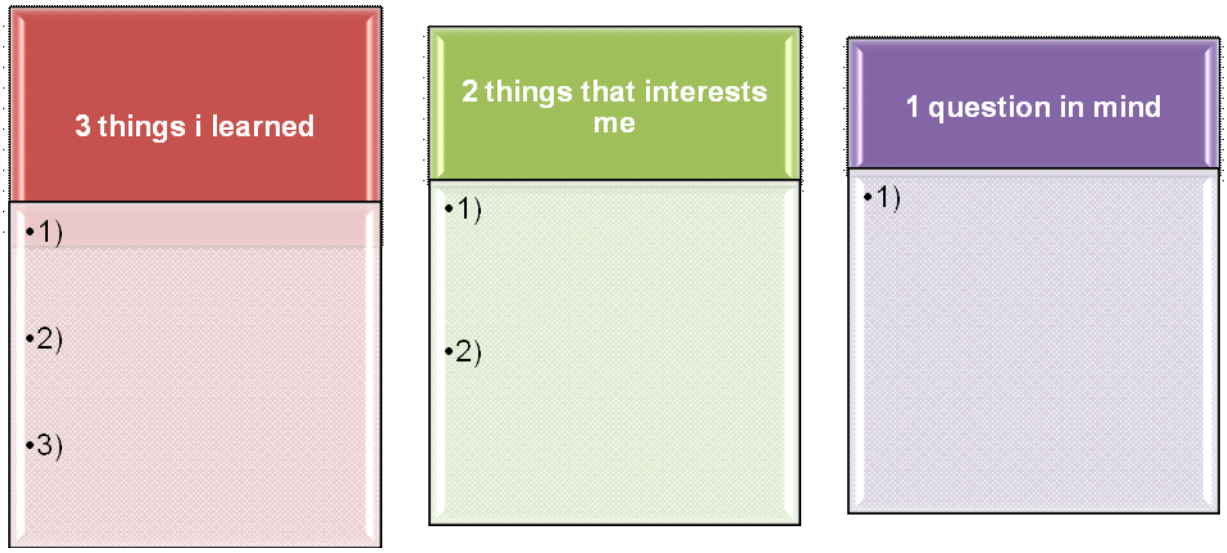
5. $\sqrt{7}$ ⟸ **2.64**

Let's go back to the questions raised before the lesson:
Have you ever wondered if there are still numbers in-between 1 and 2? How about between 3 and 4? So on….

Keep in mind or take note of your answer to this question. Through them you get to realize the whole point of extracting square roots.

Exercise 7: **3-2-1 – Recording one's thoughts and feelings.**

In this section, the discussion was about approximating the square root of a real number. Fill-out the given 3-2-1 diagram with regards to this lesson.



End of Firm Up

In this section, the discussion was about approximating/estimating square root. You also learned to identify numbers that are perfect square.

For the questions that you still have, you may go back to the website and try to find the answer.

Now that you know the important ideas about this topic, let's go deeper on approximating square roots.

DEEPEN

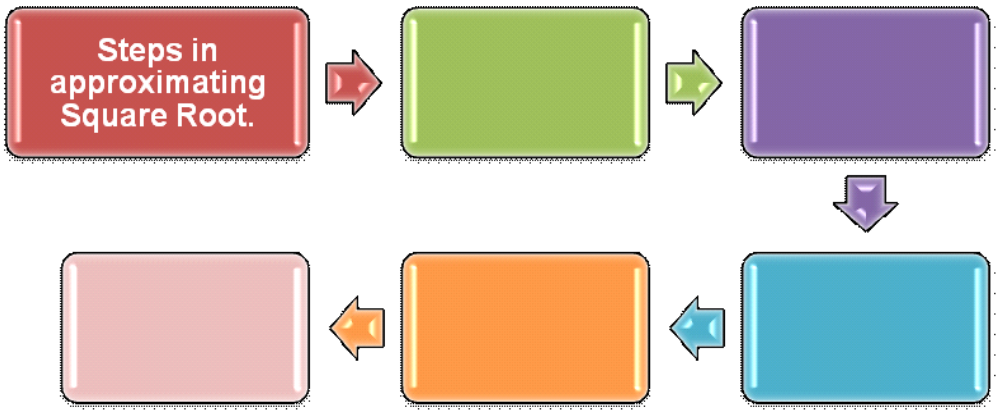
Your goal in this section is to take a closer look at some aspects of the topic.

That your knowledge and skills regarding square roots may be used in real life situations.

Before we proceed to the next selection, let's review your understanding of square roots.

Exercise 7: Complete the diagram below by writing the steps in approximating Square Root then click "Save".

.



Exercise 8:

Click on the given websites below and answer the questions to know the importance of square roots.

1. **http://www.homeschoolmath.net/teaching/why_need_square_roots.php**
   Provides a column that shows the importance of square roots and its application to other fields.

2. **http://gwenellenmorett.suite101.com/the-pythagorean-theorem-a21010**
   Provides a column that shows the importance of square roots and its application to other fields.

3. **http://www.dailymotion.com/video/xeak7k_how-to-apply-square-roots_tech**
   Provides a video that shows the application of finding the square roots in solving real life word problems.

4. **http://www.dailymotion.com/video/xeak7g_how-to-apply-estimation-of-square-r_tech**
   Provides a video that shows the application of estimating square roots in solving real life word problems.

Try to take note of your answer to these questions before we proceed on approximating the square root of a number.

1. **According to the videos and articles, why is your knowledge and skill in square roots important in daily life?**
2. **According to the articles, why is your knowledge and skill in square roots important to other fields?**
3. **What are the other application or important of square roots?**

ACTIVITY 6. Problem-Solving

Solve the given problem. Fill-out diagram by writing your answer in the answer box and answer the follow-up questions then click “Submit” to check your answer.

1. A 20-foot ladder is placed against the wall of a building. The ladder touches the building 15 ft from its base. How far is the ladder from the foot of the building?



Answer:

1. **How can your skill in approximating square roots be applied to solve real life problems?**

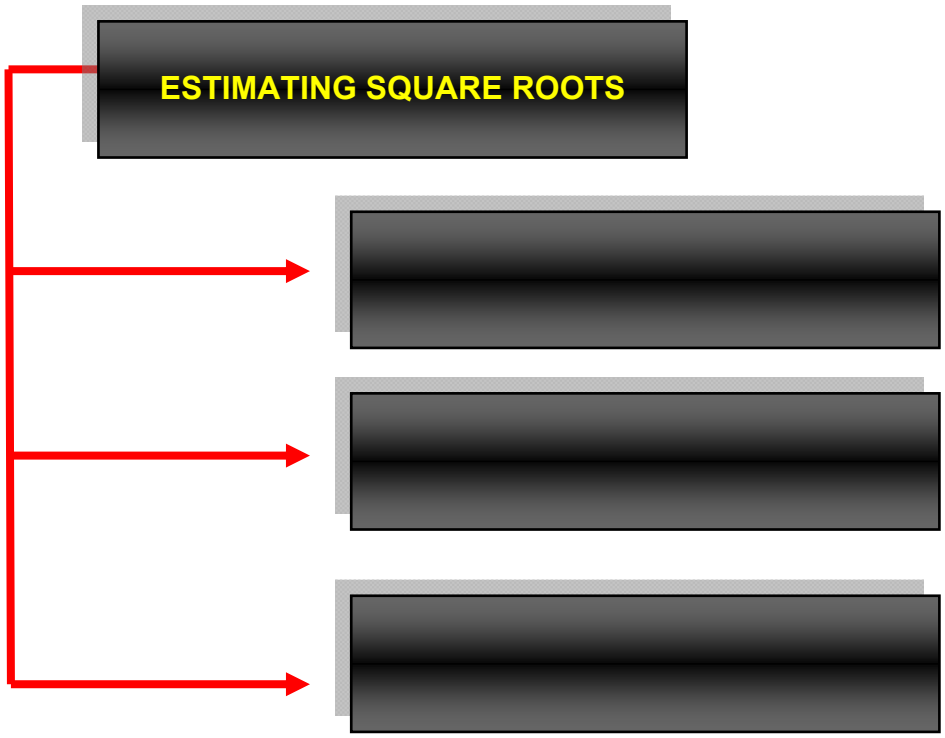
Answer:

2. **How can the knowledge of square roots help us solve problems in daily life?**

Answer:

Exercise 9: Generalization Organizer

In this section, the discussion was about approximating the square root of a real number. Fill-out the organizer below with regards to your generalizations to this lesson then click “Save”.



End of DEEPEN:
In this section, the discussion was about the application of the knowledge and skills of approximating and graphing square roots.

TRANSFER

Before we begin this section, recall this question asked at the start of the module. ***How can you approximate the square root of a given real number? How can the knowledge of square roots help us solve problems in daily life?*** The transfer section of the module will help guide you in determining the best answer to the question.

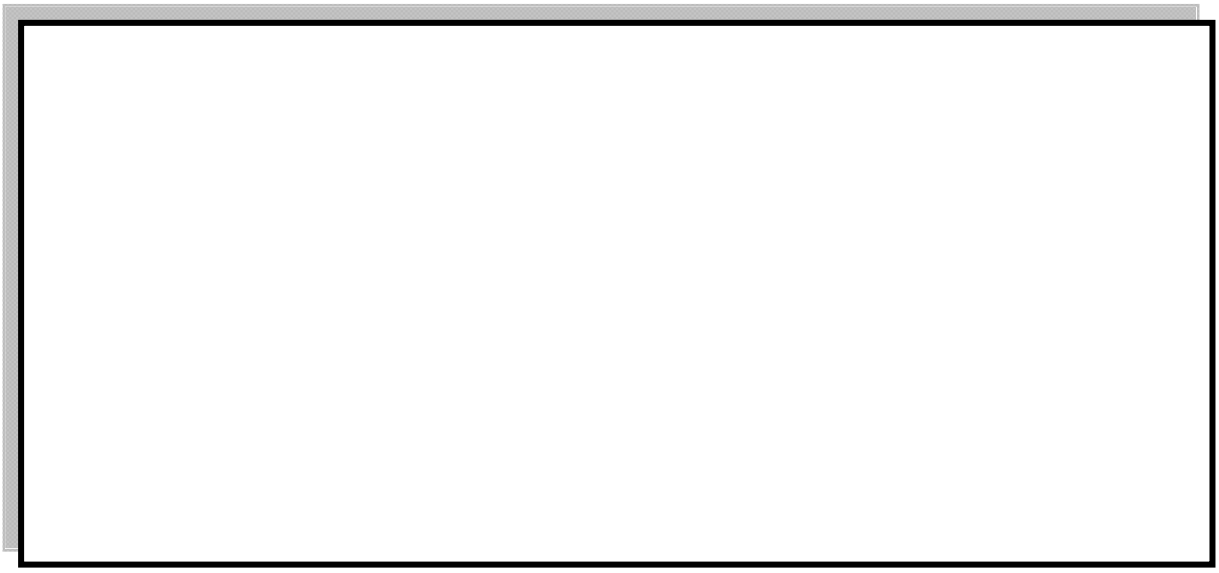
Your goal in this section is to apply your learning to real life situation. You will be given a practical task that will demonstrate your understanding. How will you apply your knowledge and skills in square root to real life situations or problems?

TASK

Your goal in this section is apply your learning to real life situations. You will be given a practical task which will demonstrate your understanding.

For buildings to be accessible to handicapped persons, the engineering department passed a bill that that the slope of the ramp be less than or equal to 1/12. You are required to have a proposal regarding the ramp's dimensions and present this to the Board. The Board will like to see its concept used, practicality, accuracy of computation and organization of report.

Write your proposal below. Refer to the rubric below to help you write your plan/proposal then click "Submit".



Now that you are done with your work, use the rubric below to check your work. Your work should show the traits listed under SATISFACTORY or 3. If your work ahs these traits, you are ready to submit your work.

If you want to do more, you work should show the traits listed under EXCELLENT or 4.

If your work does not have any traits under 3 or 4, revise your work before submitting it.

RUBRIC: Center Table at the Lounge

CATEGORIES	4 EXCELLENT	3 SATISFACTORY	2 DEVELOPING	1 BEGINNING
Mathematical Concept	Demonstrate a thorough understanding of the topic and use it appropriately to solve the problem.	Demonstrate a satisfactory understanding of the concepts and use it to simply the problem.	Demonstrate incomplete understanding and have some misconceptions.	Shows lack of understanding and has severe misconceptions.
Accuracy of Computation	All computations are correct	The computations are correct.	Generally, most of the computations	Errors in computations are severe.

	and are logically presented.		are not correct.	
Practicality	The output is suited to the needs of the client and can be executed easily. Ideas presented are appropriate to solve the problem.	The output is suited to the needs of the client and can be executed easily.	The output is suited to the needs of the client and cannot be executed easily.	The output is not suited to the needs of the client and cannot be executed easily.
Organization of Report	Highly organized. Flows smoothly. Observes logical connections of points.	Satisfactorily organized. Sentence flow is generally smooth and logical.	Somewhat cluttered. Flow is not consistently smooth, appears disjointed.	Illogical and obscure. No logical connections of ideas. Difficult to determine the meaning.

End of TRANSFER:
In this section, your task was to produce a written and oral report with the application of your knowledge and skills about approximating square root.

LESSON 4: SIGNIFICANT DIGITS

☑ **LESSON INTRODUCTION:**

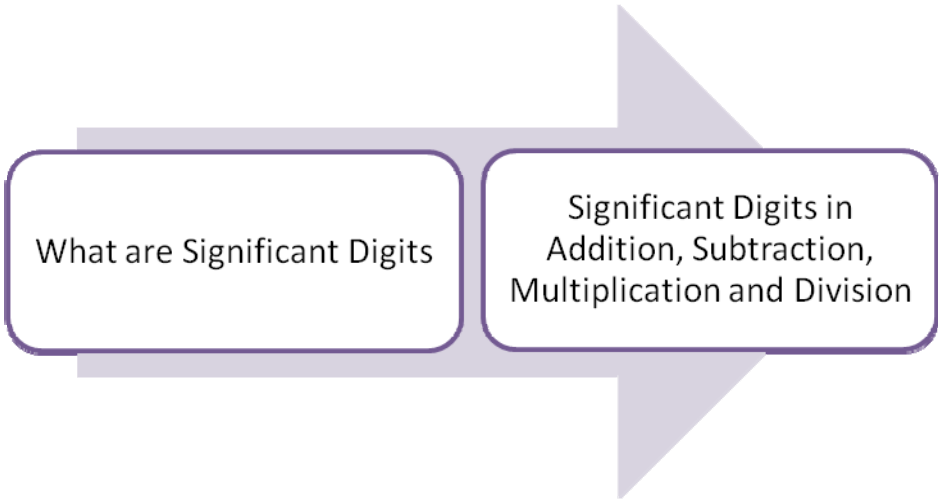
Did you know that numbers can be significant or not? Yes, it's just like our personal experiences. We sometimes say that we have significant and insignificant experiences. This labeling depends on how our experiences affect our daily life. Numbers too, are labeled significant and insignificant depending on the calculations made. ***How can we tell when a certain calculation is significant to consider?*** What guidelines can we use to help us determine the significance of a calculation? What then makes a calculation significant? Do you want to know more about it? Read on!

☑ **LESSON COVERAGE:**

In this lesson, you will examine this question when you take the following topics:

Topic No.	Title	You'll learn to…	Estimated Time
4.1	What are significant digits	Rules in determining significant digits	1 hour
4.2	Significant Digits in Addtition, Subtraction, Multiplication, and Division	Determining the appropriate significant digits in a calculation	1 hour

Here is a simple map of the above lessons you will cover:



To do well in this lesson, you need to remember and do the following:

1. Read the concepts very well. Write your ideas on a sheet of paper or on your notebook. This will help you remember the ideas presented in each lesson.
2. Complete all the exercises.
3. Supplement yourself with other learning materials if available and necessary.
4. Keep in mind that success depends on how much effort you exert in learning this module.

PRE-ASSESSMENT:

Let's find out how much you already know about this lesson. Click on the letter that you think best answers the question. Please answer all items. After taking this short test, you will see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this lesson.

1. How many significant digits are there in 2,091?
A. 1
B. 2
C. 3
D. 4

2. Which number has 4 significant digits?
A. 0.0001
B. 0.0234
C. 4,000
D. 2,004

3. Which value shows a significant zero-digit?
A. 0.01
B. 0.005
C. 1.05
D. 100

4. How many significant digits are there in 0.0432?
A. 1
B. 2
C. 3
D. 4

5. How many significant digits should the product of 8.5 x 3.2 have?
A. 2
B. 3
C. 4
D. 5

EXPLORE

Let us start by examining the different readings of calculations which we often encounter in our daily activities. How can we tell when a certain calculation is significant to consider? What guidelines can we use to help us determine the significance of a calculation?

But first let us define what a significant digit is?

Significant digits are digits that carry meaning according to their precision. Oftentimes, significant digits are related to rounding-off. Study the following tables to grasp more on the concept of significant digits.

Examine the different tables below. Each set represents a rule on determining significant digits. Start with Table A.

TABLE A
Nutrient Daily Values based on Reference Daily Values

Nutrient	Value	No. of Significant Digits
Thiamin	1.5 mg	2
Riboflavin	1.7 mg	2
Vitamin B6	2 mg	1
Iron	18 mg	2

Study Questions:

1. What kind of digit was used in each value in Table A?
2. What can you say about the relationship of the number of digits in the value and the number of significant digits in each?
3. What rule on significant digits can you conclude?

Ans. Rule 1. All non-zero digits are significant.

TABLE B Tiny numbers in Science		
Quantity	Value	No. of Sig.Digits
wavelength of green light	0.00000055	2
radius of a hydrogen atom	0.000000000025	2
charge of an electron	0.00000000000000000016	2

Study Questions:

1. What kinds of digits were used in each value in Table B?
2. Which kind of digit was considered significant?
3. Describe the position of zero with respect to the decimal point and the non-zero digit.
4. What rule can you conclude?

Ans. Rule 2. Zeroes written after a decimal point but before a nonzero digit is not significant.

TABLE C Linear Measures		
Linear Measure	Converted Value	No. of Sig.Digits
1 foot to meters	0.3048	4
1 rod to meters	5.029	4
1 mile to kilometers	1.6094	5
1 hectometer to feet	328.083	6

Study Questions:

1. Describe the relationship of the number of digits in the value and the number of significant digits in each.
2. Are the zeroes counted as significant?
3. Describe the position of zero with respect to nonzero digits.
4. What rule can you conclude?

Ans. Rule 3. Zeroes written in between nonzero digits are significant.

TABLE D Volume Measures		
Volume Measure	Value	No. of Sig.Digits
1 fluid ounce to milliliters	29.60	4
1 tablespoon teaspoon	3.0	2
1 teaspoon to milliliters	5.0	2
1 ft^3 to dm^3	28.3170	6

Study Questions:

1. Describe the relationship of the number of digits and the number of significant digits in each value.
2. Were the zeroes considered significant?
3. Describe the position of the zeroes with respect to the decimal point and the non-zero digit.
4. What rule can you conclude?

Rule 4. Zeroes written after the decimal point and after a non-zero digit is significant.

END OF EXPLORE:

You just tried finding out the rules in determining significant digits. Let's us now practice what you have discovered by doing the next part.

FIRM-UP

Your goal in this section is to practice what you have learned in the previous part by answering the worksheets given.

Worksheet No. 1

How many significant digits does each have? State the rule to support your response.

1. 0.041
2. 10.09
3. 4,000
4. 4.0
5. 2,341
6. 0.0041
7. 10.0039
8. 0.0029
9. 4.0051
10. 234,500

Think about this…

How would you know if a certain calculation is significant to consider? What guidelines can we use to determine the significance of our calculations? Write your idea in the box.

END OF FIRM UP:

In this section, you practiced determining the number of significant digits in a given value.

If you have incorrect answers, go back to the EXPLORE part for a review.

DEEPEN

Now that you know the basic rules in determining significant digits, how would you now know if your calculation is significant to discover? Read on!

> The number of significant digits in the sum, difference, product or quotient should equal the least number of digits in any one of the numbers being added, subtracted, multiplied or divided.

When calculating sum, difference, product and quotient of two or more numbers, how would you know the appropriate number of significant digits to use?

You must remember that:

For example:

A hair dryer uses 1.2 KW of power while a hair iron uses 1.14 KW of power. How much power is needed if you wish to use the two at the same time?

1.2 has two significant digits
1.14 has three significant digits

Therefore the sum of 1.2 + 1.14 should have two significant digits

1.2 + 1.14 = 2.34 or 2.3 KW

Let's have another example:

150.0 grams of water is to be combined with 0.507 grams of salt. What is the total weight of the mixture?

15.0 has 3 sig figures
0.51 has 2 sig. figures

Therefore the sum should have 3 sig. figures. So, 15.0 + 0.51 = 15.51 or 16

To further deepen, click on the website for more practice:
http://www.lon-capa.org/~mmp/applist/sigfig/sig.htm

END OF DEEPEN:

In this section, you deepened your understanding of significant digits by applying the concept to the basic operations.

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

TRANSFER

In this section you will be tasked to apply what you have learned on how to express certain calculation in significant figure. Furthermore, for you to achieve this you will practice determining the significance of a calculation using the guidelines you have studied in the previous sections.

TASK

Performance Task

You are a school researcher and you want to know how students spend their weekly allowance. This information will help the parents association of your school to understand how their children budget their allowance. Survey a good sample of students. Your research will be judged according to the significance of your calculations, and your presentation.

PERFORMANCE RUBRIC

STANDARDS	Excellent 4	Satisfactory 3	Developing 2	Needs Improvement 1
Use of Significant Digits	All calculations done in the research show appropriate and effective consideration of significance	All calculations done in the research show appropriate consideration of significance.	Some calculations done in the research showed inappropriate consideration of significance.	Few calculations done in the research show appropriate consideration of significance.
Presentation	Written and Oral Presentations were delivered excellently. Written work is free from errors.	Written and Oral Presentations were delivered well. Confidence and poise was manifested during the presentation.	Written and Oral Presentations were delivered unsystematically and shows unpreparedness. Written work had undergone few revisions.	Written and Oral Presentations were delivered poorly. Lack of self-confidence and poise was manifested.

END OF TRANSFER:

In this section, your task was to present to parents how students spend their weekly allowance. Were you able to apply the concepts of significant digits? Great!

You have completed this lesson. Before you go to the next lesson, you have to answer the following post-assessment.

POST ASSESSMENT

Let us find out how much you have learned on this lesson. Click on the letter that you think best answers the question. Please answer all items. After taking this short test, you will see your score. Take note of the items you were not able to correctly and go back to the previous sections so you can correct your answer.

1. How many digits are significant in 89,018?
A. 5
B. 4
C. 3
D. 2

2. Which value has a significant zero digit?
A. 0.0045
B. 0.045
C. 0.45
D. 4.50

3. How many significant digits should the sum of 1.21 and 1.355 have?
A. 2
B. 3
C. 4
D. 5

4. Which product requires 5 significant digits?
A. 1.23 x 4.123
B. 2.035 x 4.0023
C. 0.00045 x 1.001
D. 4.2356 x 0.756432

5. When is a zero significant?
A. If the zero is placed after a decimal point and before a non-zero digit
B. If the zero is placed between two non-zero digits
C. If the zero is placed after a non-zero digit
D. If the zero is placed before a decimal point and before a non-zero digit.

6. How many significant digits should be considered when multiplying 0.23 and 0.5
A. 1
B. 2
C. 3
D. 4

7. The number 0.032040 has ___ significant digits?
A. 3
B. 4
C. 5
D. 6

8. The ± relative density error in the density of a metal rod is determined to be ±0.02. If the calculated value of the density is 8.6321947…, how should the density be reported?
A. 8.63
B. 8.6
C. 8.632
D. 8.6322

9. The answer to (4.166 x 2.2 x 32.0) ÷ 16.553 = 17.7180209 should be expressed as:
A. 17.718021
B. 17.718
C. 17.7
D. 18

10. The answer to (4.8864 x 0.00900 x 665) ÷ 87.885421 should be expressed in how many significant digits?
A. 1
B. 2
C. 3
D. 4

11. The density of a metal is calculated to 8.9377 g/cm^3, using weight and v olume measurements. The ± absolute error is determined to be ±0.006 g/cm^3. The density should be correctly reported as”
A. 9
B. 8.9
C. 8.93
D. 8.938

12. The answer to the addition problem 10.11111 + 1.02 + 100.00001 + 0.04000 = 111.17112 should be expressed as?
A. 111.1712
B. 111.2
C. 111
D. 111.171

13. The atomic weight of silicon is 28.0855. Round this off to three significant figures.
A. 28.08
B. 28.09
C. 28.1
D. 28.0

14. Significant figures are important because they indicate ___?
A. The number of digits in a calculator
B. A counted number
C. The accuracy of a conversion factor
D. The number of measurements

15. A calculator answer showed 423.6959. The answer should be rounded off to three significant digits. What should be the reported answer?
A. 423.6
B. 424
C. 420
D. 423.7

16. Which of the following numbers contains the designated CORRECT number of significant figures?
A. 3.0650 4 significant figures
B. 0.043 00 5 significant figures
C. 156 000 3 significant figures
D. 1.04 2 significant figures

17. The number of significant figures in the measurement of 45.030 mm is _____.
A. four
B. six
C. three
D. five

18. Which of the following examples illustrates a number that is correctly rounded to three significant figures?
A. 4.05438 grams to 4.054 grams
B. 103.692 grams to 103.7 grams
C. 109 526 grams to 109 500 grams
D. 20.0332 grams to 20.0 grams

19. How many significant figures are in the number 0.00208?
A. six
B. four
C. three
D. two

20. How many significant figures are in the number 9,000,000?
A. 7
B. 4
C. 3
D. 1

GLOSSARY OF TERMS USED IN THIS MODULE:

Significant Digit. A number whose presence is given importance.

Non-zero digit. A number which is not zero.

WEBSITE RESOURCES AND LINKS IN THIS MODULE:

http://www.lon-capa.org/~mmp/applist/sigfig/sig.htm

http://www.physics.uoguelph.ca/tutorials/sig_fig_dig.htm

http://www.purplemath.com/modules/rounding2.htm

www.nutribase.com

LESSON 5: SCIENTIFIC NOTATION

☑ LESSON INTRODUCTION:

Do you know that the earth weighs 6,588,000,000,000,000,000,000,000 tons? Have you heard that the human body contains 70,000 miles of blood vessels? Do you know that it takes roughly 0.000000003 seconds for light to travel one meter? These are some examples of big and small numbers facts. Do you think it is possible to read and write these numbers in an easier way? ***What is the best way to represent very large or very small numbers?*** Read on to find out!

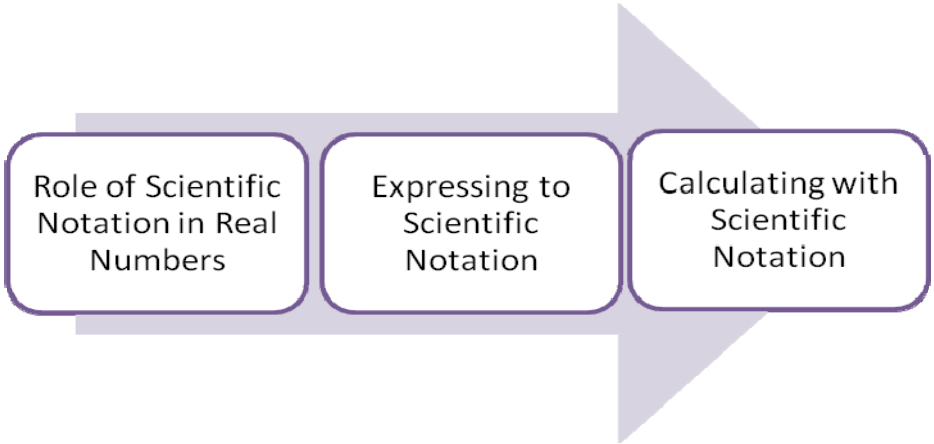
☑ LESSON COVERAGE

This lesson has the following topics:

Title	You'll learn to…	Estimated Time
5.1 Role of Scientific Notation in Real Numbers	Discuss the use of scientific notation	1 hour
5.2 Expressing big and small numbers to scientific notation	Convert big and small numbers to scientific notation	1 hour
5.3 Calculating with Scientific Notation	Add, subtract, multiply and divide numbers in scientific notation	1 hour

☑ Concept Map of the Module

Here is a simple map of the above lessons you will cover:



☑ Expected Skills

To do well in this lesson, you need to remember and do the following:

1. Read the concepts very well. Write your ideas on a sheet of paper or on your notebook. This will help you remember the ideas presented in each lesson.
2. Complete all the exercises.
3. Supplement yourself with other learning materials if available and necessary.
4. Keep in mind that success depends on how much effort you exert in learning this module.

PRE-ASSESSMENT:

Let's find out how much you already know about scientific notation.

Click on the letter that you think best answers the question. Please answer all items. After taking this short test, you will see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this lesson.

1. Why is scientific notation important to real numbers?
A. Because it makes real numbers mathematical
B. Because it helps in mathematical computations
C. Because it simplifies big and small numbers
D. Because it makes use of the powers of 10

2. In the scientific notation 6.0×10^4, which is the coefficient?
A. 4
B. 6
C. 10
D. X

3. In the scientific notation 4.65×10^{-3}, which shows the number of times the decimal place is moved?
A. -3
B. 0.65
C. 3
D. 4.65

4. Which part of the scientific notation indicates the direction of the movement of the decimal point?
A. Power of 10
B. Sign of coefficient
C. Sign of exponent
D. Position of decimal point

5. Which is the scientific notation of 456,000,000,000?
A. 456×10^9
B. 45.6×10^{10}
C. 4.56×10^{11}
D. 0.456×10^{12}

EXPLORE

Let's begin the module by writing your initial thoughts on scientific notation using the table below. Write your thoughts on the first column.

ACTIVITY 1. Generalization Table

Generalization Table on Scientific Notation				
MY INITIAL THOUGHTS ON SCIENTIFIC NOTATION	MY FINDINGS AND CORRECTIONS	SUPPORTING EVIDENCE	QUALIFYING CONDITIONS	MY GENERALIZATIONS

Next, try to find out what other people know about scientific notation.

ACTIVITY 2. Other people's initial ideas on scientific notation

Interview 2 to 3 persons (these can be your classmates, parents or friends) on what they know about scientific notation. Use the following guide questions in your interview.

1. Are you familiar with scientific notation?
2. Where do we use scientific notation?
3. Is scientific notation helpful in life?

Now that you have some ideas on scientific notation, try to write your idea on representing very large and very small numbers.

ACTIVITY 3. My Idea of Representing Large and Small Numbers

Try represent123,456,000,000,000. Write your ideas in the box. You can use any mathematical concept or method you have previously studied to represent this very big number easily.

Think…
1. How did you represent the given value?
2. Was it easy to represent a large value?
3. What do you think is the best way to represent very small or very big numbers?

END OF EXPLORE:

You just gave your initial ideas on scientific notation. Let us now continue to discover the best way to represent very small and very large numbers.

FIRM-UP

Your goal in this section is to learn and understand key concepts of scientific notation and how it can help represent very small and very big numbers. To help you know more about scientific notation, click on any of the links below.

Web Readings:

1. IERR Online Classroom - http://www.ieer.org/clssroom/scinote.html

2. Slideshare Scientific Notation
http://www.slideshare.net/penningm52/scientific-notation-rules

3. Math and ScienceActivityCenter edinformatics.com
http://www.edinformatics.com/math_science/scinot.htm

4. Math Rap – Scientific Notation
http://www.youtube.com/watch?v=HtXTKrigYqk

ACTIVITY 4. Comprehension Check

Which is right?

Click on the item that shows correct scientific notation.

1. 234,567,000 → 2.34567×10^8
2. 0.0987→ 98.7×10^3
3. 6,700→ 6.7×10^{-3}
4. 0.000007789 → 7.789×10^{-6}
5. 8,000,000→ 8.0×10^6

Correct Answers: Numbers 1, 4, and 5

Based on the web readings, answer the following questions:

1. What is scientific notation?
2. Why is it useful?
3. How do we express big and small numbers in scientific notation?
4. Is scientific notation the best way to represent very large or very small numbers? Why?
5. How does it help you in writing very large or very small numbers? Why do you say so?

Let us put into practice what you have read on expressing numbers in standard form to scientific notation. Click on the following links for an interactive exercise.

ACTIVITY 5. Interactive Activity

1. Converting Large Numbers to Scientific Notation
http://www.xpmath.com/forums/arcade.php?do=play&gameid=21

2. Converting Small Numbers to Scientific Notation
http://www.aaamath.com/dec71ix2.htm

ACTIVITY 6. What have you discovered?

Fill in the second, third and fourth column of the Generalization. This will help you organize your thought and understanding in Scientific Notation.

Generalization Table on Scientific Notation				
MY INITIAL THOUGHT	MY FINDINGS AND	SUPPORTING EVIDENCE	QUALIFYING	MY GENERALIZATIONS

S ON SCIENTIFIC NOTATION	CORRECTIONS		CONDITIONS	

How much of your initial ideas are found in the discussion? Which ideas are different and need revision?

END OF FIRM UP:

In this section, you found out how useful scientific notation is in expressing very small or very big numbers and how to express small and big numbers to scientific notation.

Now that you know the important ideas about this topic, let's go deeper by moving on to the next section

DEEPEN

Your goal in this section is to take a closer look at some aspects of the topic. You have already found out the use of scientific notation in representing very large and small numbers. Now, what if you are asked to operate these numbers? How will you do it? ***Is scientific notation still the best way to represent very small or very large numbers?***

Click on the following links to help you decide whether scientific notation is still the best way to represent very small and very big numbers.

Web Videos:

1. Adding and Subtracting Scientific Notations
http://www.youtube.com/watch?v=PYTp75sryWA

2. Multiplication and Division of Scientific Notations
http://www.youtube.com/watch?v=ciFOlirz4Js

ACTIVITY 7. Comprehension Check

From the video you have watched, answer the following questions:

1. How do we add and subtract numbers in scientific notation?
2. How do we multiply and divide numbers in scientific notation?
3. Is it easy to operate very large and very small numbers using scientific notation? Elaborate your answer.
4. Is scientific notation still the best way to represent very large and very small numbers?

Let us practice calculating with scientific notation.

1. Scientific Notation - The Astronomy Workshop
http://janus.astro.umd.edu/astro/scinote/

Note: Click on the Practice Add/Subtract and Practice Multiply/Divide Button.

ACTIVITY 8. Generalization Table

Generalization Table on Scientific Notation				
MY INITIAL THOUGHTS ON SCIENTIFIC NOTATION	MY FINDINGS AND CORRECTIONS	SUPPORTING EVIDENCE	QUALIFYING CONDITIONS	MY GENERALIZATIONS

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

END OF DEEPEN:

In this section, you have deepened your learning on how scientific notation helps in representing very small and very big numbers.

What new realizations do you have about the topic? What new connections have you made for yourself? Let's go back to the Generalization Table in the first section, fill up the last column.

TRANSFER

Your goal in this section is to apply your learning to real life situations. You will test what you have discovered about how useful scientific notation is in representing very big and very small numbers. Are you ready?

ACTIVITY 9. Application of Scientific Notation

1. What is the ratio of Milky Way radius to our solar system radius given that, the distance from Pluto to sun is 5,900,000,000,000 meters and the Milky Way disk radius is. 390,000,000,000,000,000,000 meters. Round the coefficient to the nearest tenth.

Submit Correct answer: 6.6×10^7

2. The speed of light is 380,000,000 meters/second. If the sun is 150,000,000,000 meters from earth, how many seconds does it take light to reach the Earth. Express your answer in scientific notation.

Submit Correct answer: 5.7×10^2 seconds

How did you find the two problems? Were you able to answer it correctly? I hope you did.

ACTIVITY 10. Reflect on this

Having studied this module on Scientific Notation, do you agree that Scientific notation is the best way to represent very large or very small numbers? Cite specific evidences to support your answer. Write your answer in paragraph form.

My Realizations on Scientific Notation

_____

_____

_____

Now, you will be given a practical task which will demonstrate your understanding on scientific notation.

TRANSFER

In this section you will be tasked to apply what you have learned on how to express certain calculation in scientific notation. Furthermore, for you to achieve this you will practice determining the significance of a calculation using the guidelines you have studied in the previous sections.

TASK

ACTIVITY 11. Performance Task

You are a researcher in NASA, you are tasked to create word problems involving the different distances and relationships of the planets in our solar system. This set of problems will be given to 7th Grade students of a nearby school for an astronomy quiz bee. Your word problems will be judged according to your creativity and to how scientific notation is applied in each problem.

PERFORMANCE RUBRIC

STANDARDS	Excellent 4	Satisfactory 3	Developing 2	Needs Improvement 1
Use of Scientific Notation	The problems reflect the varied complex applications of scientific notation. Problems involved complex operations on scientific notation.	The problems reflect varied simple applications of scientific notation. Problems involved the simple operations on scientific notation	The problems reflect few simple applications of scientific notation. Problems involved limited and sometimes erroneous operations on scientific notation	The problems reflect no application of scientific notation. Problems involved no operations on scientific notation
Creativity	Problems are varied, interesting and engaging and are related to the experiences of Grade 7 students.	Problems are interesting and are related to the experiences of Grade 7 students.	Problems are simple and plain. Few problems are related to the experiences of Grade 7 students.	Problems are plain and simple. No problem is related to the experiences of Grade 7 students.

END OF TRANSFER:

In this section, your task was to create problems involving scientific notation. How did you find the performance task? How did the task help you see the real world use of scientific notation and real numbers?

Congratulations to you! You have now completed this lesson! Before you proceed to the next module, you have to answer the following post-assessment.

GLOSSARY OF TERMS USED IN THIS MODULE:

Coefficient. It is the part of a scientific notation which should be greater than 0 but less than 10.

Base. The base of a scientific notation should always be 10.

Exponent. He power of 10. It shows the number of places the decimal needs to move in changing numbers to standard notation.

WEBSITE RESOURCES AND LINKS IN THIS MODULE:

1. IERR Online Classroom - http://www.ieer.org/clssroom/scinote.html

2. Slideshare Scientific Notation
http://www.slideshare.net/penningm52/scientific-notation-rules

3. Math and ScienceActivityCenter edinformatics.com
http://www.edinformatics.com/math_science/scinot.htm

4. Adding and Subtracting Scientific Notations
http://www.youtube.com/watch?v=PYTp75sryWA

5. Multiplication and Division of Scientific Notations
http://www.youtube.com/watch?v=ciFOlirz4Js

POST-ASSESSMENT:

It is now time to evaluate your learning. Click on the letter of the answer that you think best answers the question. Your score will only appear after you answer all the items. If you do well, you may move on to the next module. If your score is not at the expected level, you have to go back and take the module again.

1. Which of the following shows a correct scientific notation representation?
A. 437.60×10^2
B. 43.760×10^3
C. 4.376×10^3
D. 0.4376×10^4

2. Which is the scientific notation of 1,345,000?
A. 1345×10^3
B. 1345×10^{-3}
C. 1.345×10^6
D. 1.345×10^{-6}

3. Which statement is true about scientific notation?
A. The whole number called mantissa should be 0<M<1.
B. A movement of the decimal point to the right results to a negative exponent.
C. Scientific notation uses powers of 10.
D. Zeroes are insignificant in scientific notation.

4. Simplify: $\frac{(5\times10^6)(2\times10^3)(3\times10^3)}{5\times10^4}$

A. 6×10^8
B. 6×10^5
C. 5×10^8
D. 5×10^5

5. Simplify: $3 \times 10^4 + 2.5 \times 10^5$
A. 5.5×10^9
B. 5.5×10^5
C. 2.8×10^9
D. 2.8×10^5

MODULE: NUMBER and NUMBERS SENSE>POST-ASSESSMENT

UNIT POST TEST

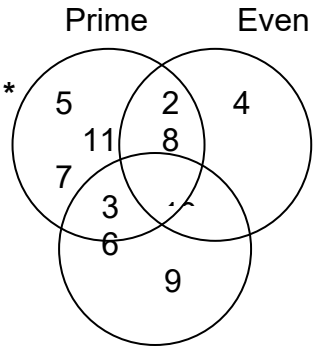
DIRECTION: Choose the best answer among the given options.

(A)
1) How many subsets will a set of 5 elements have?

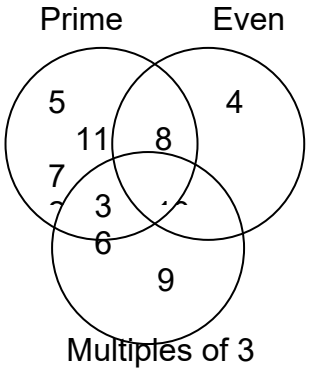
A. 10
B. 25
C.32
D. 64

(M)
2)Where does each of the following real numbers belong on the Venn Diagram?
2, 3, 4, 5, 6, 7, 8, 9, 10, 11

A. *

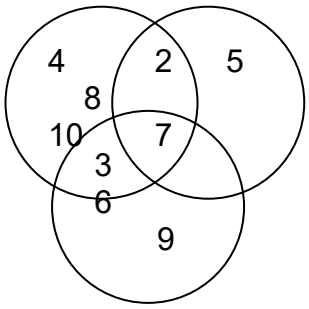


B.



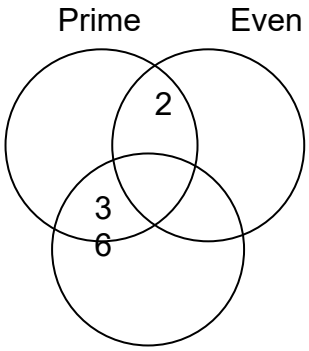
Prime Even

C.



Multiples of 3

D.



Multiples of 3

(T)

3) As a canteen incharge , you are to make a survey of the food preferred by 36 nursery pupils for their Christmas Party options. The result will be presented to their class and class adviser. Your survey shows the following;

Spaghetti = 18 pupils
Sandwich = 15 pupils
Palabok = 13 pupils
Spaghetti and Sandwich = 6 pupils
Sandwich and Palabok = 3 pupils
Spaghetti and Palabok = 3 pupils
Sandwich, Spaghetti and Palabok = 2

How many students preferred spaghetti only?

A. 4
B. 5
C. 6
D. 7

4) Which of the following shows the Distributive Property of integers? *(A)*

A. 6x (4 + y) = (6x + 4) (6x + y)
B. (6x + 4) + y = 6x + (4 + y)
C. 6x (4 + y) = (4 + y) 6x
D. 6x (4 + y) = 6x (4) + 6x (y)

5) Which should be done first in the process of subtracting integers with unlike signs? *(A)*

A. add integers with unlike signs
B. Subtract integers with unlike signs
C. Change the sign of the subtrahend
D. follow the rules of addition

6) Which of the following statements is false? (M)

A. (-2)(-2)(-2) = -6
B. (-6)(-5)(1) = 30
C. (-11)(2)(1) = -22
D. (-3)(3)(-2) = 18

(T)

7) As a nursing aid of MG hospital asked to closely monitor a 5-minute interval of a patient's temperature in the emergency room. The initial body temperature as recorded at 4:00pm was 39°C. Your monitoring noted the following; up 1°C, down 5°C, up 3°C, up 1°C, down 2°C, down 2°C and up 5°C. What is the patient's body temperature at 4:35pm?

A. 35°C
B. 37°C
C. 38°C
D. 40°C

8. You are a business owner and you want to know if you have made a profit for the month. You are given the following information:

i. The monthly salary of your employees is Php 8000.00 each and you have 5 employees.
ii. The store rent is Php 20,000.
iii. Utilities expenses amount to Php 20,000.00
iv. 100 pieces of your product were sold at Php 1000.00 each.

Did your business make a profit for the month? (T)
A. Yes, the business made a profit of Php 100,000.00 for the month.
B. Yes, the business made a profit of Php 20,000.00 for the month.

C. No, the business just managed to break even for the month.
Notes for the choices:
Choice A – you may have forgotten to subtract the expenses from the total sales
Choice C – the total of the expenses is not equal to the total sales
Choice D – the total of the expenses is not more than the total sales

9. Perform the indicated operations. (3/4 ÷1/2) + (1/3 • 6/5) – 4/5 (A)
A. 1/7
B. 6/7
C. 9/10
D. 11/10

10. Which of the following is an irrational number? (A)
A. 2/3
B. 2/5
C. $\sqrt{2}$
D. $\sqrt{9}$

11. You want to save up to buy an item worth Php 500.00. If you earn Php 250.00 daily, which of the following would let you save for the item in the least number of days?(M)
A. saving 1/10 of your daily earning
B. saving 1/5 of your earnings every 4 days
C. saving 0.2 of your daily earning
D. saving 0.3 of your earnings every 6 days

12. A capitalist is investing 50 million pesos in putting up a chain of stores. 20 million of the capital is to be spent for the main store and the rest to be spent equally for the 6 store branches. What part of the capital will each store branch get? (M)
A. 1/10
B. 1/7
C. 1/5
D. 3/5

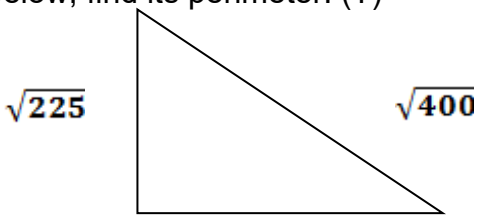
13. You are going to put up a business that needs a capital of Php 800,000. You already have 1/4 of the needed capital and there are 5 investors willing to contribute equally for the rest. How much should each of the investors contribute? (T)
A. Php 50,000
B. Php 80,000
C. Php 120,000
D. Php 150,000

14) What is the simplified form of $\sqrt{8\ 100}$? (A)

A. $2\sqrt{2\ 100}$
B. $20\sqrt{2}$
C. 900
D. 90

15) Which of the following is TRUE? (M)
A. The principal root of 0 is ± 0.
B. Each odd real number has no real square root.
C. Every positive number has two square roots.
D. The symbol $\sqrt{\ }$ is called radicand.

16) Perimeter of a polygon is computed by adding the measurement of all the sides. Given the triangle below, find its perimeter. (T)



A. $\sqrt{949}$
B. $\sqrt{149}$
C. 53
D. 23

17) Which is NOT a significant digit? *(A)*
A. a non zero digit
B. a zero placed before a non zero digit
C. a zero placed between two non zero digit
D. a zero placed after a non zero digit but after a decimal point

18) Which of the following shows a correct way of writing scientific notation? *(A)*

A. 0.40×10^2
B. 4.00×10^2
C. 14.50×10^2
D. 0.40×10^2

19) Which scenario results to a number whose digits are all significant? *(M)*
A. measuring the length of book.
B. converting centimeters to meters
C. multiplying multiples of 10
D. giving a number with placeholder

20) In chemistry, which of the following quantities is best expressed in scientific notation? *(T)*
A. mass of 1 moles of gold atoms

B. electron mass
C. empirical mass
D. relative atomic mass

Module 1.2: Measurement

☑ INTRODUCTION AND FOCUS QUESTION(S):

Measurement is an indispensable process in many aspects of daily life. We describe the sizes, capacities and values of many things, from the large distances involved in space travel, to the very small quantities in computer design. To do this, we must be able to choose an appropriate level of accuracy for a measurement; to select what measuring instruments to use and to correctly determine the measures of objects, space and time. These activities require us to use standard instruments including rulers, volume and capacity measures, timers and emerging measurement technologies found in the home and workplace.
How does one make an accurate and precise measurement? How are different measuring devices useful? When do we need to convert one unit of measure to another? How can one tell that a reasonable estimate has been made? When is it appropriate to express measurements in scientific notation?

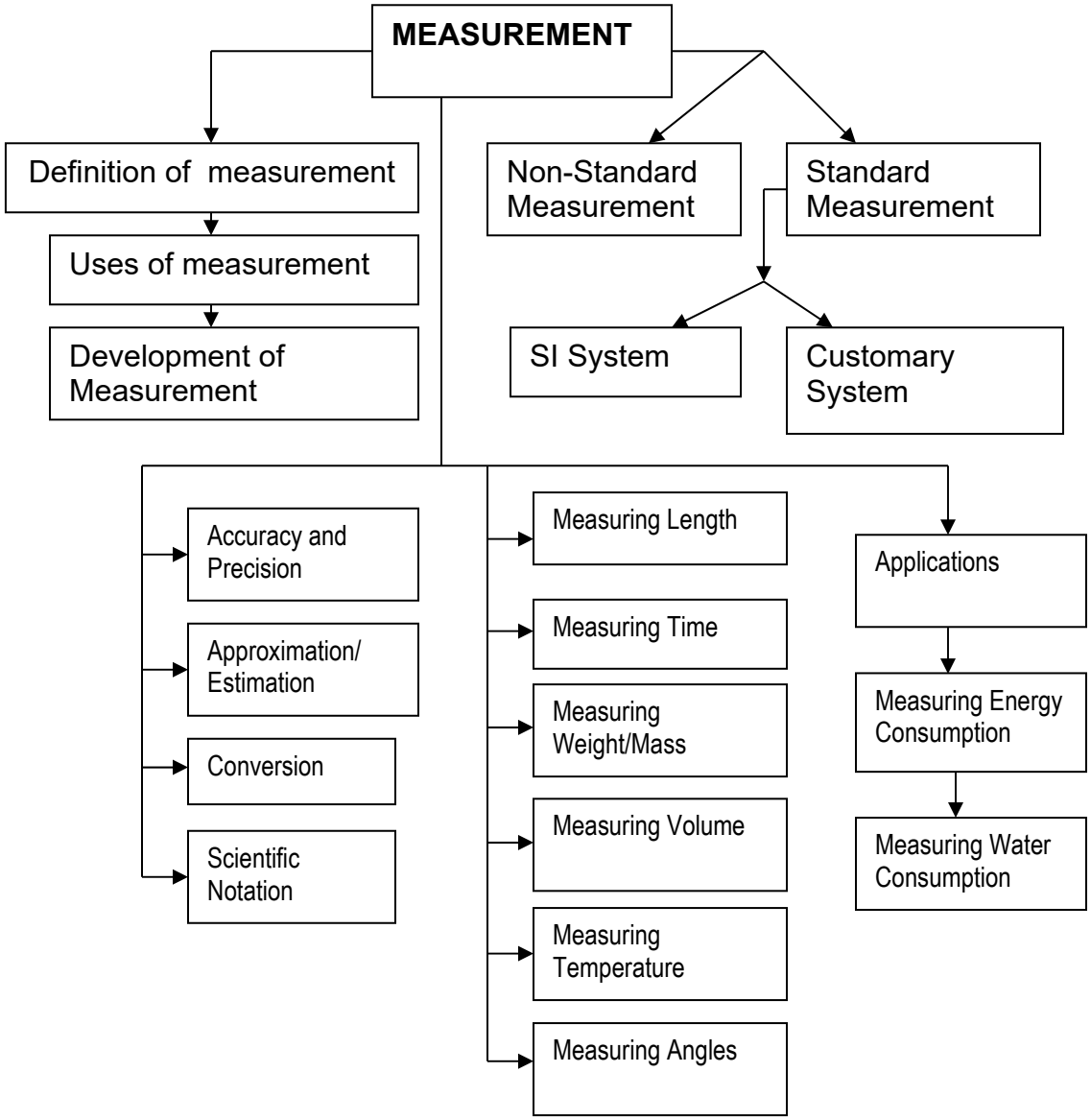
In this module you will try to answer the questions above. You will acquire deeper understanding of what measurement is by knowing the importance of precision and accuracy in measurement, the tools used in measurement, and its many uses in life.

☑ MODULE LESSONS AND COVERAGE:

Lesson No.	Title	You'll learn …	Estimated Time
1	Measurement in Real Life	-the concept of measurement and the different measuring devices and their respective uses - the development of measurement from primitive to the present international system of units.	3 days
2	Standards and Non-Standard Units of Measure of Measure	The uses of non-standard units of measure and why there is a need for the standards in measurement.	3 days
3	Metric System (SI) and Customary System of Measurement	The unit of measures used in the SI or Metric System and Customary System of Measurement and use appropriate units in expressing measures	3 days

4	*Measures of Length, Weight/Mass, Volume/Capacity, Time, Angle and Temperature*	-to measure length, weight/mass, volume, time , angle and temperature	7 days
5	*Conversion of Units*	How to express one unit of measure to another.	2 days
6	*Approximating Measures*	How to approximate/estimate measures of quantities particularly length, weight/mass, volume, time, angle and temperature.	2 days
7	*Using Scientific Notation*	How to express very large and very small measures in Scientific Notation	3 days
8	*Applications*	Applications of the concepts and skills in measurement to solve real-life problems involving measurements such as perimeter, area weight, time, speed, temperature, volume/capacity and utilities usage (meter reading) using a variety of strategies.	4 days

Here is a simple map of the above lessons you will cover:



To do well in this module, you need to remember and do the following:

- Carefully read the module and do the activities neatly and accurately.
- Break tasks into manageable parts.
- Complete all activities even if you may not be asked to hand these in, but they will help you learn the material.
- Keep copies of all accomplished activities. These are needed to assess your progress and for grading.
- If you are having problems, do NOT wait to request help. The longer you wait the bigger the problem becomes!
- Form study groups if possible.

Before we start, find out where you are in terms of knowledge and skills and understanding of the concept of measurement by taking the pre-test.

PRE-ASSESSMENT:

Let's find out how much you already know about this module. Click on the letter that you think best answers the question. Please answer all items. After taking this short test, you will see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this module.

1. Which one is a measuring device is used by early Filipinos to measure distance?
   A. sandali B. metro C. ruler D. talaro

2. Which of the following is a common characteristic of a contemporary measuring device ?
   A. simplicity of design B. handy C. electronic D. atomic

3. Lina was asked by her Mother to buy curtain material for their big window at home. She has to deliver the new material to the sewer right away. Unfortunately Lina can not find a measuring device to measure the height of the curtain rod from the floor. What is the most practical way to get the height accurately?
   A. Count the number of span using her hand
   B. Use her feet to measure the length
   C. Get a stick and count the number of sticks from the rod to the floor
   D. Get a long string, tie it to the metal rod and extend to the floor and cut.

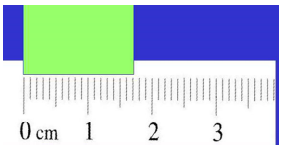
4. If the top line is 2 units, then the bottom line is ABOUT how many units?

A. 2 B. 4 C. 6 D. 8

5. The weight of a clothespin is 9.2 g. Which of these is the best estimate of the total weight (mass) of 1000 clothespins?
A. 920 g B. 9,200 g C. 92,000 D. 920,000

6. Tessie is making 7 patches . Each patch uses 4 1/2 inches of ribbon. She wants to buy the exact amount of ribbon needed to make the patches . How much ribbon should she buy?
A. 21.5 in B. 28.5 in C. 30 in D. 31.5 in

7. How many millimetres long is the green rectangle?
A. 0.17
B. 1.7
C. 17
D. 170



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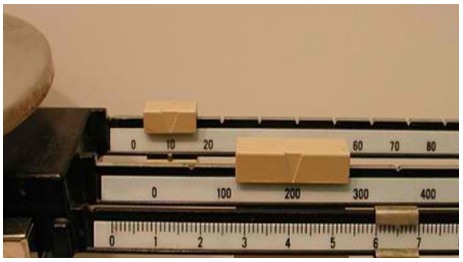
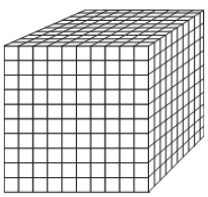
8. How much blue solution is in the beaker?
A. 150 mL
B. 200 mL
C. 0 mL
D. 50 mL

.

9. What is the mass of the item?
A. 210 g
B. 16.5 g
C.6.5 g
D. 216.5 g



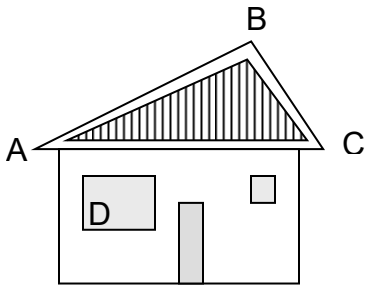
A 10 cm× 10 cm ×10 cm wooden block is painted red on all of its faces. It is then cut into cubes, 1-cm on each edge. How many cubic centimeter pieces have exactly 2 faces painted?
A. 64 B. 96 C. 100 D. 104



10.

11.

At the right is a drawing of Jeff's house. Which of the marked angles measures approximately 63°?



A. ∠A C. ∠C
B. ∠B D. ∠D

12. Which of these would most likely be measured in milliliters?
A. The amount of syrup in tease spoon
B. The weight of a safety pin
C. The amount of water in a jar
D. The thickness of a writing paper

13. At 6:00 a.m., a pump began filling the water tank shaped like a rectangular prism, at a constant rate of 10 cubic meters per minute. The table below shows the depth of the water in the tank at different times during filling.

Water in Tank	Depth in cm
6:00 a.m.	1
8:20 a.m.	5
10:40 a.m.	9
1:00 p.m	13

Assuming the same rate of filling, what was the depth, in centimeters of the water in the tank at 8:00 p.m. that same day?
A. 17 B. 21 C. 25 D. 29

14. Jose was awarded by the government to construct road in Cagayan de Oro City. Using one truck and one mixing machine. He covers one-half kilometer in 8 hours. If they only work 6 hours in a day, how many days will it take Jose to cover 60-kilometer road?

A. 80 B. 120 C. 160 D. 240

15. Mark wanted to put in tile in his room. The rectangular room is 9 feet wide by 12 feet long. Mark bought 12 inches square tiles that were only sold in boxes of 20 tiles. How many boxes are needed to cover the floor?

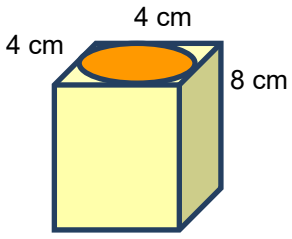
A. 1.5 B. 2 C. 2.5 D. 3

16. Marie, Tina and Sharon would like to build a shed in the garden. They wrote notes about building the shed and its location. Below is their shed notes.

A. Dimensions: 10 ft x 12 ft x 10 ft
B. A sheet of plywood is 4 ft x 8 ft
C. The shed will have one door
D. The garden is 40 ft x 75 ft

Which information is <u>not</u> needed to figure out how many sheets of plywood to buy?

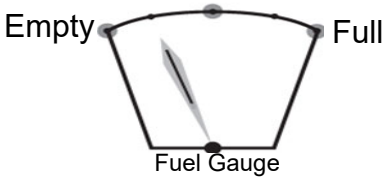
17. Maria was preparing a bread stick container shown at the right. If the space outside the cylinder was filled with strawberry dip, what is the volume of the dip in cubic centimeters?



A. 12.6 C. 128
B.115.4 D. 243.4

18. The tank of Karen's car can hold 8 gallons of gasoline when it is full. She wants to fill the tank with regular unleaded gasoline.

Gasoline Prices	
Regular Unleaded	P55.96
Unleaded plus	P60.00
Supreme	P65.00
Diesel fuel	P51.00

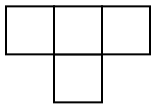
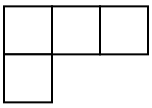
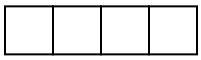
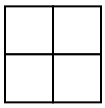


How much will Karen pay for filling the tank to the full?

A. P335.76 B. P447. 68 C. P480 D. P810

19. Casie drives to work 6 days a week. In the morning, she takes a 10-mile route. In the afternoon, she takes a 12-mile route home to avoid traffic. Casie's car gets 20 miles to the gallon. How many gallons of gasoline will Casie use each week driving to and from work?
A. 6.6 B. 200 C. 240 D. 440

20. Mrs. Joson is making a flower garden with an area of 100 square meters and a perimeter of 40 meters . He outlines the sections using squares with 5- meter sides. How might his garden look like?

A  B  C  D 

Let's begin by looking into what measurement is, the many devices used to measure and the usefulness of measurement in real life. As we go through the module try to find answers to the following questions.

- ***How are different measuring devices useful?***
- ***How useful are measurement in real life?***
- ***How does one know when a measurement is precise? accurate?***
- Why are the units of measurement converted?
- Why are measurement approximated?
- How can one tell a reasonable approximation has been made?

Lesson 1: Measurement in Real Life

EXPLORE

Reflecting on what we know about the measurement is a good practice in expanding our knowledge of measurement. Seriously look into what you know and what you want to learn about measurement so that you will be energized to learn more about measurement. Do the activity below.

ACTIVITY 1. Looking back, Looking Forward

Fill up the first two columns of the KWL Chart below.

What I know about measurement	*What I want to know about measurement*	*What I have learned…*	*So what…*

Why do you need to study measurement? In what way will it help you in real life?
Where in real life do we use measurement? Why is measurement important?
How does one know when a measurement is precise? accurate?
What could be some of the consequences when measurement are not correct?
Could it be life threatening? Let's answer these questions in the succeeding activities.

In the next activity you will see a real life example that will illustrate how important measurement is in real life and the possible consequence if we fail to do it right.

ACTIVITY 2. Fuel Miscalculation Caused Emergency Landing

Read the news article below and answer the questions that follow:

On 23 July 1983, Air Canada flight 143, a Boeing 767 flying from Montreal to Edmonton via Ottawa, ran out of fuel about an hour into its flight. At an altitude of 41,000 feet the crew received its first indication of low fuel pressure in one fuel pump, and a few seconds later, in the other fuel pump.

Fortunately, the captain was an experienced glider pilot and the first officer knew of an unused air force base about 20 kilometers away. Together, they landed the plane on the runway, and only a few passengers sustained minor injuries.

This incident was due partially to the airplane's fuel indication system, which had been malfunctioning. Maintenance workers resorted to manual calculations in order to fuel the craft. They estimated that 7,682 liters of fuel were in the tank. They knew that 22,300 kg of fuel was needed the remaining flight, so the question was, how much fuel, in liters, should be pumped from the fuel truck into the aircraft? They know that density of the fuel is 1.77 pounds per liter. Their calculation yields 4,916 L, which was pumped into the aircraft. They ended up with less than half of the required amount of fuel on board. What went wrong?

Questions:

1. Why was it necessary for the maintenance workers to calculate for the amount of fuel to be pumped to the aircraft?
2. What could be the source of error in the computation?
3. What should be the correct number of liters of fuel to be pumped into the aircraft?
4. How did you arrive at this answer?
5. In what other situations in life is accurate and precise measurement needed?
6. What devices or tools can be used to measure physical quantities?

You just explored examples in real life where measurement is needed and why precision and accuracy in measurement is important. You will now try to answer those questions considering the uses of measurement in many other areas in life.

In the next session you will find comprehensive answers to questions we have asked earlier.

FIRM-UP

Your goal in this section is to learn and understand how to measure different physical quantities, the devices used in measurement, how to ensure accuracy and precision, systems of measurement and their many uses. Indeed where in real life do we use measurement? What units of measures are appropriate to use? Under what conditions do we need to be very precise and accurate? What tools will help use make accurate and precise measurement?

One of the areas in real life where there is a need to have a precise and accurate measurement of a variety of physical quantities is in Olympics. In Olympics we measure length, time, area, volume and other physical quantities like speed. Do the activity below and see if you have a good knowledge of the measurements needed in Olympics. Is measurement really important? Are there sports events that do not involve measurement?

ACTIVITY 3. Winners or Losers?

People all over the world are becoming sports – lovers. When people play sports, they need some way of comparing performances: whether in netball court or a sprint track, measures are needed to separate the winners from the losers. Choose your favorite Olympic game. Then interview a person involved in sports: a teacher, coach, trainer to help you answer the following questions.

Questions	Answers
a. How is measurement used to determine the winners of the sport event?	
b. What units of measurement are used in the different sport events?	

c. What devices are used to measure these units?	
d. What other measures are needed to be taken in order to prepare for the game?	
e. Are there measurements that are obtained without using a device? Cite an example.	
f. What is measurement?	
g. How does one know if the measurement is precise? accurate?	
h. What conditions are needed to make measurement accurate and precise?	

From ancient times, man has needed a way to measure things. Measurement provides a way to answer questions about “how many,” “how much” and “how far.” It is required to build things, to administer medicine, to make equitable division of resources, and to specify information about distance, weight or volume. In our modern world, advanced electronic devices have replaced the simple devices used in the past.

What does it mean to measure something?

According to the National Council of Teachers of Mathematics (2000), "Measurement is the assignment of a numerical value to an attribute of an object, such as the length of a pencil.

To be able to assign a numerical value to an attribute of an object, we must first be able to identify the attribute, and then we must have some kind of unit against which to compare that attribute. Most often we need a measurement tool that supplies us with our units. If our units are smaller than the attribute in question, then our measurement is in terms of numbers (quantities) of those units. On the other hand, if our units are larger than the attribute in question, then our measurement is in terms of parts of the unit. Most often measurement includes a quantity of whole units along with a part of a unit. The fractional part of a unit determines the precision with which we measure. Greater precision results from smaller partitions.

Measurement helps us not only to compare but also predict many events. It is important for calculation and precision. It also can tell a story as to how long. For example it takes 25 years for narra trees to be harvested as timbers. The average life span of a television set is 4-6 years.

In the next activity find out the many uses of measurement in real life. You may interview people working in the given field or find answers in the internet to help you complete the task.

ACTIVITY 4. Why Measure?

You are given five areas in life where measurements are very useful. Choose an area and describe in what way is measurement important in this field. Cite an example to illustrate your point. What could be the consequence if measurement is not accurate in the situation you have cited. Write your answer in the appropriate column.

Areas	In what way is measurement important?	What could be the consequence if accurate measurement is not observed?
1. Medicine Administration		
2. Cooking and food preparation		
3. Transportation		
4. Architecture & Engineering		
5. Buying and Selling		

Is it possible to measure height of an object without actual contact with that object? In the next activity explore how to measure heights using the same method used in the early days.

ACTIVITY 5. Scaling Trees

Your task is to find the height of the tree using your partner's shadow. With a partner on a sunny day find the height of the tree nearest to your house. You might have to pick your time for this task.

Wait until the tree casts a shadow then measure the length of the shadow. Ask your partner to stand next to the tree, then measure his/her shadow. Be sure to do it as soon as you can after you measure the tree shadow! Measure the height of your partner. Record your observations.

	Data	Computation
length of the tree's shadow		Tree's Height = (Tree's Shadow / Your Partner's Shadow) x Your Partner's Height
length of your partner's shadow		

your partner's height		Tree's Height =

Divide the length of the tree's shadow by the length of your partner's shadow. Then multiply the answer by your partner's height. This will tell you how tall the tree is!

Questions:

Think-Write -Share:

1. Why does this process work?
2. How else can you use this method?
3. Is there another way of finding heights of tall trees and buildings ? How?

Lesson 2: Standards and Non-Standard Units of Measure

There are two types of units of measures that we use. The standard and the non-standard units of measures.

Non-Standard Units of Measures

Non-standard units of measurement are units that are not universally accepted. These are units that we invent to compare sizes, capacities and other physical quantities. Some of these are toothpicks, popsicle sticks, paper clips, tennis ball and others.

Example:
The width of the art paper is twice as long as a popsicle stick. In the next activity we will experience the use of these units. The activity will give you an idea on how you can use things around you to measure quantities.

ACTIVITY 6. What is my Measure?

Materials:

Straws, toothpicks, popsicle sticks, paper clips

A. Using the materials cited, measure your body parts. You may ask a partner to help you on this activity.

Body Parts	How many of these objects are your body parts?			
	Number of toothpicks	Number of straws	Number of popsicle sticks	Number of Paper clips
1. Palm				
2. feet				
3. thumb				
4. span				
5. arms length				

B. Using the data that you have gathered, predict the measures of the following parts of your body.

Body Parts	Measure

	Number of toothpicks	Number of straws	Number of popsicle sticks	Number of Paper clips
1. wrist				
2. ankle				
3. neck				
4. waist				

Questions:

1. How did you measure some of your body parts?
2. In what way can you use these measures of your body parts?
3. What difficulties did you encounter to be able to measure?
4. How can measurement be made easier?
5. Why is it important to use standards of measurement?

In many instances standard measuring devices are not available. Our knowledge and skills in the use of non-standard units will help us do the necessary measurement.

In the next activity you will explore the difference between the nonstandard measures and the standard measures. Be very observant and be able to compare and contrast the nonstandard and the standard unit of measure.

ACTIVITY 7. Which Measure?

You are given five objects to measure. You are task to measure these objects using the devices identified. Record your observation in the appropriate column.

Objects	Units of Measurement		
	A	B	C
	"Dangkal"	"Hakbang"	Meter stick
1. Width of the stairs			
2. Width of the door.			
3. Length of the a room			
4. Height of a chair.			
5. Length of a book			

Questions	Answers
a. How did you measure?	
b. Compare the results in column A, B and C. Are there differences in the measures? If there are , how do you explain the differences?	
c. How can these differences in measures be minimized if not eliminated?	
d. How do you know which measure is precise? accurate?	
d. Why is it necessary to have a standard of measurement?	
e. What is a standard of measurement?	

In the activity above, you saw that it is important to use the common reference to the same units of measurement. You learned why the use of standards is needed in many instances. In the next lesson you will learn the standard unit of measures.

Standard Unit of Measurement
The units that we use to measure are most often standard units, which means that they are universally available and are the same size for all who use them. Standard units of measurement are important because they provide reference points that everyone can use. They allow us to build, do commerce and trade, invent, and to communicate successfully. Standard is a necessity in almost all activities of man.

For example, if you want to buy something, then you have to decide how much, what, and how you are going to agree to exchange your money : 5 meters , 10 liters or 1000 pounds of something with units of measurement that you both agree to.

You both have to use the same units of measurement to get to the point of the exchange. To understand each other requires us to have the same perspective, viewpoint, enough to get the other person to see the same thing we saw. In the final analysis that means we have the same set of measurements.
.
In science, standards is necessary to ensure that scientific findings can be analyzed and understood by everyone around the world.

ACTIVITY 8. We have Gone a Long Way!

Read the History of Measurement (Hand Out #1) and identify the measuring devices used for each of the given quantities. Use other resources like books, journals and internet. Write your answers on the appropriate column.

Quantities	Earliest Measuring Device	Description/Meaning	Measuring devices Today	Advantages/ Disadvantages
Length				
Time				
Mass				
Volume				

Questions:

1. What are the key features of the earliest measuring devices?
2. In what way is the modern measuring devices different from ancient devices?
3. Are there devices used in the early times that are still used today? Can you cite and example?

In the next activity your knowledge of the measuring devices will be challenged. You need to be familiar with theses devices for you to be able to use it well. See if you can identify the given devices.

ACTIVITY 9. Who Am I?

Look at the picture and complete the table below.

Device	What is the device?	What quantity does it measure?	Device	What is the device?	What quantity does it measure?
1. 			6. 		
2. 			7. 		
3. 			8. 		
4. 			9. 		
5. 			10 		

Questions:

a) What conditions affect accuracy of measurement when using the devices cited above?

b) What skills needs to be developed to ensure accuracy and precision in measurement?

c) What is the difference between accuracy and precision?

d) Can a measurement be accurate but not precise? Cite an example to illustrate your point

e) Can a measurement be very precise but not accurate? Cite and example.

You saw from the previous activities that accuracy and precision in measurement are important in many instances. In the next activity you will see how accuracy and precision can affect even decision in real life.

ACTIVITY 10. Who Won the Gold?

Read the story below and answer questions that follow.

In 1960 Olympic Games in Rome, Australian's John Devitt and America's Lance Larson finished neck-and-neck in the final of the 100 meters freestyle swimming event. Two of the three first place judges had Devitt as the winner, but two of the three second place judges had Devitt second. Among the timekeepers there was no doubt: all three on Devitt's lane gave him 55.2 seconds, while timekeepers on Larson's lane gave him 55.0, 55.1 and 55.1 seconds – all faster than Devitt.

Hand – held stop watches that time was declared to be uncertain by at least 0.2 of a second and all six measurements where within 0.2 of a second of each other; thus, they did little to help decide the winner.
Who got the gold medal?

Questions:

a. Who do you think got the medal?
b. What is the basis of your decision?
c. How was the measuring device used in this game useful in determining the winner?
d. Note that recorded time for Larson smaller than that of Devitt. What do you think Larson felt if he was not declared winner?
e. How does one know when a measurement is precise? accurate?
f. How are these kinds of difficulties in measurement of time in competitions like this were addressed today?

In the swimming event cited above, John Devitt got the gold medal on the basis of the decision of the first place judges. This is an example of a situation that depends highly on the precision of the instrument used and the accuracy of measurement. This serves as a motivation to find ways and means of improving the precision measuring devices.

Now, look back and summarize what you learned by filling up the table below.

ACTIVITY 11. Understanding Check!

CORNELL' S NOTE	
TOPICS	**THINGS I LEARNED**
Question I want to be answered:	

Lesson 3: The Metric System and the Customary System of Measurement

The Metric System
The metric system **is an international decimalized system of measurement. France was first to adopt a metric system, in 1799, and a metric system is now the official system of measurement, used in almost every country in the world**

The system derives its name from measuring distance (metre), but includes other variables, such as weight (gram) and time (century). At first, one meter was derived from the earth's circumference, but it now seems to be 1,650,763.73 wavelengths of radiation from a line in the spectrum of Krypton-86.

The **basic units** of measures cited above maybe used with one of the following prefixes:

Physical Quantity	Unit of Measure	Symbols
1. Length	meter	m
2. Weight/Mass	gram	g
3. Capacity/volume	liter	L
4. temperature	Kelvin/Celsius	k. C
5. power	watt	w
6. time	second	s

These units are used with none or one of the following prefixes:

Prefixes	Symbols	Equivalent	Prefixes	Symbols	Equivalent
nano	n	1,000,000,000	deca	D	10 units
micro	μ	1/1,000,000 unit	hecto	h	100 units
milli	m	1/1,000 unit	kilo	k	1,000 units
centi	c	1/100 unit	mega	M	1,000,000 units
deci	d	1/10 unit	giga	G	1,000,000,000

The prefix system allows you to size up or down metric units to almost any size you possibly ever need — without having to know special unit names for each and every physical quantity. Learn the prefixes once, and they work for every possible unit.

Examples:

Units	Equivalent	Units	Equivalent
1 micrometer	1/1,000,000 meter	1 decagram	10 grams
1 millimeter	1/1,000 meter	1 hectogram	100 gram
1 centimeter	1/100 meter	1 kilogram	1,000 grams
1 decimeter	1/10 meter	1 megagram	1,000,000 grams

In the Philippines, Batas Pambansa Bilang 8 mandates that effective January 1, 1983, the metric system (SI) shall be the sole measurement system to be used in the Philippines for all products, commodities, materials, utilities, services, and commercial transactions, in all contracts, deeds and other official and legal instruments and documents, in accordance with the provisions of Presidential Decree 187 as amended by Presidential Decree 748 and this Act and their implementing rules and regulations.

Customary System of Measurement
In the customary system of measurement used in the United States, the common units to measure length include inch, foot, yard, and mile. You should know the following equivalencies and abbreviations.

Length
12 inches (in.) = 1 foot (ft)
3 feet (ft) = 1 yard (yd)
36 inches (in.) = 1 yard (yd)
5,280 feet (ft) = 1 mile (mi)
1,760 yards (yd) = 1 mile (mi)

Weight
16 ounces (oz) = 1 pound (lb)
2,000 pounds (lb) = 1 ton (T)

Capacity
8 fluid ounces (fl oz) = 1 cup (c)
2 cups (c) = 1 pint (pt)
2 pints (pt) = 1 quart (qt)
4 quarts (qt) = 1 gallon (gal)

ACTIVITY 12. . Measurement in the News

Measurement is used in almost all our endeavors. This role of measurement is reflected in the most common source of updated information. Browse any news papers and list measures found in the paper.

Measures	Units of Measure	Quantity it Measures	System of Measurement

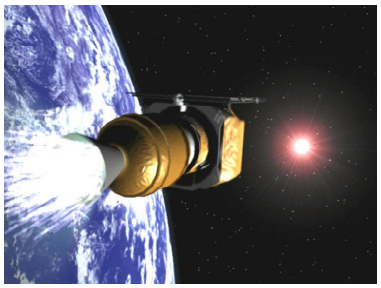
Questions:

a) What are the systems of measurement included in your list?
b) In what kind of quantity is one system preferred over the other?
c) What are the advantages and disadvantages of one system compared to each other?
d) Are there quantities that do not have a unit of measure? What are those quantities?

Can we use units of measures from both system of measurement? Under what condition? What could happen if these conditions are not met? Try to answer these questions as you do the next activities.

ACTIVITY 13. The Mars Probe: What Went Wrong?

Read the story and answer the question that follows.



In December 11,1998 NASA sent Mars Climate Orbiter. The probe was supposed to land on a part of Mars that had not been studied before. It was going to collect samples of materials found in the atmosphere and take photographs of the polar region of the planet. Scientists world-wide waited expectantly for the first reports from the probe, but they never came. As the days passed, they gave up hope and began looking for possible causes of the failure.

What they discovered was this: U.S. scientists had used English measurements when programming a portion of the system. The rest of the system had been programmed using metric measurements.

Do you think that this could have caused the mission to fail? Write down what you think and why.

My initial Answer	My Revised Answer	My Final Answer

Do the next activity to help you further clarify your answers.

ACTIVITY 14. Metric, English or Both?

1. Look at the following objects and make an approximation of their dimensions. Write your answers on the appropriate boxes.

	How long?	How wide?
Objects	I think …	
1. table		
2. book		
3. a table		
4. a sheet of paper		

2. Now use a ruler to find the dimensions. Record you observations.

	A	B	C
Objects	How long in inches?	How long in centimeters?	How do the numbers in column A compare with the numbers in column B?
1. table			
2. book			
3. a table			
4. a sheet of paper			

3. Now measure again using the ruler. Record your observations.

	A	B	C	D
Objects	How long in inches?	How wide in inches?	How long in centimeters?	How wide in centimeters?
1. table				
2. book				
3. a table				
4. a sheet of paper				

4. Compare numbers in columns A and B. What did you observe?

_____

5. Compare numbers in column C and D. What did you observe?

_____

6. What is the difference between the measurements in centimeters and the ones in inches? Do you think you would always get the same results?

_____

_____

7. Based on your observations, will using two differing systems of measurement to construct something cause problems? In what way?

_____

_____

8. Has your prediction about what happened to the Mars probe changed? Why or why not? What did you learn from this lesson that helps you back up or changed your initial idea. Do you think that what you have learned will always be true?

_____

_____

The Mars Climate Orbiter could have actually overshot Mars and kept going in space or could have exploded due to a faulty programming. In order for the mission to succeed, the probe needed to be programmed with the same exact unit of measurement instead of using different units of measurement. To know more about the mishap you may access:

http://www.cnn.com/TECH/space/9909/30/mars.metric.02/
CNN News on the loss of NASA Orbiter
http://news.bbc.co.uk/2/hi/science/nature/462264.stm

Go back to your answer to the questions and complete column 2. Discuss your answer with a peer or your teacher. Is there a need to revise your answer? Write it down on the third column.

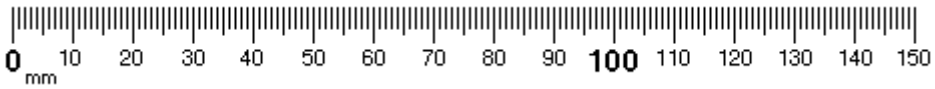
My initial Answer	My Revised Answer	My Final Answer

Now that you understand the basic concepts of measurement, measuring devices and units of measurement, your are ready to deepen your knowledge further.

Lesson 4: Measuring Length, Weight/Mass, Volume, Time, Angle and Temperature

Measurement of Length

Metric length is collected with a ruler measured in meter (m), centimeter (cm), and/or millimeter (mm) units. We use this instrument the same way we would use a foot ruler or yard stick of the English system. Get a meter stick and centimeter ruler and study its features.



Locate the centimeter and millimeter markings.

Questions:

1. How many centimeters are there in the meter stick?
2. How many millimeters are there in the meter stick?
3. How long is the centimeter ruler in cm? In mm?

Practice measuring length by doing the activity below.

ACTIVITY 15. Turning my Measures Metric!

Complete the table below. You may ask assistance in taking the measurement .

PERSONAL DATA SHEET

Height	_____cm
Finger tip to finger tip	_____cm
Top of head to chin	_____cm
Top of head to eyes	_____cm
Around neck	_____cm
Around biceps	_____cm
Length of foot	_____cm
Elbow to wrist	_____cm

Questions:

1. What instruments can you use to find the length?
2. What are the units of measures for length?
3. What are the systems of measurement?
4. What skills are needed to be able to measure length accurately?
5. What real life situations in life require accurate measurement of length?
6. What could be a consequence when measurement of length is not accurate?
7. In what way can you and your health provider make use of the measures of your body parts to monitor your health and wellbeing?

http://www.ehow.com/video_4755255_measuring-length.html
Measuring length is a straightforward process, but the measurer must be able to use different units of length. Discover how to relate inches to other length units with help from a math teacher in this free video on basic math lessons.

Measurement of Time?

Time is a measure but it is a different from the other measures in that it can neither be seen nor touched. However, we are surrounded by the effect of time passing, for example, when day turns into night and when one season changes into another. There are two aspects of time you must develop:

- time as an instant which can be named, for example, 6:15;
- time as a duration which describes an amount of time that has passed, for example, a minute, the afternoon, the year

Time appears to be a crucial element in many types of measurements. Time is a component of speed, force and pressure. Gravity, electricity, light, radiation and other waves are all phenomena taking place over time. Just like the meter is derived from radiation, the second is defined as the time of 9,192,631,770 periods of the electro-magnetic radiation corresponding to a transition in the Cesium-133 atom. Such measurements may remain relatively stable over time, but they are not absolutely constant.

It is very important that you can distinguish specific clock times as well as intervals of time. Telling time refer refers not only to clock time but also the day in a week, the month of the year and the season of the year.

ACTIVITY 16. Show or Tell the Time!

I. Draw the hands on the clock to show the correct time.

7:00 a.m.

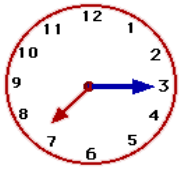
9:30 a.m.

12:15 p.m.

3:48 p.m.

II. What time is it?

_____



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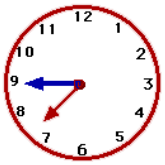


_____

_____

Questions:

1. Why is it important to know how to read time?
2. What situations in life requires you to read time?
3. What could happen if you didn't know how to read time?
4. What situations in life requires accurately and precisely read or set the time?

Now, that you know how to read the time, see if you have a very good approximation of the length of time needed to do the following tasks. This skills is as important as knowing how to read time.

ACTIVITY 17. How long?

Predict how long will it take to do the following?

Event	Length of Time	
	seconds	minutes
1. count numbers from 1 to 60		
1. sing happy birthday song		
2. cook 4 cups of rice for the family		
3. boil 3 cups of water		
4. cook 1 boiled egg		
5. cool 1 cup of boiled water		

Questions:
1. Why is it important that we develop the skill in approximating length of time specially in doing some task?
2. How good are you in approximating length of time?
3. When and how can you use this skill in real life?

Now let's see if you can use what you know about time measurement to solve problems. Problem solving is a very important skill. To become a good problem solver you should learn how to organize the given information, make a reasonable estimations, check your estimate, draw conclusions and make predictions about future situations. The more problems you solve the more successful problem solver you will become.

ACTIVITY 18. Let's Solve!

Solve the following. Show the process you used to get your answers.

1. At 9.25 a.m. mother set a timer to ring in 45 minutes so that she could remove the stuffed she had in the oven. chicken with cashew nuts and lemon grass stuffing from the oven. What time will it be when the timer rings?

2. Leo was planting sweet potato on Saturday morning at 9.38 a.m. He finished the entire work at 11:46 a.m. How long did it take him to plant sweet potato?

3. Suppose that tides vary from 5 feet above to 5 feet below sea level and that successive low tides occur every 20 hours. Assuming that on a particular day low tide occurs at 6:00 am, determine the water level at noon.

4. For a school Project, Ron recorded how much TV he watched in one weekend and what kinds of programs he watched. His list is shown below.

SATURDAY: 9:30-10:30AM; 1:00-3:30PM; 8:00-10:00 PM
SUNDAY: 1:00-2:30PM; 8:00-10:00PM

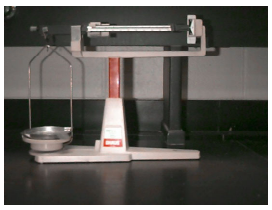
Ron watched sports programs for one half of the time. He watched movies for one third of the time. He watched cartoons with his sister Ronnette the rest of the time. How many minutes did Ron watch cartoons? Make sure you explain all of the steps and label your answers.

Measuring Mass/Weight and Volume

Understanding weight is very important. Is that object too heavy to pick up by yourself or do you need to use something to lift it? Some may think this is not important but it is pretty easy to hurt yourself if you lift objects that are too heavy.

Mass is measured in gram (g) units and is a measure of how much of a substance in an object consists of. Mass differs from weight because it is unaffected by gravity. The mass of an astronaut on Earth or the moon is constant even though the weight of the astronaut is less at the moon than on Earth. To measure mass we use a balance. Mass is determined with a balance similar to how an object might be weighed. Different types of balances are available to measure weight or mass. An example of balances used today is shown at the right.

To use, place an object in the pan of the balance. Using the counterbalances of known mass (1g, 10g, or 100g), slide the counterbalances toward the right until the arm rests at the centerline. If the arm falls below the centerline, move the counterbalance towards the left. Practice balancing other objects



You also need to learn proper use of capacity or volume. Volume is the measure of how much space an object occupies. Volume is a cubic measurement, thus to to find volume you need to consider not only the length and width of an object but also the height. Thus for rectangular solids,

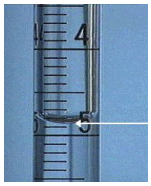
Volume = length x width x height

For other regular solids you can use the following formula for volume:

Sphere: $V = 4/3\pi r^3$
Prism: $V = A_b h$
Pyramid: $V = 1/3\ A_b h$
Cube : $V = s^3$
Cylinder: $V = \pi r^2 h$
Cone: $V = 1/3\ \pi r^2 h$

Liquids and gases conform to the shape of the container they occupy. To calculate the volume of a liquid you need only to pour the liquid that is being measured into a container of known volume. In the laboratory, a container called a graduated cylinder is used to measure the volume of a liquid.

When measuring the volume of a liquid it is important to remember that liquids often adhere to surfaces. How?

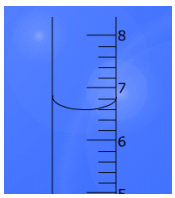


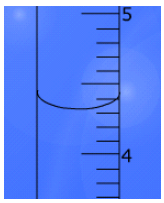
Place some liquid in a graduated cylinder and look at the meniscus (where the liquid meets the air). Notice that the meniscus is bent such that the edges are higher than the center. To get an accurate measure of volume, read the middle (lowest point) of the meniscus. It is also important to have your eyes at the same level as the meniscus when reading the measurement.

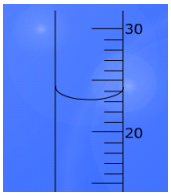
Let's practice. See if you can tell the volume of the liquid shown below.

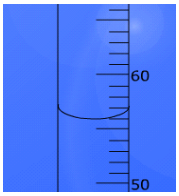
ACTIVITY 19. Can you Read Me?

What is the volume of liquid shown in each of the following.









Reading _____

Why is it important to have a concept of capacity? Can you cite examples in real life the will illustrate this?

In the next activity you will use your knowledge and skills in finding weights using the balance.

ACTIVITY 20. How Heavy?

Materials: balance, measuring cups , sugar, water

Using a balance, find the weights of sugar and water. How best can you do this? Record your observations.

	Value
Weight of the cup	
Weight of the cup and sugar	
Weight of sugar	
Weight of the cup and water	
Weight of water	

Questions:

- How did you determine the weight of sugar? Water?
- Is the weight of 1 cup of sugar the same as the weight of 1 cup of water?
- How do you explain the difference if there is any?
- What is the difference between mass and weight of an object?
- How is the volume of sugar determined?
- How is the volume of water determined?

Extra Mile Challenge!

- How are volumes of regularly shaped solids determined?
- How can the volume of irregularly shaped solids determined?

You can conduct a interview or do some readings to answer this questions comprehensively.

Now let's again put to use your knowledge on volume or capacity and weights by doing the next activity. Be able to justify your answer.

ACTIVITY 21. Can You Solve?

Solve the problems below.

1. Last December 17, 2011 typhoon Sendong hit Cagayan de Oro . Mr. Nieles basement got flooded! He wondered just how much water he could collect if he used his shop vac that could hold up to 10 gallons of water. The height of water in the backwards `L' shaped section of his basement is 5 inches. (See diagram at the right.) How many gallons of water were in his basement and how many times did he have to empty his shop vac?

2. Mary's Café serves fudge made from an old secret recipe. Mark works at the shop after school. He does not know what all of the ingredients are, but he knows that in 3 days they use 15 pounds of dark chocolate, 30 pounds of sugar, and 21 pounds of butter. When Mark orders chocolate, sugar, and butter for 3 weeks, how many pounds of each ingredient does he order?

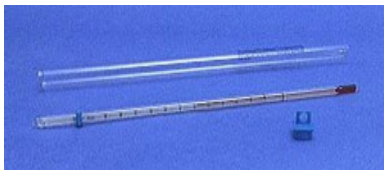
3. Each Filipino throws away about 60 kilograms of plastic packaging each year. At this rate, about how many years will it take one person to throw away a ton of plastic?

Measuring Temperature

Now that you know how to measure volume of materials, let's learn how to measure temperature. First what is temperature? What devices can we use to measure temperatures? What units of measurement are used to express temperatures of matter? Do we need to measure temperature in real life?

What is temperature?

Temperature is a measure of the average heat or thermal energy of the particles in a substance. Since it is an average measurement, it does not depend on the number of particles in an object. In that sense it does not depend on the size of it.



For example, the temperature of a small cup of boiling water is the same as the temperature of a large pot of boiling water even if the large pot is much bigger than the cup and has millions and millions more water molecules.

How is temperature measured?

Many devices have been invented to accurately measure temperature. It all started with the establishment of a temperature scale. This scale transformed the measurement of temperature into meaningful numbers.

The three main temperature scales used for measuring temperature are Fahrenheit, Celsius, and Kelvin. The Kelvin scale is used for most scientific work because it is proportional to the kinetic energy in a substance.

When working with very low temperatures it is more appropriate to use the Kelvin temperature scale. This scale is very convenient for measuring the very low temperatures of liquid nitrogen. On this scale liquid nitrogen would have a temperature of 77 K. At this temperature any cells that are touched by the liquid will be instantly frozen!

At a temperature of Absolute Zero there is no motion and no heat. Absolute zero is where all atomic and molecular motion stop since it is the lowest temperature possible. Absolute Zero occurs at 0 degrees Kelvin or -273.15 degrees Celsius or at -460 degrees Fahrenheit. All objects emit thermal energy or heat unless they have a temperature of absolute zero.

Reading a Glass Thermometer

A thermometer measures temperature through a glass tube sealed with mercury that expands or contracts as the temperature rises or falls.

The tiny size of the bulb and micro-fine size of the tube help the mercury reach the temperature of what it is measuring very rapidly.

Bulb thermometers follow the simple principle that liquids change their volumes relative to their temperature. As temperatures rise, the mercury-filled bulb expands into the capillary tube. Its rate of expansion is calibrated on the glass scale. Two different scales can be found on thermometers--the Fahrenheit scale and the Celsius scale.

Reading a glass thermometer, also known as a mercury thermometer or alcohol thermometer, takes a bit of practice and skill. Let's learn proper technique for reading a glass thermometer.

Reading a Glass Thermometer

- Place the bulb of the thermometer in the testing medium. For example, if you are testing the temperature of ice water, place the bulb in the water, below the ice, but not touching the bottom of the flask or cup the water is held in. Why?
- Interpret the readings. Etched into the body of the thermometer are markings indicating degrees in Fahrenheit and/or Celsius. Relevant periodic markings of degree units will also be present on the thermometer. For instance, if you are measuring in degrees Celsius, every 10 degrees will be marked on the scale, with smaller lines indicating single degrees. Thus, ice water will show up as 0 degrees Celsius, room temperature water might be 20 or so degrees.

Example:
What is the temperature in degrees centigrade? degrees Fahrenheit?
Look at the scaling at the left. The tip of the mercury is at the second division. Thus the temperature is 54ºF. Look at the scaling at the right. The tip is at two division above 10. Thus the temperature is 12ºC

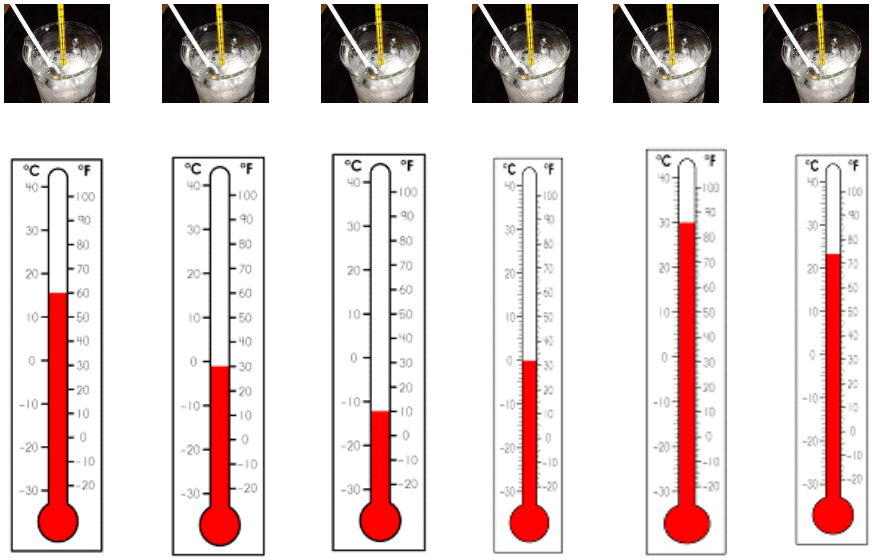
Common Temperature Reference Points:

	Fahrenheit	Celsius	Kelvin
Absolute Zero	-460	-273	0
Water (freezing)	32	0	273
Water (boiling)	212	100	373

Questions:
1. Why are these pieces of information important? In what way can you use them?
2. Where else in real life is the knowledge and skills on measuring temperature
important?

ACTIVITY 22. How Hot is Hot?

Six thermometers were dipped into six bowls of soup. The readings are shown below. How hot or how cold is the soup?



A B C D E F

	A	B	C	D	E	F
°F						
°C						

Questions:

1. Why is it important to know how to measure temperature?
2. What situations in real life requires precise and accurate measurement of temperatures? Cite at least two.
3. What could be some of the consequences when temperature reading is incorrect?

ACTIVITY 23. The Temperature Challenge!

Solve the following problems below.

1. The temperature on Monday is 35 °C warmer than it was on Sunday. Saturday's temperature was 7 °C cooler than Sunday's. At 45 °C, Friday's temperature was 22 °C warmer than Saturday's. What was each day's temperature? What is the average temperature for the time period from Saturday to Monday?

2. Beneath Earth's surface, the temperature increases 10°C every kilometer. Suppose that the surface temperature is 22°C,and the temperature at the bottom of a gold mine is 45°C.What is the depth of the gold mine?

3. The temperature at a ski slope decreases 2.5°F for every thousand feet of elevation above the base. The temperature at the base is 28°F and the temperature at the summit is 24°F.How many thousand feet above the base is the summit?

Questions:

1. In what way is your knowledge and skills in measuring temperature useful in monitoring your health status?
2. What does it imply when your body temperature in above 37°C ? below 37°C ?
3. Where else in real life is measurement of temperature very important?

Measuring Angles

An **angle** measures the amount of turn. It may also be described as a figure formed by two lines or rays diverging from a common point (the vertex). Where do we use angles? In the activity below see if you can identify the angles in the pictures.

ACTIVITY 24. . Oh My Angles!

Trace and identify the types of angles in each of the pictures below.

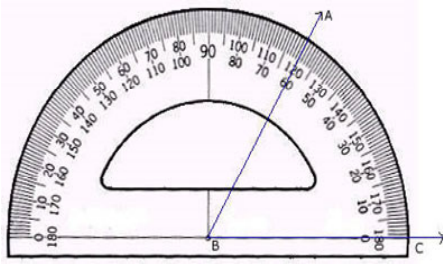



Questions:

Can you explain why the angles are there? Where else in real life do we see angles? Why is measuring angles important?

How are angles measured?

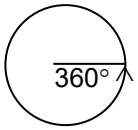
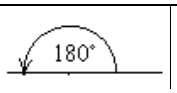
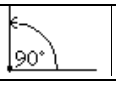
We measure angles using a tool called a **protractor**. A protractor is half of a circle. A protractor uses units called degrees to measure angles.



A protractor can measure angles starting from the left or from the right. It measures from 0 to 180 degrees. 180 degrees is half of the measure of a circle.

Look at the protractor in the picture to see how this works! This protractor is measuring an angle starting from the left. What is the measure of the angle?

Look at the figure below. Note the measure of the angles shown.

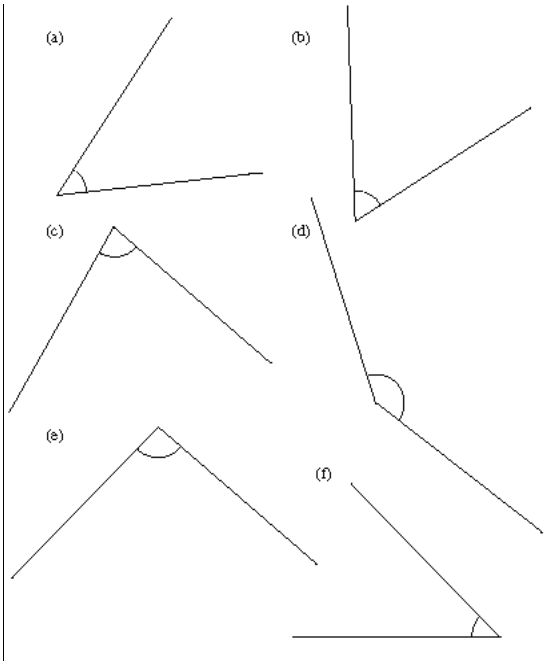
	The angle around a complete circle is 360º
	The angle around a point on a straight line is 180º.
	A right angle is 90º.

In what situations in life we need to use our skill of approximating measures of angles? When is accurate and precise measurement of angles needed?

Now use your new knowledge on angles to do the next activity.

ACTIVITY 25. Guess and Check!

Approximate the measure of each of the angles below. Check using a protractor.



ANGLES	My Guess	My Measure
a)	_____	_____
b)	_____	_____
c)	_____	_____
d)	_____	_____
e)	_____	_____
f)	_____	_____

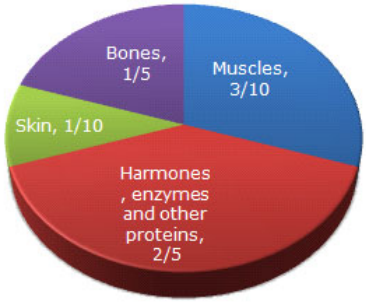
Questions:

1. How do you rate your skill in approximating measures of angles?
2. Where and under what condition can you use this skill in real life?

ACTIVITY 26. What's in a Pie?

What is the role of angles in drawing a pie chart? Use the pie chart below to answer the questions.

The pie chart below shows the component of the human body.



Questions:

1. What percentage of proteins of the human body is equivalent to the weight of its skin?

2. To represent the percentage of the skin, what central angle must be marked?

3. How much of the human body is neither made of bones or skin ?
   What measure of central angle will represent this figure?

4. What is measure of central angle representing the percentage of muscles?

5. Why is the measure of central angle needed in drawing a pie chart?

ACTIVITY 27. Draw Me

Construct the following:

1. Draw a polygon with four equal angles in the circle. What do you call this polygon?
2. Draw a regular pentagon. What is the measure of each angle? How did you know?
3. Draw an isosceles triangle. Justify why it is an isosceles triangle.

End of FIRM UP:

In this section, the discussion was about measuring the basic quantities: length, mass or weight, volume, temperature and angles. You learned about the different devices used in measuring quantities and the units used in measurement.

Go back to the previous section and compare your initial ideas with the discussion. How much of your initial ideas are found in the discussion? Which ideas are different and need revision?

Now that you know the important ideas about this topic, let's go deeper by moving on to the next section.

DEEPEN

Your goal in this section is to take a closer look at some aspects of the topic. We will see that knowing how to measure is more than knowing how to use the device. It is also very important that we know how to express our measures correctly and appropriately. Let's deepen our answer to the questions we tried to answer from the start of the lesson. **How does one know when a measurement is precise? Accurate?** How can one tell a reasonable approximation has been made? Let's answer these questions in the next activities.

Lesson 5: Conversion of Units

In many instances you are required to express one unit of measure to another unit. Can you cite an example? In the next activity you will learn how to convert one unit of measure to another.

ACTIVITY 28. Measuring Up!

1. Fill 10 glasses of the same sizes with water. Transfer all of these to a dipper. How many dippers were filled with water dipper?. Now compare the number of glasses and the number of dippers of water. 10 gallons of water _____ dipper of water? Which one is bigger?

2. Using a meter stick measure 4 yards of plastic straw. Now cut this in such a way that each piece is 1 foot each. How many small pieces are there? 4 yards = _____ feet? Did the number of units of measures becomes bigger or smaller?

You see from the activity that the numerical part of the measurement changes when units are expressed in other units of measures. In the next activity you will learn how to convert a unit of measure to another by using conversion factor.

ACTIVITY 29. Can You Follow?

Study the examples of expressing one unit of measure to another unit of measurement, then answer the questions that follow.

Conversion of Metric Units

Express 2 kg in g
Process:

×1000
2 kg = 2000 g

$$2\,kg \times \frac{1000\,g}{1\,kg} = 2000\,g$$

÷1000
2,300 g = 2.3 kg

$$2{,}300\,g \div \frac{1000\,g}{1\,kg} = 2.3\,kg$$

$$2{,}300\,mg \times \frac{1\,kg}{1000\,mg} = 2.3\,kg$$

×1000
3.5 km = 3500 m

$$3.5\,km \times \frac{1000\,g}{1\,km} = 3{,}500\,m$$

÷100
560 cm = 5.6 m

$$560\ cm \times \frac{1\,m}{100\,cm} = 5.6\,m$$

Question:
How do we change a metric unit of measure to another?

Conversion of Customary System

Look at the example for converting customary unit of measures another unit of measure.

Express 2 lb in oz
Process:

2lb = 32 oz

$$2\,lb \times \frac{16\,oz}{1\,lb} = 32\,oz$$

Express 320 inches in yd
Process:

320 in = 8.9 yd

$$320\,in \times \frac{1\,ft}{12\,in} \times \frac{1\,yd}{3\,ft} = 8.9\,yd$$

Questions:

1. How are units expressed in another unit?
2. What happens to the numerical value when a big unit of measurement is changed to smaller unit of measurement? Small unit of measurement are expressed in big units of measurement?
3. What is similar in the process of converting units of measurement from metric system to the customary system? What is different?

Conversion of units involves comparison of different standard physical values, either of a single physical quantity or of a physical quantity and a combination of other physical quantities. The process of conversion is summarized below.

1. Find facts relating the original unit to the desired unit:
   1 mile = 5280 feet and 1 hour = 3600 seconds
2. Next use the above equations to construct a fraction that has a value of 1 and that contains units such that, when it is multiplied to the original physical value, will cancel the original units.
3. Last, multiply the original expression of the physical value by the fraction, called a conversion factor, to obtain the same physical value expressed in terms of a different unit. Note: since valid conversion factors are dimensionless and have a numerical value of one, multiplying any physical quantity by such a conversion factor (which is 1) does not change that physical quantity.

Now check your knowledge and skills in conversion by doing the next activity.

ACTIVITY 30. Let's Do Conversion

A. Convert the following metric units measures to the required units:

1. 520 cm = _____ dm
2. 2.4m = _____ cm
3. 540 dm = _____ dam
4. 5.2 kg = _____ cg
5. 5.1 L = _____ mL
6. 50 cm = _____ dm
7. 1.5m = _____ cm
8. 620 dm = _____ dam
9. 7.2 kg = _____ cg
10. 1.2 L = _____ mL

B. Convert the following English units to the required units:

1. 4.2 ft = ___ in

2. 32 in = ___ yd

3. 12 oz = ___ lb

4. 24 c = ___ pt

5. 1.8 gal = ___ oz

6. 36 pt = ___ c

7. 0.6 T = ___ lb

8. 320 qt = ___ pt

9. 48 c = ___ qt

10. 620 oz = ___ lb

How are units of measures for temperature converted into other units of measurement? The following formulas may be used to convert from one temperature scale to another.

Formulas:

- Degrees Fahrenheit = (9/5 * Degrees Celsius) + 32
- Degrees Celsius = 5/9(Degrees Fahrenheit - 32)
- Kelvin = Degrees Celsius + 273

Examples:

1. Convert 40°C in Kelvin and Fahrenheit scale
   Solution:
   a. K = Degrees Celsius + 273
   = 40 +273
   = 313K

   b. °F = (9/5 * Degrees Celsius) + 32
   = (9/5 * 40) + 32
   = 104°F
2. 100 °F convert to °C and K
   a. Degrees Celsius = 5/9(100°F - 32)
   = 5/9(100°F - 32)
   = 37.78
   b. Kelvin = Degrees Celsius + 273
   From a, degrees Celsius is 37.78
   Thus, Degrees Kelvin = 37.78 + 273
   = 310.78
3. Convert 400K to °C and °F
   a. Kelvin = Degrees Celsius + 273
   So, Degrees Celsius = Kelvin – 273
   = 400 – 273
   = 127°C
   b. °F = (9/5 * Degrees Celsius) + 32
   = (9/5 * 127) + 32
   = 260 °F

Now, apply what you have learned about conversion by doing the activity below.

ACTIVITY 31. My Other Names Please!

Complete the table below by expressing the given temperature in other units.

Temperature	Degrees Celsius	Degrees Fahrenheit	Kelvin
1. Boiling point of water	100°C		
2. Freezing point of water		32°F	
3. Normal Human Body Temperature	37°C		
4. Room Temperature		68°F	
5. Lowest Temperature Possible			0K
6. Temperature on top of Mt. Apo at night	3°C		
7. Temperature in Baguio City in the morning			290K

Questions:

1. Where in real life is the Celsius scale commonly used? Fahrenheit scale? Kelvin scale?
2. How are their uses justified?

Now that you have mastered how to express one unit of measure to another, find out how you can prepare measuring tools that uses metric units of measure. Start by doing the next activity.

ACTIVITY 32. Turn your Measuring Tools Metric!

Materials: balance, measuring cups and spoons, graduated cylinder, beaker
rice, water

1. Pour the rice into a measuring cup. Scrape and transfer into the beaker. What is its volume in milliliter? Record your reading.
2. Do the same for other measuring tools: ¾ cup, ½ cup and others. Record their volumes in milliliters.
3. Fill the cup with water then transfer to the graduated cylinder. What is the volume in milliliters? Record your reading.
4. Do the same for the other measuring tools.
5. Compare the readings for rice and water. Is there a difference in their volumes? How will you explain the difference if there is any?

English Measuring Tool	Metric Equivalent In milliliter		English Measuring Tool	Metric Equivalent In milliliter	
	Rice	Water		Rice	Water
1 cup			1 tablespoon		
¾ cup			½ tablespoon		
½ cup			1 teaspoon		
¼ cup			½ teaspoon		

Questions:

- How should the reading of volume of liquids be obtained?
- How are volumes of regularly shaped solids determined?
- How can the volume of irregularly shaped solids be determined?
- How does one know when the measurement of volume is precise? accurate?
- When do we need to convert one unit of volume to another? How does one express a unit of volume to another?

If you were able to answer the questions above, then you are ready to assess yourself by doing the activity below. Use the knowledge and skills you have acquired in conversion of units to answer the problems below.

ACTIVITY 33. Conversion Challenge!

Solve the following problems. Always look back and check your answer.

1. John adds 250 ml of water to a jug that already contains 1.2 liters of water. How much water is now in the jug?
2. A cake recipe requires 0.25 kg of flour. Rachel has 550 grams of flour. How many recipes can Rachel have?
3. A chemistry teacher requires 250 milligrams of a chemical for an experiment per group. He has 30 grams of the chemical. How many groups can perform the experiment?
4. A bottle contains 1.5 liters of cola. Hannah drinks 300 ml of the cola and then Ben drinks 450 ml. How much of the cola is left?
5. Emma estimates that the mass of one sweet is 20 grams. A packet contains 0.36 kg of these sweets. How many sweets would you expect to find in the packet?

6. The temperature at the top of Mt. Apo at night is usually 3°C Express this in Fahrenheit and Kelvin scale.

ACTIVITY 34. Do you Know This?

		Given	Answer
1.		The height of the tallest building in the Philippines is 259 meters. (Philippine Bank of Communications) How high is that in centimeters?	
2.		Mt. Apo peaks at 2,956 meters. How high is that in millimeters?	
3.		The weight of a ten peso coin is 8.7 g . What is the weight in milligrams?	
4.		4. The volume of sea water in Manila Ocean Park is 12,000 cubic meters. What is this volume in gallons?	

Question: Under what condition do we need to express this facts in other units of measures?

In the next activity you are expected to express a recipe in metric units of measures. This will test your mastery of the conversion process.

ACTIVITY 35. Recipes in Metric Units

Given the recipes below, convert the units of measures indicated to metric units.

Recipes:

Moist Banana Bread Recipe

	English	Metric
sugar	1 cup	
egg	1	
butter at room temperature	½ cup	
bananas, peeled and mashed	1 cup	
milk	2 tablespoons	
sifted flour	2 cups	
baking powder	1 teaspoons	
baking soda	½ teaspoon	

Questions:

1. What are some of the metric utensils that are used in measuring quantities at home?
2. What could be the reasons why the English utensils are the ones usually used at home?
3. Construct at least three metric measuring devices for measuring quantities of components of a recipe.
4. Be ready to explain and show how your measuring devices should be used.
5. Can 1 cup of flour be expressed in other units of measurement? What unit will it be? Support your answer.

Lesson 6- Approximating Measures

In the next activity, you will try to develop your skills in approximation. It is an exciting game that you can play with your friends or classmates.

ACTIVITY 36. Shopping Spree

Advertising flyers from Stores
Paper Money
Timer

Rules:

1. Only one player for each group will be assigned per round.
2. Each player will be given the amount for shopping.
3. From the advertising flyers, players will choose and list prices of the items they would like to buy for the given amount of money.
4. The player who comes closest to spending the given amount without going over that amount is the winner.

Questions:

1. How did you fare in the activity?
2. Were able to make a good approximation of the prices of the items?

Approximation is a process of finding a representation of something that is not exact, but close enough to be useful.

Approximations may be used because incomplete information prevents use of exact representations. It is a skill that is learned through trial and error. Each time you make an estimate of something and then receive feedback about the accuracy of your estimate, you take a step in learning the skill of estimation in that particular context. The more times you make an estimate in a particular context and then receive feedback, the more skilled you will become in estimation in that particular context.

Thus, you should be spending a lot of time building and developing our estimation skills in a variety of contexts. Ask questions like: How much water do I need for bathing? How much money should I be saving for a mobile phone? How much money do I need for one month water bill? Our lives are full of estimates of measurements from the time we wake up in the morning until the time we go to bed at night.

Now try the next activity.

ACTIVITY 37. How Close is you Guess?

Look around in your house and identify the object listed below. Approximate the physical attributes and complete the table below.

	Approximate Values			Exact Measures		
Objects	Length	Width	Weight	Length	Width	Weight
1. book						
2. box						
3. picture frame						
4. paper weight						
5. cellular phone						

Now, test your skill and understanding in approximation by doing the Self-Check below.

Self-Check:

1. Find a object in your house about twice the length of the book. Record it.
2. Find an object about one-half the weight of the cellular phone.
3. Find a object thrice as long as the picture frame.
4. Cite a situation in life where approximation is preferred than the exact value.
5. What is a good strategy to use when you need to approximate?
6. Where in real life can you use your skill in approximation?

ACTIVITY 38. Is Rounding an Approximation?

Give a good approximation of the required measurement when you convert it. Round your answers to the nearest hundredth.

1. 2.3 meters to yards

2. 0.6 kilometers to miles

3. 258 centimeters to inches

4. 2.4 kilograms to pounds

5. 158 grams to ounces

6. 35 liters to quarts

7. 0.85 liters to gallons

8. 180 meters to miles

9. 1.4 kilograms to ounces

10. 5.6 decigrams to ounces

ACTIVITY 39. Do News Reporters Approximate?

With a group or friends , write down big numbers (more than 4 digits) you saw on the newspaper. What quantity does each number describe? Write your answers on the appropriate column.

Newspaper Number	What does it describe?	Rounded Value

Now go to the number on the paper and read again using the rounded value.

Questions:

1. How do the rounded number affect what is being describe?
2. Is the description still accurate? Why?
3. Do the rounded numbers change how well someone would understand what is being described?
4. (Extend) Give at least three examples when exact numbers are necessary.
5. (Extend) Give at least three examples when rounded number is satisfactory.

Now that you know how to measure using different devices, how to covert one unit of measurement to another and how to ensure that your measurement is precise and accurate, assess yourself by doing the activity below.

ACTIVITY 40. Designing the Best Packaging

As a packaging designer of Pinoy Toy company you are task to design a box to house 36 cubes. The box must use the least area of packaging materials to minimize cost. You are to choose from available materials for box making considering its weight and durability. You are to present a design proposal with prototype model to production department of the toy company, store owner and mothers.

Your proposal should include justification of design in terms of the computation of the volume and the area of the box materials, shape, weight, practicality in storing and transporting the products, mass production in an assembly line and attractiveness to customers.

Your product will be judge according to the following standards: accuracy of computation, clarity of report and presentation, workmanship, compliance to specifications.

Lesson 7: Using Scientific Notation

Scientific notation is a compact form of writing numbers that are very large or very small. It is especially useful when expressing measurements such as distances to stars, eons of time, or the sizes of objects that are extremely large or small. This type of notation helps simplify calculations and comparisons of these numbers, and it helps express the precision with which quantities have been measured.

Examples:

Measure	Value	Scientific Notation
1. Moon's mass	73477000000000000000000 kg	7.3477×10^{23}
2. Earth's mass	5,973,600,000,000,000,000,000,000 kg	5.9736×10^{24} kg
3. Electron's mass	0.000000000000000000000000000091093826 kg	$9.1093826 \times 10^{-31}$ kg
4. proton's mass	0.00000000000000000000000000167 kg	1.67×10^{-27} kg
5. speed of light	300,000,000 meters per second	3×10^{8} m/s

Questions:

1. Look at the examples above . How are the measures expressed in scientific notation?
2. When are the exponents of 10 positive? negative?
3. What does the exponent of 10 indicate?
4. What is the advantage of writing measures in scientific notation?

Scientific notation allows us to report the precision of a measurement. Suppose the instrument you used could only determine the distance to within 10 km? How could you write down a distance of 100 km and indicate that the precision was only to within 10 km?

In scientific notation, we write numbers so that no matter how large or how small they are, they always have a decimal point in them. The way we do this is to represent a number as a something times a power of ten. For example, "50" could be written in scientific notation as "5 x 10." The number "150" could be written as "1.5 x 100."

Do you see why this helps us in writing down the precision of our original measurement?

Instead of writing the distance as 100 km, I could write it as 1.0 x 100. How does this help? When reporting values that were the result of a

measurement or calculated using measured values, it is important to have a way to indicate the certainty of the measurement. This is accomplished through the use of significant figures. Significant figures are the digits in a value that are known with some degree of confidence. As the number of significant figures increases, the more certain the measurement. As precision of a measurement increases, so does the number of significant figures.

According to our rules of significant figures, the zero in 1.0 is significant, because it is at the end of the number and to the right of the decimal. Thus, by writing down our measurement this way, we indicate that the zero was actually measured and that the measurement is precise to within 10 km. There is no way to do that with normal, decimal notation, because neither of the zeros in 100 is significant. Scientific notation, then, gives us a way to *make* zeros significant if they need to be. If our measurement of 100 km was precise to within 1 km, we could indicate that by reporting the measurement as 1.00 x 100 km. Since both zeros in 1.00 are significant, this tells us that both zeros were measured, so our precision is within 1 km. How do we express numbers written in scientific notation back to decimal form? Look at the examples below.

Example 1: Write 1.34×10^{-4} in non-exponential form.
$1.34 \times 10^{-4} = 0.000134$

Example 2: Write 2.045×10^{-6} in non-exponential form.
$2.45 \times 10^{-6} = 0.000002045$
2.46

Questions:
What happened to the position of the decimal point?
What happened to the exponent of 10?

Now, check if you understand this technique by doing the next activity.

ACTIVITY 41. In Power or Decimal, That is Still Me!

A. Convert the following numbers into scientific notation.

1. 3,450,000
2. 63,045,000
3. 70,100,000,000
4. 0.00000912
5. 0.0000000061300

6. 0.0000000007801

B. Convert the following numbers written in scientific notation to decimal form.

1. 3.1×10^{5}
2. 5.03×10^{7}
3. 9.007×10^{15}
4. 4.6×10^{-5}
5. 7.03×10^{-7}
6. 8.152×10^{-12}

Questions:
1. How do are very big numbers expressed in scientific notation?
2. How are very small numbers expressed in scientific notation?
3. How are numbers written in scientific notation expressed as a non-exponential quantity?

In the next activity you will test your knowledge and skills in using scientific notation to perform basic operations.

ACTIVITY 42. The Power Challenge

1. Light travels about 1.9 x 10^5 miles per second. How long does it take for light to reach earth from the sun 9.3 x 10^7 miles away?

2. The surface area of a sphere with radius r is $4\pi r^2$. Ryan's Company manufactures hollow rubber balls 5.2 inches in diameter. About how many square inches of the rubber is needed to produce 10^3 balls?

3. The volume of a sphere with radius r is $\frac{4}{3}\pi r^3$. How many cubic meters of rubber are needed to produce 10^4 solid rubber balls with a diameter of 2.2×10^{-4} meter?

4. The speed of the radio wave is about 1×10^9 ft per second. How far does a radio wave travel in 10 nanosecond?

5. If a water lettuce doubles everyday and it takes 30 days to completely cover a pond,
a. on what day will the pond be 1/4 covered? ½ covered?

b. What kind of environmental consequences can be expected as the 30th day approaches?

c. What will begin to happen at one minute past the 30th day?

d. At what point (what day) would preventative action become necessary to prevent unpleasant events?

Questions:

1. In what way are addition and subtraction of scientific numbers different from addition of decimals?
2. How are multiplication and division of numbers in scientific notation different from multiplication and division of decimals?

Now that you have acquired knowledge and skills on measurement, you are ready to apply what you have learned. Where in real life can you use your knowledge and skills?

TRANSFER

Your goal in this section is apply your learning to real life situations. You will be given a practical task which will demonstrate your understanding.

ACTIVITY 43.

Construct and solve problems based on the situation below. You are encouraged to pose problems that are challenging and creative.

Your score will be based on the rubric below:

Rubric for Problem Posing and Solving

Components	1 Beginning	2 Developing	3 Good	4 Excellent

Statement of the problem	Did not pose a problem	Posed at least a solvable problem	Posed at least two multi-step problem	Posed at least multi-step problems interesting challenging and relevant
Strategy/ Procedure	Strategy ineffective and inappropriate	Strategy appropriate but inefficient	Strategy appropriate and efficient	Strategy appropriate effective and efficient
Completion	Process not completed	All but three of the problems were completed	All but two of the problems were completed	All problems were completed
Mathematical Concepts	Explanation shows limited understanding of the underlying concepts used to solve the problem	Explanation shows some understanding of the underlying concepts used to solve the problem	Explanation shows substantial understanding of the underlying concepts used to solve the problem	Explanation shows complete understanding of the underlying concepts used to solve the problem
Accuracy	75% of the steps have errors	75% - 84% of the steps have no errors	85- -89 % of the steps have no errors	90 – 100% of the steps have no errors

For each of the given situation formulate your own problem. Then solve your problem. Show your process and label your final answer.

Given	Problems	Solutions
1. A playground is 15 feet wide and 30 feet long. Around the playground is a sidewalk that is 3 feet wide.		
2. Mrs. Castro is a cook for the Neri family. She usually makes a 5 kilos of roast for dinner on Thursdays. She knows that it takes 2 1/2 hours to cook this roast. Her boss is having a dinner party and she needs to make more food. She decides that she needs 15 kilos of meat. She only has one oven and it will not hold a roast bigger than 10 kilos .		
3. Adieh is planning to have a party for 105 people. She wants to serve at least 2 cups of fruit punch to each guest. She has 4 fruit punch bowls which can hold 3 gallons.		

How is your performance so far? Check your progress by doing the journal writing below.

ACTIVITY 44. Journal Writing

Focus: Self-assessment (A-M) **How Is My Progress?**
Answer the questions below.

What have I learned so far in this lesson?	*What still confuses me?*	*How can I use what I've learned outside the classroom?*

Lesson 8: Applications

Power Consumption

One of the quantities that we regularly use and pay for is the use of energy. Would you like to know how your energy bill is computed? Would you like to know ahead of time how much energy you will consume for the use of certain appliances?

This session will help you with these concerns. You will learn how to read and interpret electric meters and electric bills. You will also learn how to compute for electric power consumption based on the use of appliances, and how to check the computation of your electric bill.

Electricity Meter

An **electricity meter** or **energy meter** is a device that measures the amount of electric energy consumed by a residence, business, or an electrically powered device.

Electricity meters are typically calibrated in billing units, the most common one being the kilowatt hour.

Dial Type Electricity

There are two types of electric meters that are commonly used in our country. One is the digital type which indicates kilowatt-hour (KWH) readings by digital numbers as illustrated.

In Dial type, you will notice that there are five dials and inside each dial is a pointer which indicates the number to be read. The pointers will alternately turn clockwise and counterclockwise.

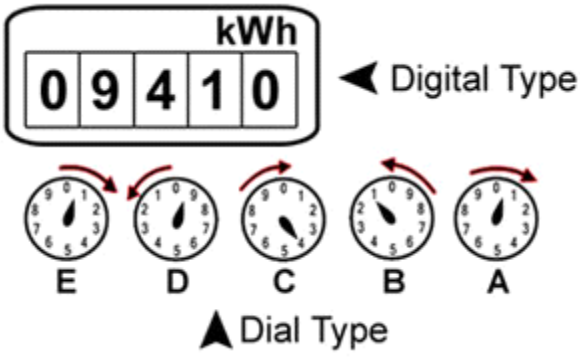
digital electricity meter

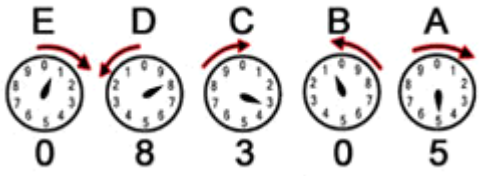
How to Read Your Meter

The pointer of Dial A has to complete one revolution from "0" back to "0" before the pointer of Dial A is equivalent to one point of Dial B. The same procedure follows for Dial B and Dial C. Same goes for Dials C and D, Dials D and E.

1. Always read the dials from the right to the left, starting from Dial A to Dial E.

2. Read the number by the pointer of the dial. When the pointer is between two (2) numbers, the lower number is recorded.





3. To compute your electric consumption, simply subtract the previous reading from the present

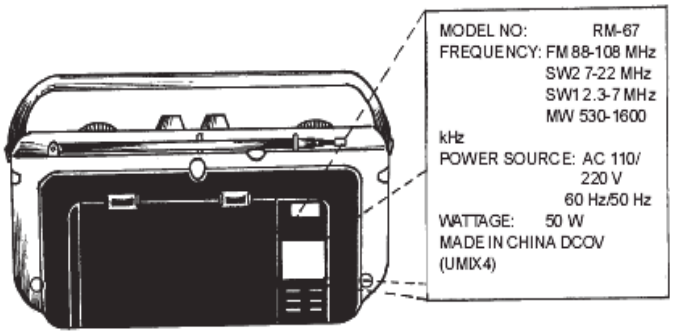
What is the reading shown above?

Suppose the previous reading is 08275. What is the energy consumption?

If the Electric Company charges P8.00 per kilowatt-hour, how much should your bill be?

Appliances consume electric power. But how much electricity do they use? Appliances have a power rating that indicates the amount of electric power they
consume. The power rating or wattage is measured in watts or kilowatts. The symbol for watts is "W" and the symbol for kilowatts is "kW." You can determine the power rating or wattage of an appliance by looking at the back panel where it is indicated or else you can look it up in the appliance manual.

Look at the back panel of a radio or your television set.



Electric power consumption is the amount of electric energy that an appliance consumes within a certain period of time. Electric power consumption is obtained by multiplying the power rating of the appliance with the amount of time the appliance
was used.

Power rating × Time used = Electric consumption

Example :

Problem	Power Rating	Time of use	Power Consumption
A desk fan with a power rating of 80 W is used for a period of 10 hours. What is the electric power consumption?	**80 W = 0.08 kW**	**10 h**	**0.80 kWh**

ACTIVITY 45. Know your Power!

Read each problem then identify the given power rating and the number of hours the appliances are used. Using the formula, find the power consumed. Write your answers in appropriate column.

Problem	Power Rating	Time of use in Hours	Power Consumption in kWh
1. In a kitchen, an oven (1,500 W), a rice cooker (450 W) and a refrigerator (180 W) are used for three hours. What is the total electric power consumption?			
2. A light bulb with a power rating of 50 W is turned on for 12 hours. What is its total power consumption?			
3. In a living room, a flat iron (1000 W), an electric fan (70 W) and a television (120 W) are used for 3 hours. What is the total electric power consumption?			
4. In a bedroom, a television (80 W), an air conditioner (1,420 W) and a light bulb (100 W) are used for 6 hours. What is the total power consumption?			

Now that you know how to determine the amount of power your appliances consume for certain number of hours used, how will you know how much are you supposed to pay?

Electric companies are charging other fees related to the use of electricity. To approximate the amount determine the average unit price per kilowatt-hour. Then multiply the number of kWh consumed to this unit price.

ACTIVITY 46. Oh Is That What I Pay?

Now look at your energy bill for the past three months. Is your family consuming the same amount of energy? What is the average amount that

you consume? How much is the company charging you each month? How much is the cost of one kilowatt-hour of power consumed?

List the appliances you are using at home, their power rating and number of hours used. How much are you suppose to pay for the use of these appliances?

Item	Number of watts	Number of Hours Used/day	Power Consumption/ day	Cost of Power Consumption/day	Cost of Power Consumption/30 days
electric bulb					
refrigerator					
TV					
flat iron					
rice cooker					
radio					
oven					
water heater					
electric clock					

2. If an appliance, such as a television, is left switched on for a long period of time, what is the impact on electric consumption?

_____

3. What are some ways to reduce electric power consumption?

_____

_____

_____

4. What are the benefits of reducing electric power consumption?

_____

_____

5. How can you help in conserving energy

a. in school

b. at home

Another basic commodity that we consume is water. How are we billed for the water that we consume from the water district? In this session you will answer this question.

WATER CONSUMPTION

Recognizing the amount of water you use each month can have a positive impact on your utility bill. There are several methods to measure and reduce your water consumption.

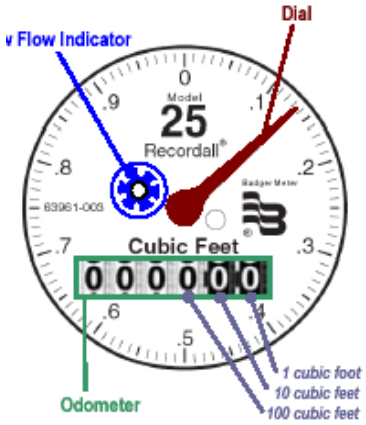
Questions:

1. **How is the water consumption measured?**
2. **How is the cost of water consumption determined?**
3. **What is the basic rate of water in Cagayan de Oro?**
4. **In what way can your knowledge and skills in determining cost of water consumed be of used ?**
5. **In what way have you helped conserve the water supply in your community?**

The Water Meter

Most meters look like the one pictured at the right. It has a dial, low flow indicator and odometer.

Dial: the dial will rotate when water passes through the meter. One full rotation of the dial equals 1 cubic foot of water or 7.48 gallons.



Low Flow Indicator: the Low Flow Indicator will rotate with very little water movement. Any water moving through the meter is detected so even small leaks will register.

Odometer: the odometer records total water use. The water meter odometer records water use in cubic feet and displays as follows: The digits from right to left represent 1 cubic foot, 10 cubic feet, 100 cubic feet and so on.

ACTIVITY 47. What is my Bill?

Read and use the information to answer the questions below.

Basic rate of Water Consumption:
a. Residential:
P 210.00 for the first 10 cu.m. + excess
Excess Rates:

11-20	21-30	31-40	41-50	Over 50
29.40	30.60	32.40	34.60	34.60

b. Commercial:
P 420 for the first 10 cu.m. + excess
Excess Rates:

11-20	21-30	31-40	41-50	Over 50
58.80	61.20	64.80	69.20	69.20

1. **What is the cost of the different amounts of water consumed?**

READING		CHARGES		
CU. M.		Residential		Commercial
45				
50				
68				
102				

6. **How can you conserve water?**

End of DEEPEN:

In this section, the discussion was about conversion of the different units of measures both in the English and the Metric system, approximation of measures, expression of very large and very small measures in scientific notation, and applications of measurement specially on reading meters for electric consumption and water consumption.
What new realizations do you have about the measurement? What new connections have you made for yourself?

Now that you have a deeper understanding of measurement , you are ready to do the tasks in the next section.

TRANSFER

Your goal in this section is apply your learning to real life situations. You will be given a set of practical tasks which will demonstrate your understanding.

Check your faucets at home and in school -- do any of them drip? Well, maybe it's just a small drip -- how much water can a little drip waste?

ACTIVITY 48. Catch That Precious Water!

Collect the drips of water for 10 minutes. Measure the volume. How many milliliters of water did you collect. Record the volume. Use this data to answer the questions below.

Time	10 minutes	1 hour	1 day	1 month	1 year
Volume in mL					

Questions:

1. If there are three leaking faucets in your home how many liters of water is wasted in a day? In a month
2. If there are 100 home in your community and each home has al least three leaking faucets, how many liters are wasted.?
3. How will your prevent wastage of water through the leaking faucets?
4. Why do we need to conserve water?

You see from the previous activity how you can use your knowledge and skills to help conserve our resources such as water. How can you apply this in the use of other resources such as energy?

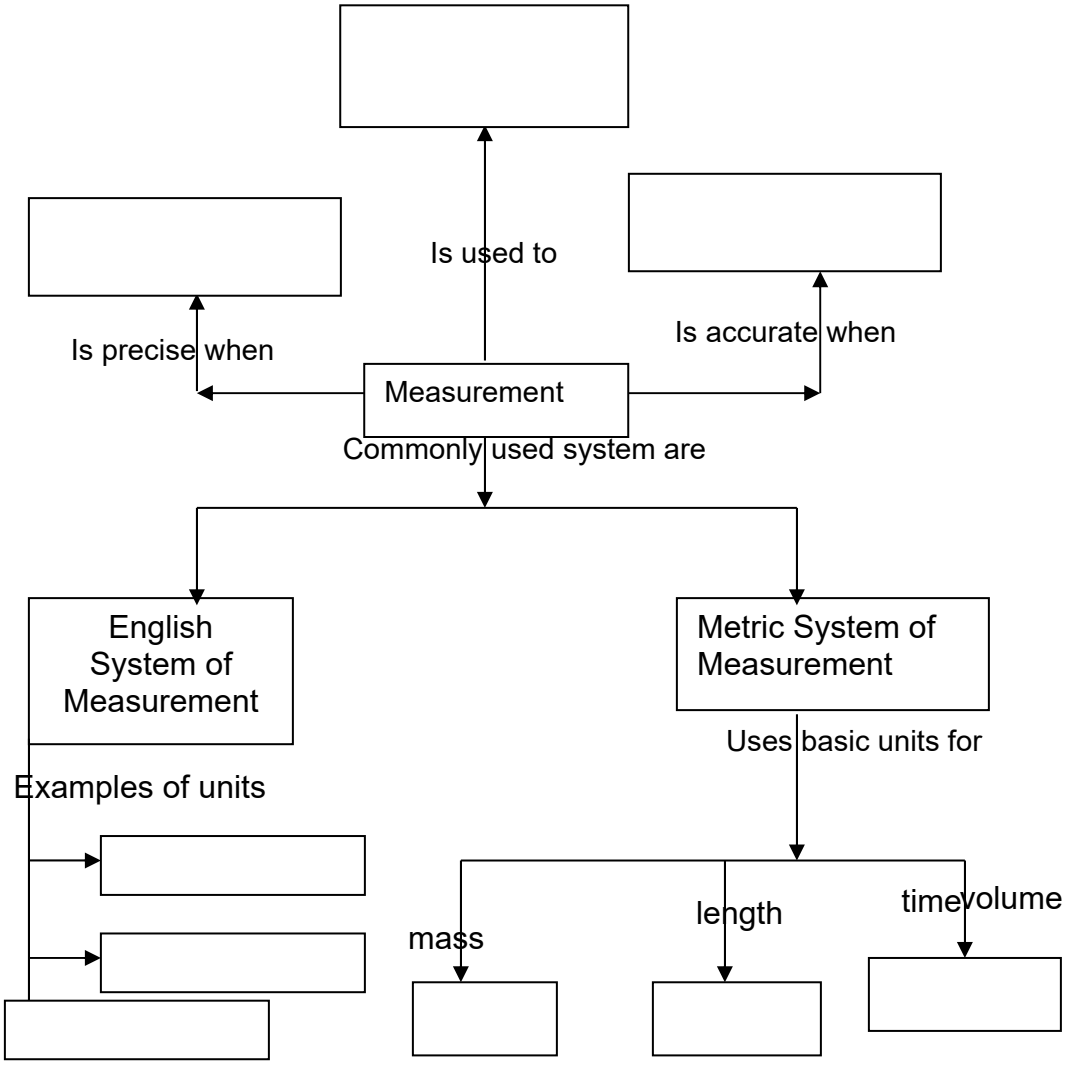
Now check if indeed you were able to master the knowledge and skill that you ought to acquire and develop in this module. It is hoped that you gained a deep understanding of the concepts that you have learned so as to be able to use them in life situations.

Now summarize what you have learned by doing the next activity.

ACTIVITY 49. Summing It Up

Answer as required.

1. How are different measuring devices useful?
2. How does one know when a measurement is precise? Accurate?
3. Complete the concept map below.



2. Draw a flow chart to demonstrate how to convert a unit of measure to another measure.

How was your performance in the activity? What did you discover about your understanding of the topics covered in this module? If you did very well, then you are ready for the next challenge which is your final performance task for this module.

Performance Task:

ACTIVITY 50. Love Food, Avoid Waste

TASK

You are a researcher in the National Food Authority. You are task to make a study on the food that is wasted during lunch. Make appropriate recommendation on the amount of food that should be prepared for family members. The food to be measured includes the main course, side dish, dessert, soup, appetizer and drinks (if served). Your report should include data on the amount of food prepared for lunch, the amount of left over food and the average number of family members. It should also include your recommendations for the amount of food that should be served for a given number of family members such that waste can be avoided.

Present your report creatively to the senior officers of NFA and to the representative of the Philippine Information Agency. Your report will be graded based on the authenticity of data, accuracy of measurement and computation, use of appropriate mathematical concepts and formula, use of appropriate unit of measurement, clarity of presentation , validity of recommendations and fluency and confidence in the delivery of report.

Rubric: Project Making and Presentation of Output

Components	1 Beginning	2 Developing	3 Satisfactory	4 Excellent
Use of appropriate Mathematical Concepts	Explanation shows limited understanding of the underlying concepts used to process data.	Explanation shows some understanding of the underlying concepts used to process data	Explanation shows substantial understanding of the underlying concepts used to process data	Explanation shows outstanding understanding of the underlying concepts used to process data
Accuracy of measurement	75% of the measures obtained are erroneous	76%-84% of the measures obtained are accurate	85%-89%the measures obtained are accurate	90% -100% of the measures obtained are accurate
Use of appropriate measuring tools	60% of the measuring tools used are inappropriate and improperly calibrated	Measuring tools used are appropriate but improperly calibrated	Measuring tools used are appropriate and properly calibrated	Measuring tools used are appropriate and accurate and precise

Accuracy of computation	Errors in computations are serious	Most of the computations are not correct	The computations are correct	All computations are correct and are logically presented
Fluency of presentation	Hesitant, not confident. Explanation is missing.	Somewhat hesitant, less confident and failed to explain significant number of points	Generally fluent, confident and clearly explained the proposal.	Fluent, confident and thoroughly explained each point by providing support that contains rich, vivid and powerful detail .
Organization of the report	Illogical and obscure. No logical connections of ideas. Difficult to determine the meaning.	Somewhat cluttered . Flow is not consistently smooth, appears disjointed.	Satisfactorily organized. Sentence flow is generally smooth and logical	Highly organized. Flows smoothly. Observes logical connections of points
Quality of Presentation	Not presentable	Creative but not done thoroughly and appearance not attractive	Creative, done thoroughly but appearance not attractive	Creative , done thoroughly, and attractive

Questions:

1. In what way did the measuring devices help you in doing this task?
2. How did you that your measurements ant accurate and precise?
3. What insights did you gain from your study?
4. Why is there a need to avoid waste of food?
5. How can you use your knowledge of measurement in ensuring reduction of food wastage if not totally eliminated?
6. What concrete steps can you do to help avoid food wastage?
7. What can you do to inform the public of the need to avoid food wastage?

End of TRANSFER:

In this section, your task was to use your knowledge and skills in measurement to understand and solve problems related to measurement in real life.

How did you find the performance task? How did the task help you see the real world use of the measurement? In what other aspects in real life can you use your knowledge and skills in measurement?

The knowledge and skills that you have acquired and developed in this module have to be nurtured and developed further because measuring is a basic skill. It will greatly affect your performance later in other disciplines especially in sciences. Measurement is also a tool that will help you perform successfully in your daily life endeavor.

You have completed this lesson. Before you go to the next lesson, you have to answer the following post-assessment.

POST-ASSESSMENT:

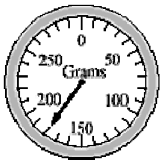
It's now time to evaluate your learning. Click on the letter of the answer that you think best answers the question. Your score will only appear after you answer all items. If you do well, you may move on to the next module. If your score is not at the expected level, you have to go back and take the module again.

Direction: Choose the best answer.

1. Which one is a measuring device is used by early Filipinos to measure weight?
   A. sandali B. metro C. ruler D. talaro

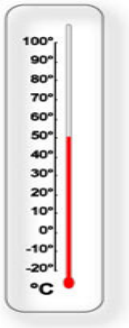
2. Which of these devices is used since early times until now?
   A. protractor B. digital clock C. ultrasonic scale D. laser sensor

3. What is the weight shown on the scale?

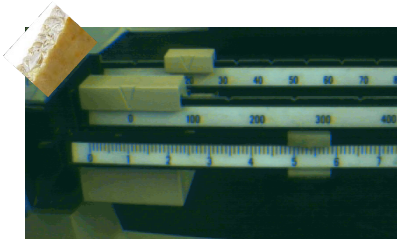


A. 153 g
B. 160 g
C. 165 g
D. 180 g

4. How many degrees does the thermometer show?
   A. 0°C
   B. -20°C
   C. 40°C
   D. 50°C



5. A bar of carrot soap was placed on a pan of the balance. What is the mass of this object?



A. 128 g C. 25.4 g
B. 125 g D. 20.4 g

6. If the top line is 3 units, then the bottom line is ABOUT how many units?

A. 6 B. 9 C. 12 D. 14

7. Sugie is baking. She needs 4 cups of sugar. Her problem is that she only has a 1/2 cup measure and a 3/4 cup measure. What is the least number of scoops that she could make in order to get 4 cups?
A. 4 B. 5 C. 6 D. 8

8. At 98°C degrees, would your drink be:
A. cold B. cool C. hot d. very hot

9. Carl bought a carpet for his room. Which unit of measure is MOST appropriate to describe the size of the carpet ?
A. cubic meters
B. square meters
C. square kilometers
D. kilometers

10. What piece of laboratory equipment is best-suited for accurately measuring the volume of a liquid?
A. graduated cylinder
B. beaker
C. Erlenmeyer flask
D. thermometer

11. Which of the following instrument can be used to measure the power consumed?

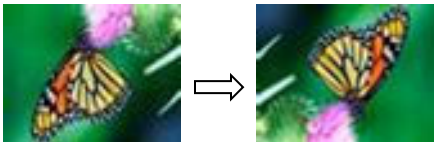
A. 

C. 

B. 

D. 

12. Nora took a picture of a butterfly and she turned the image to get a good view. How many degrees counterclockwise did she turned the picture to get the second view?



A. 90° B. 180° C. 270° D. 360°

13. The maximum weight per piece of luggage allowed by an airline is 25 kilograms. A passenger travels with a large suitcase that weighs 2 kilos and 450 grams when it is empty. What is the maximum allowed weight of belongings the passenger can pack into the suitcase?

A. 550 grams
B. 22 kilograms and 550 grams
C. 23 kilos and 450 grams
D. 23 kilograms and 550 grams

14. A nurse was ordered to give a patient 30 mg of a certain medication. The medication is stored 3 mg per 5-mL dose. How many milliliters needs to be given?

A. 15 mL B. 50 mL C. 90 mL D. 150 mL

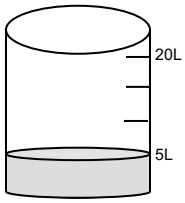
15. Trinidad is going to buy a new TV. She already has a cabinet and she wants to be sure that the new TV will fit. Her cabinet is 24 inches wide by 24 inches high by 12 inches deep. She wants to have 1 inch clearance on each side, 1 inch on top and 1 inch behind so the TV will slide in easily. Which of these would be her best choice?

A. Volume of 5280 cu. in. w = 22", h = 20"
B. Volume of 5290 cu. in. d = 10", base and height the same
C. Volume of 5566 cu. in. w = 22", d = 11"
D. Volume of 4840 cu. In. w = 22" , d =10"

16. Lorna would prepare a gift for her Mom. The dimension of the box she used is 4 inches x4 inches x 8 inches. She wants to tie it with a ribbon as shown at the right. If the bow is 14 inches long, how many yards of ribbon does she need?

A. 1.5 B. 40 C. 48 D. 128

17. Mercy's container can hold 20 L. She wants to fill her water container to the full. If a liter of water cost P15.00, how much will Mercy pay?

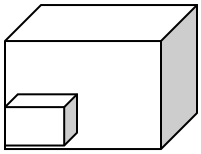


A. P75.00 C. P225.00
B. P150.00 D. P300.00

18. The family of Mr. Morena together with the family of Mang Jose, their tenant cooks 4.5 kilograms of rice a day for five days. On Saturday and Sunday, Mang Jose's family stays in the farm and Mr. Morena cooks only 2.5 kilograms. If Mr. Morena buys rice in bags containing 10 kilograms each? How many bags of rice does he buy every week?

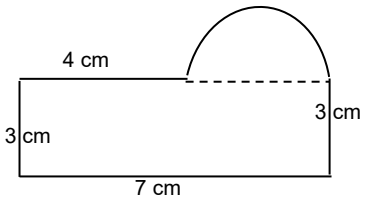
A. 2 B. 3 C. 4 D. 5

19. May is packing a set of wooden blocks into a rectangular box. Each wooden block is a 2 cm cube. If the dimensions of the rectangular box are 12 cm by 6 cm by 8 cm, how many wooden blocks can the box hold?



A. 24 B. 72 C. 576 D. 2304

20. What is the perimeter of the figure with the semicircular top shown at the right?



A. 20 cm C. 17 + 3π
B. 20 + 2.25π D. 17 + 1.5π

GLOSSARY OF TERMS USED IN THIS MODULE:

Measurement is the assignment of a numerical value to an attribute of an object, such as the length , weight and volume.

Non-Standard Units of Measurement are units that are not universally accepted. These are units that we invent to compare sizes, capacities and other physical quantities.

Standard Units of Measurement are the units that are universally available and are the same size for all who use them.

Metric system, also known as the International System (SI), is the primary system of measurement that has a base unit to which prefixes are added to indicate multiples of ten.

Customary System of Measurement are based on based on nature and everyday activities. The system for measuring length in the United States customary system is based on the inch, foot, yard, and mile.

Accuracy refers to how close a *measured* value is to the actual (true) value.

Precision is defined as, "(1) The ability of a measurement to be consistently reproduced" and "(2) The number of significant digits to which a value has been reliably measured".

Approximation an estimate of the value of some quantity to a desired degree of accuracy

Power consumption refers to the electrical energy over time that must be supplied to an electrical appliance or device to maintain its operation.

Water consumption is the amount of water consumed for a period of time as determined by using a water meter.

WEBSITE RESOURCES AND LINKS IN THIS MODULE:

http://www.historyworld.net/wrldhis/PlainTextHistories.asp?historyid=ac07
Gives the comprehensive history of measurement

http://www.french-metrology.com/en/history/history-mesurement.asp
Gives the history of measurement

http://www.theweatherprediction.com/habyhints/246/
Differentiate accuracy from precision

http://atlantis.coe.uh.edu/archive/science/science_lessons/scienceles3/measure/
Gives the history, standard units and interactive drill for both metric and customary system of measurement. Click on Drill and Practice for the interactive exercises.

http://janus.astro.umd.edu/astro/scinote/
Provides interactive practice converting between scientific notation and normal numbers. Click go to start the quiz.

http://www.convert-me.com/en/
Choose interactive units converter, pick the conversion you need by clicking alphabetical list, the use conversion online.

http://www.chem.sc.edu/faculty/morgan/resources/sigfigs/index.html
Tutorial on the use of scientific notation

http://www.cobbk12.org/sites/literacy/math/math2.htm
Select measurement, Choose the activity by clicking.

http://michaelbluejay.com/electricity/measure.html
Gives suggestions on how to save electricity

http://ed.fnal.gov/ntep/f98/projects/nrel_energy_2/measurement.html
Gives information on the general power rating of some appliances, formula for finding annual cost of power consumption and sample word problems related to measuring

http://www.erc.gov.ph/pdf/Cepalco_Annexes_11.14.07.pdf
Gives existing schedule of rates residential meter and general services applicable only to areas served.