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

DepED
DEPARTMENT OF EDUCATION

2018

LEARNING MODULE

Mathematics G9 | Q3

Geometry, Parallelogram and Triangle Similarity

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.

The learning modules developed by PEAC are aligned with the K to 12 Basic Education Curriculum of the Department of Education. Public school teachers may also download and use the learning modules.

MATHEMATICS 9

Module 3: Geometry Parallelogram and Triangle Similarity

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

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Have you ever wondered how engineers make structural designs? How do artist choose shapes in their art pieces? In this module you will try find answers to these questions. You will acquire knowledge and skills needed to solve problems involving shapes and geometric relationships. You will learn how to name and classify quadrilaterals. You will also verify some of the properties of parallelograms, rectangles, rhombuses, squares, trapezoids and kites and use these properties to differentiate one from the other. It is hoped that you will acquire deep understanding of the lesson to enable you to determine the best way to solve problems involving quadrilaterals and triangle similarity.

A quadrilateral can be classified into many different forms, but in this learning module you will focus on the most important family of quadrilaterals—trapezoids, parallelograms and kites, along with their sub-shapes. You will explore uses of quadrilaterals in real life. Make sure to write down insights gained on how understanding of quadrilaterals can be effectively used in real life as you do the various learning tasks in this module.

To be able to succeed in this module you need to ensure that you have a good understanding of what polygons are, the relationship been sides and angles as well as concepts of parallel and perpendicular lines.
This module contains four lessons. Each lesson includes applications of the shapes to real life situations for better appreciation of the topics.
Remember to search for the answer to the following question: What is the best way to solve problems involving quadrilaterals and triangle inequality?

☑ MODULE LESSONS AND COVERAGE:

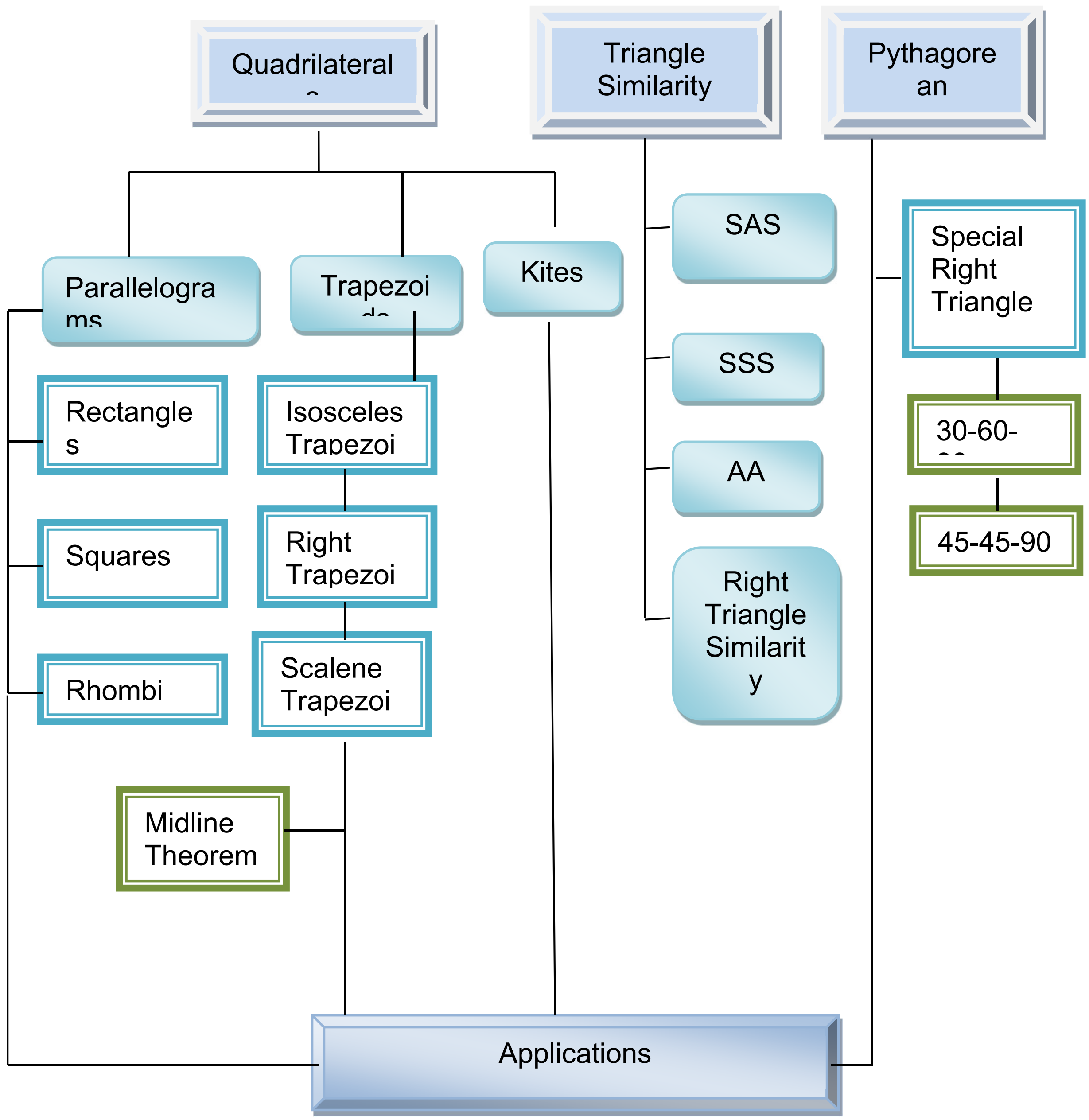
In this module, you will examine this question when you take the following lessons:

Lesson No.	Title	You'll learn to…
Lesson 1	Parallelogram	Identify quadrilateral that are parallelogram, trapezoid and kite Determines the conditions that guarantee a quadrilateral is a parallelogram. Use properties to find measures of angles, sides and other quantities involving parallelograms Prove theorems on different kinds of parallelograms.

Lesson No.	Title	You'll learn to…
		Prove the Midline Theorem
Lesson 2	Trapezoid and Kites	Prove theorems on trapezoids and kites Describe special trapezoid and their properties Demonstrate uses of quadrilaterals in real life. Solve problems involving parallelograms, trapezoids and kites.
Lesson 3	Triangle Similarity	Describes a proportion. Applies the fundamental theorems of proportionality to solve problems involving proportions Illustrates similarity of figures. Proves the conditions for similarity of triangles a. SAS Similarity Theorem b. SSS Similarity Theorem c. AA Similarity Theorem d. Right Triangle Similarity Theorem
Lesson 4	Special Right Triangle	Illustrates Special Right Triangle Theorem. Applies the theorems to show that give triangles are similar. Proves the Pythagorean Theorem. Solves problems that involve triangles similarity and right triangles.

☑ 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. Carefully read the module and do the activities neatly and accurately.
2. Break tasks into manageable parts.
3. Complete all activities even if you may not be asked to hand these in, but they will help you learn the material.
4. Keep copies of all accomplished activities. These are needed to assess your progress and for grading.
5. If you are having problems, do NOT wait to request help. The longer you wait the bigger the problem becomes!
6. Form study groups if possible.

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.

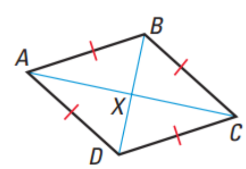
1. Which statement best differentiates squares from the rectangles?
   A. Squares must have four 90˚ angles, rectangles do not have all 90˚angles.
   B. Squares have two sets of equal sides, rectangles have only one pair of equal sides.
   C. Squares have four equal sides. Rectangles have two pairs of equal opposite sides.
   D. Squares have the diagonals that bisect each other. Rectangles have diagonals that are perpendicular.

2. When comparing a trapezoid and a kite, one similarity is:
   A. They both have congruent diagonals.
   B. They both have at least one set of parallel sides.
   C. They both have four congruent sides.
   D. They both have four sides

3. Points (2,1), (4,3) and (3,4) are vertices of a quadrilateral. What should be the coordinates of the fourth point to form a parallelogram?
   A. (1,2)   B. (2, 4)   C. (1, 4)   D. (1,3)

4. Suppose we are told two things about a quadrilateral: first, that it is aparallelogram, and second, that one of its interior angles measures 60°. The measure of the angle adjacent to the 60° angle is
   A. 60°
   B. 90°
   C. 120°
   D. impossible to know without more information

5. ABCD is a rhombus. How will you prove that its diagonals are perpendicular?



A. Show ∠AXB ≅ ∠ CXB, Since $\overline{AC}$ and $\overline{BD}$ intersect to form congruent adjacent angles, $\overline{AC} \perp \overline{BD}$.

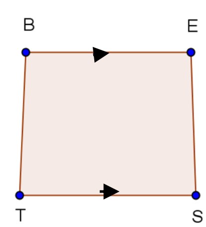
B. Show ΔAXB ≅ΔCXB. Since congruent parts of congruent triangles are congruent, then, $\overline{AC} \perp \overline{BD}$.

C. Show ΔBAD ≅ΔBCD. Since congruent parts of congruent triangles are congruent, then ∠AXB ≅∠CXB , then $\overline{AC} \perp \overline{BD}$.

D. Show ΔAXB ≅ΔCXD. Since ∠AXB ≅∠CXD , then $\overline{AC} \perp \overline{BD}$.

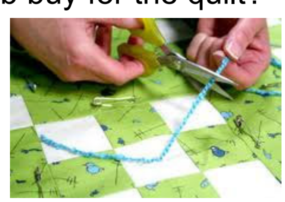
6. A carpenter accurately measure four boards to frame a door: two sides of 8 inches and a top and bottom of 40 inches. What else should a carpenter do to ensure that it will fit a rectangular door?
A. Set one side piece at right angle to the floor piece.
B. Ensure that the sides parallel.
C. Connect the opposite vertices with a pieces of woods of equal length forming diagonals.
D. Connect the two sides at their midpoints with a piece of wood.

7. Maria knows the following information about quadrilateral *BEST*: BT = *ES* , $\overline{TS} \parallel \overline{BE}$, and ∠T ≅ ∠*S*. Maria concludes that BEST *is* an isosceles trapezoid. Why can't Maria make this conclusion?



A. □BEST is a rectangle
B. □BEST is a square
C. □There is not enough information
D. Length of $\overline{BT}$ is and $\overline{ES}$ not known.

8. A Mothers' Club is making a quilt consisting of squares with each side measuring 40 cm. The quilt has five rows and 6 columns and with cord edging. How many meters of cord should the Club buy for the quilt?
A. 880
B. 88
C. 9
D. 8



9. If you are to design a room in the attic of a Victorian style house which looks like an isosceles triangle in the front and back view whose ceiling is parallel to the floor, furniture and fixtures are also designed in such a way to maximize the space. The possible things which may happen includes the following;

1. The floor area is wider than the ceiling.
2. The ceiling is wider than the floor area.
3. The bed can be attached to the side wall.
4. The built-in cabinets on the side wall are rectangular prisms.

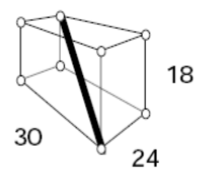
A. 1 only
B. 2 only
C. 1 and 3 only
D. 1 and 4 only

10. One liter of a certain paint can cover about 80 square feet. I want to paint a circle with a diameter of 28 ft. How many liters of paint will I buy?

A. 7 B. 8 C. 196 D. 616

11. What is the longest stick that can be placed inside a box with inside dimensions of 24 inches, 30inches, and 18 inches?

A. 38.4 inches
B. 30
C. $30\sqrt{2}$ inches
D. Can no be determined

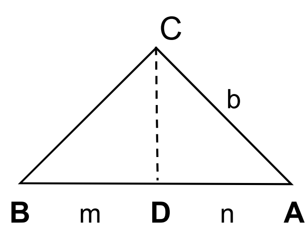


12. A triangular plot of land has boundary lines 45 meters, 60 meters, and 70 meters long. The 60 meter boundary line runs north-south. Is there a boundary line for the property that runs due east-west?

A. Yes. It's the 45 meters boundary.
B. Yes. It's the 70 meters boundary.
C. No. The plot is not a right triangle.
D. Cannot be determined.

13. Which of the following supports statement 3 in the proof?

Figure:



Statements	Reasons
1.Draw CD $\perp$ AB.	1. There is only one and only one line perpendicular to a given line form an external point.
2. CD is the altitude to AB.	2. Definition of Altitude
3. $h^2 = mn$ $a^2 = m(m+n)$ $b^2 = n(m+n)$	3._________
4.$a^2 + b^2 = m(m+n) + n(m+n)$	4. Addition Property of Equality

5.$a^2 + b^2 = (m+n)(m+n)$	5. Factoring
6. $m + n = c$	6.Definition of Betweeness
7. $a^2 + b^2 = (c)(c)$ $a^2+b^2 = c^2$	7.Addition Property of Equality Simplifying

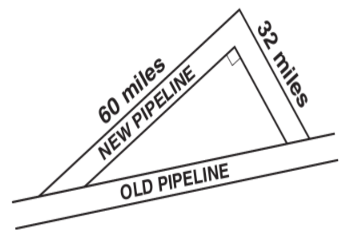
A. Geometric Mean Theorem

B. SSS Similarity Theorem

C. SAS Similarity Theorem

D. AA Similarity Theorem

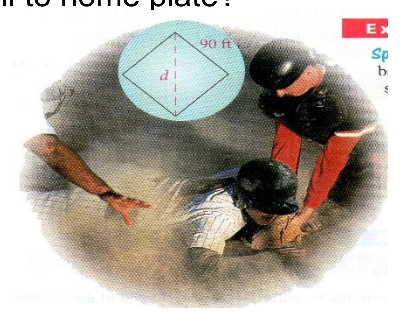
14. A new pipeline is being constructed to re-route the water flow around the exterior of the City Park. The plan showing the old pipeline and the new route is shown below. About how many extra miles will the water flow once the new route is established?
A. 24
B. 68
C. 92
D. 160



15. The dimensions of a rectangular doorway are 200 cm by 80 cm. Can a circular mirror with a diameter of 210 cm be carried through the doorway?
A. No. Diameter is longer than the length of the door.

B. Yes. The diameter is less than 200 cm by 80 cm.
C. Yes. Hold it along the diagonal of the door.
D. Additional information is needed to answer the question.

16. A baseball diamond is a square. The distance fromthe base to base is 90 ft. How far does the second baseman throw a ball to home plate?

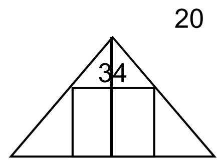


A. $6\sqrt{5}$ ft
B. 180 ft
C. $90\sqrt{2}$ ft
D. $45\sqrt{5}$ ft

17. Makee would like to have a new corner cabinet for his room. He is trying to figure out how to design it so that his TV which is 30" high, 34 inches wide and 20 " deep would fit. He wants the new cabinet to be the same length on each side (along the two walls). How long should each side of the cabinet be?
A. 84 inches

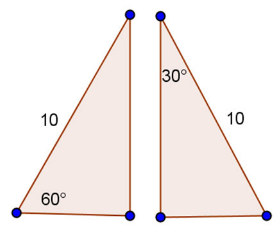
B. 64 inches
C. 42.2 inches
D. 37 inches

18. Which triangles must be similar?



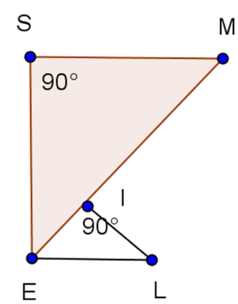
A. Two obtuse triangles
B. Two scalene triangles with congruent bases
C. Two right triangles
D. Two isosceles triangles with congruent

19. Which of the following best describes the triangles at the right?
A. Both are similar and congruent
B. Similar but not congruent.
C. Congruent but not similar
D. Neither similar nor congruent.



20. $\overline{SM} \parallel \overline{EL}$. Which of the following guarantee that Δ SME is similar to ΔCDE?

A. SAS Similarity
B. SSS Similarity
C. AA Similarity
D. None of the above



Did you do well in the pretest? Are there items that you were not sure of your answers? You can go back to those items as you gain new knowledge and skills. Now, proceed to Lesson 1. Take time to list ideas and concepts in the lessons.

Lesson 1: Quadrilaterals

In this lesson you will learn the following:

1. Describe the properties of quadrilaterals.
2. Determine the conditions that guarantee a quadrilateral is a parallelogram.
3. Use properties to find measures of angles, sides and other quantities involving parallelograms
4. Prove theorems on different kinds of parallelograms.
5. Demonstrate uses of quadrilaterals in real life.
6. Solve problems involving parallelograms.

EXPLORE

What are quadrilaterals? How do we use them? Where do we see them in real life? Quadrilaterals are everywhere. We see them on signs, buildings, work of art, books, computers, floor designs and many more. A polygon with four sides is a quadrilateral. In this lesson you will know more about quadrilaterals. Start by doing Activity 1.

ACTIVITY 1a Map It

Arrange the boxes to form a concept map that will show the relations between and among the different shapes.

Quadrilaterals	Parallelograms	Trapezoids
Squares	Rhombi	kites
Rectangles	Isosceles Trapezoids	Right Trapezoids

Your concept map here.

Questions to Answer:

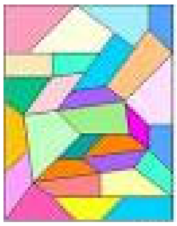
1. What is the basis of your arrangement?
2. How can you differentiate a shape from the other?
3. How can we use the properties of quadrilaterals to create designs and solve problems?

YOUR ANSWERS

In Activity 1, you made a concept map on your initial understanding of the different quadrilaterals. In the next activity you will see actual use of these shapes in real life. Take note of some questions that you might want to ask from your teacher especially on the reason why a shape is used in a particular situation.

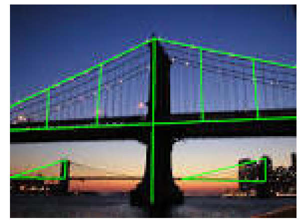
ACTIVITY 2a Quadrilaterals Everywhere

Below are some pictures of quadrilaterals in real life. Can you identify them? Can you give possible reasons why the shape is such?



A

B



C

D

E

F

You see why you need to have a good knowledge of quadrilaterals. Identifying these shapes and the understanding the properties will enable you to use appropriately these shapes.

Questions to Answer:

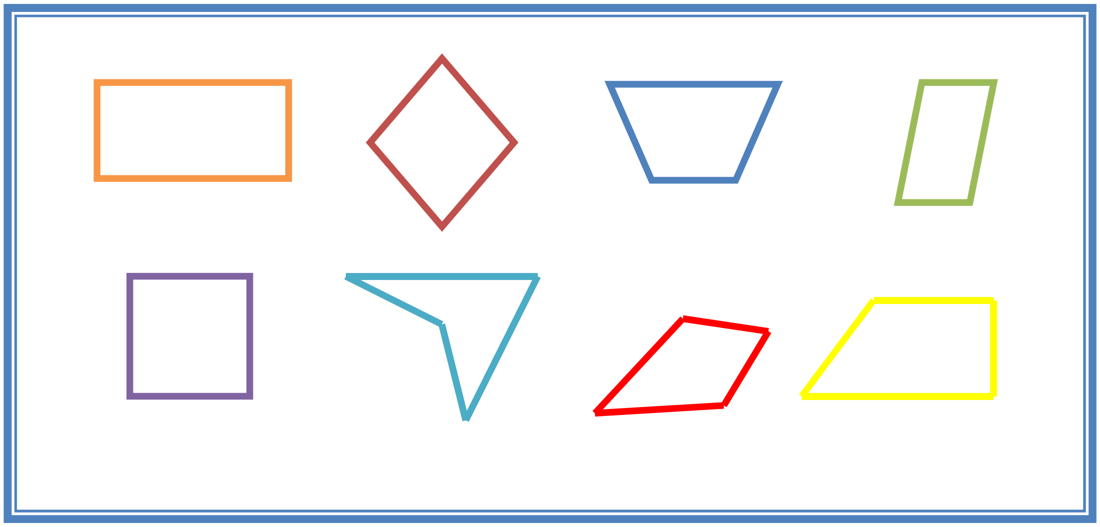
Can you cite other examples of the uses of the quadrilaterals in real life?

In the next activity you will learn how to classify quadrilaterals. Doing so, will help you identify similarities and differences between and among quadrilaterals.

At the end of this module you are expected to make a model that will demonstrate the best solution to a problem. Challenge yourself to finish the module in not more than two weeks.

ACTIVITY 3a To Be or Not To Be

Given a set of quadrilaterals, group them based on their common features by dragging them in the column for examples. Name and describe each group in terms of their identifying characteristics in 5 minutes.



Type of Quadrilaterals	Definition	Examples

Questions to Answer:

1. What are quadrilaterals?
2. How are the different types of quadrilaterals named?
3. How are quadrilaterals denoted?
4. Are there other ways of grouping quadrilaterals? How?
5. What are the properties of each quadrilateral?
6. Why is there a need to know the properties of these quadrilaterals?

YOUR ANSWERS

Now, you have a clear idea of what quadrilaterals are. In the next activity, you will build up your knowledge and skills in parallelograms by mastering their properties.

End of EXPLORE:

You just have classified quadrilaterals. Let us now strengthen that insight by doing the succeeding activities. What you will be learning in this section will help you perform well in your final performance task which will challenge you to use what you know to create a design that will help you use the materials efficiently or maximize the use of space.

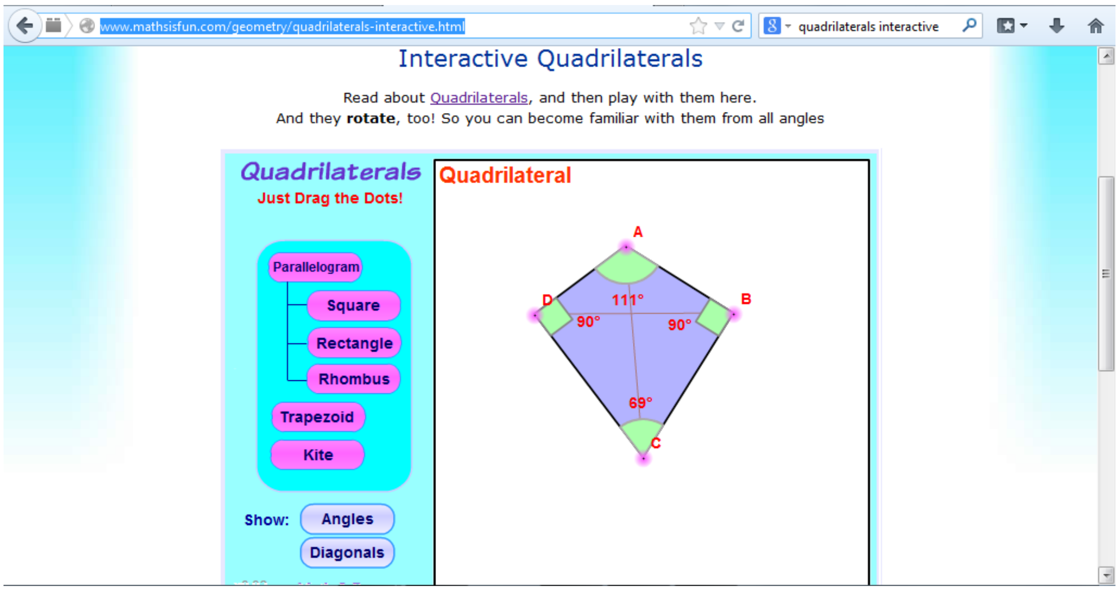
FIRM-UP

How do you know a shape is a quadrilateral? Why are quadrilaterals important? How are they used in real life? What is the best way to solve problems involving quadrilaterals? Discover the answers to these questions as you do the next tasks.

Your goal in this section is to have a good understanding of the properties of quadrilaterals. Properties of quadrilaterals will enable you to differentiate one from the other and use these shapes efficiently.

ACTIVITY 4a Show and Tell

Access http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html. Click on angles and diagonals to answer the questions below.



Drag the dots, observe the measures of the angles and the length and positions of the diagonals. Use your discovery to answer the following questions.

Questions to Answer:

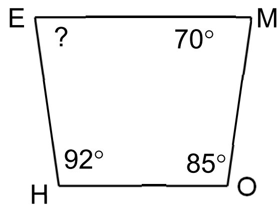
1. Given a quadrilateral ABCD, when are its side said to be opposite? Consecutive?
2. What angle is opposite ∠A ? ∠B? ∠C?∠D?
3. Which are consecutive angles?
4. What is the sum of the interior angles of a quadrilateral? How did get this number?
5. Can an interior angle of a quadrilateral measure more than 180˚? Draw a sample of this quadrilateral.

Your answers here.

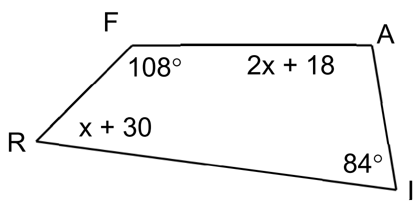
ACTIVITY 5a Try This Out

Use your answers to the questions above to find the measure of the indicated angles below. Drag the points to show the measures of the four angles. Are your answers correct?

a) m∠E



b) What is x?

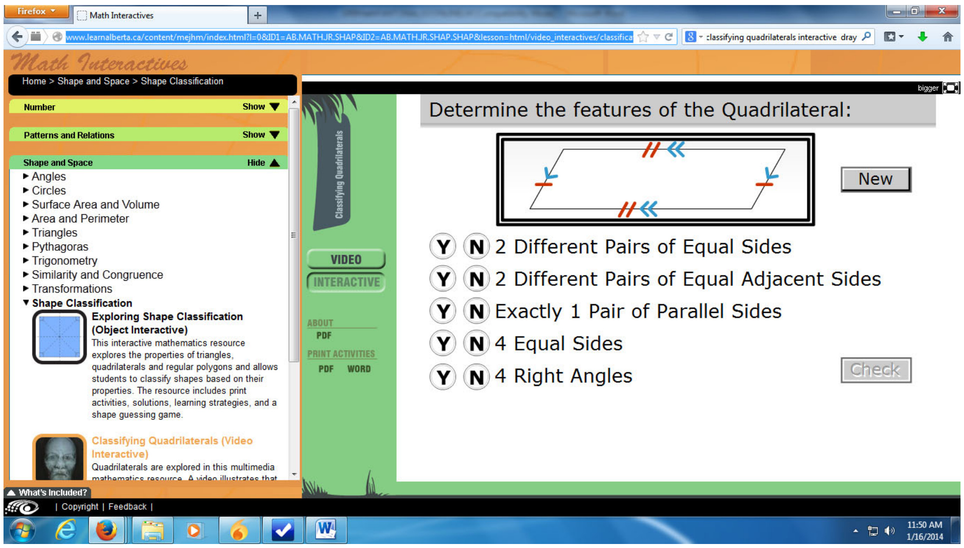


Now summarize the properties of a quadrilateral by completing the phrase" polygon is a quadrilateral if …" considering the following:

	A polygon is a quadrilateral if …
Sides	
vertices	
Interior angles	

ACTIVITY 6a Check your Understanding

Do self-assessment by accessing the website http://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.SHAP&ID2=AB.MATH.JR.SHAP.SHAP&lesson=html/video_interactives/classifications/classificationsInteractive.html

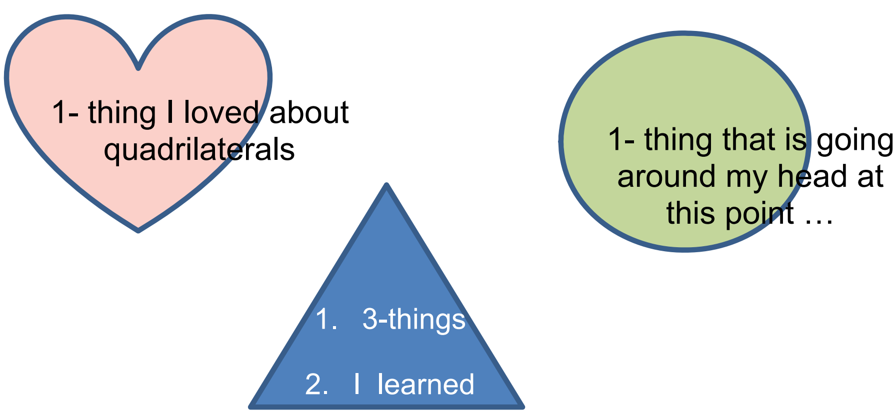


Click on new and answer the items. Click check when you are done.

Did you do well in the quiz? Are there questions that you would like to ask? Post it in the Discussion Forum.

Before you proceed to the next activity do a self- assessment. This help you identify areas that you are doing well and areas that you need to work harder.

ACTIVITY 7a Shaping Up Review



Your answers here.

From the previous activity, you tried to classify quadrilaterals into three groups: parallelogram, trapezoid and kite. How can you differentiate one from the other? In what way are they similar? How can knowledge on the properties of these shapes help you determine their best use?

1.2 Parallelograms

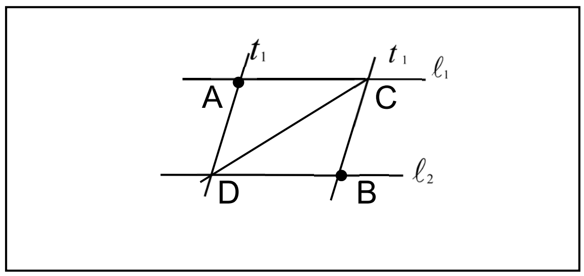
In this section you will firm up your knowledge on quadrilaterals by identifying special quadrilaterals known as parallelograms. Questions that you need to answer in this section are: When is a quadrilateral called a parallelogram? How can you find measures of angles, sides and other quantities involving parallelograms? How are parallelograms used in real life? Write down your answers to these questions as you do the next activities.

Properties of Parallelograms

In the next activity you will focus on quadrilaterals which are parallelograms. Here you will put to use your knowledge on parallel lines and their transversals to identify properties of parallelograms.

ACTIVITY 8a Draw and Discover

Use the diagram to help you follow the instructions below. You are expected to identify properties of quadrilateral formed by parallel lines in terms of the relationships of its sides, angles and diagonals.



Questions to Answer:

1. Draw two horizontal lines passing through points A and B and name them ℓ_1 *and* ℓ_2.
2. Draw a transversal t_1 passing through point A.
3. Draw a transversal t_2 passing through B parallel to the first transversal. How do you know the transversals are parallel?
4. Label the other intersections C and D.
5. Measure the length of the two opposite sides AC and DB. What can you say about the two opposite sides? Do the same for sides AD and CB. What theorem on parallel lines supports your answer?
6. Now, cut the parallelogram and duplicate by tracing the cut out figure.
7. Using a straight edge connect the two opposite vertices A and B and cut along this line.

8. Superimpose the two triangles such that corresponding parts coincides. Does one triangle completely cover the other triangle? Are the corresponding sides congruent? Are the corresponding angles congruent? Are the two triangles congruent?
9. Do the same for the duplicate parallelogram connecting CD and cutting along this diagonal.
10. By superimposing the cut out triangles, can you say that the triangles formed are congruent? What conclusion can you make about the diagonals of the parallelogram?
11. Using the cut out figures show that diagonals of a parallelogram bisect each other. Describe your process.
12. With the help of the same cut out figures answer the question: Are the diagonals of a parallelogram equal?
13. When is a quadrilateral said to be a parallelogram? Summarize your findings by completing the table below:

Write your answers here…

	If a quadrilateral is a parallelogram, then...	EXAMPLE
SIDES		
ANGLES		

DIAGONALS		

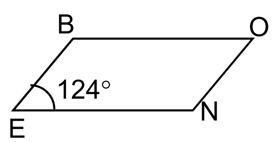
Now check your findings by going back to the interactive site: http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html. Click on parallelograms and angles. Drag the points to verify your findings. Click on diagonals. Drag points and verify your findings. Is there a need to revise your initial findings. Go back to your summary table and finalize your answers. Can you draw other shapes of parallelograms?

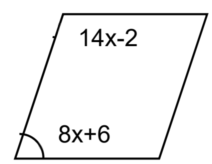
Now that you know the properties of parallelograms, put it to use by answering the next activity.

ACTIVITY 9a Parallelograms Challenge

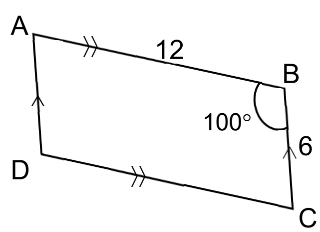
Use the properties of parallelograms to answer the following:

1. Find the measures of the other angles of parallelogram CDEB.

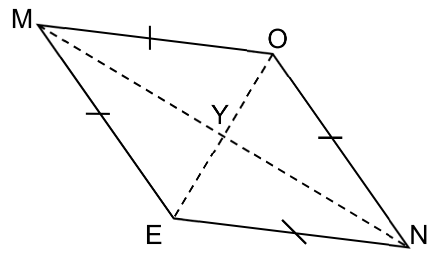




2. In the figure below, find $m\angle A$, $m\angle C$, $m\angle D$, CD, and AD.



3. Find $m\angle MOE$, $m\angle NOE$, and $m\angle MYO$.



m∠MON= 120°

Write your answers here…

Were you able to answer all the items? Are there questions that you would like to ask? Post it in the Discussion Forum.

Now rate your progress in understanding of the lesson based on your performance in Activities 6.

			
I need to shine my star!	Leveling up!	Good job!	Excellent!

You have learned in the previous section that parallelograms are special type of quadrilaterals. Are there special types of parallelograms? How do you differentiate one from the other? You will continue to build up your understanding of parallelograms in the succeeding activities.

END OF FIRM - UP

In this section you have learned that parallelograms are quadrilaterals. What make them special quadrilaterals are their unique properties: they have two pairs of opposite sides that are parallel, opposite angles are congruent and consecutive angles are supplementary.

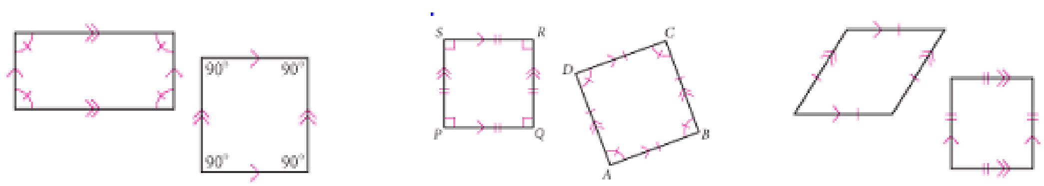
In the next section you will deepen your knowledge on parallelograms and study special parallelograms. When are parallelograms said to be special?

DEEPEN

Now you know that a quadrilateral can be a parallelogram. In the next activity, you will put to test what you know about parallelograms. Doing this activity will deepen your knowledge on parallelograms and help you solve problems involving quadrilateral. After this section answer the question: What is the best way to solve problems involving quadrilaterals? Then compare your answer to your

Classifying Parallelograms

ACTIVITY 10 **What Makes Them Special?**



Study the special quadrilaterals above. Like markings denote congruent sides or angles and arrows denote parallel sides. When is a parallelogram a rectangle? A square? A rhombus? Summarize your answers in the table below.

Special Parallelogram	Definition	Draw an illustrative example. If ABCD is a …
Rectangle		
Square		

Rhombus		

Look at your definitions of the three quadrilaterals. Will you be able to compare and contrast a rectangle from the square? from a rhombus? Are there other ways of representing these parallelograms?

The rectangle, rhombus, and square have a few other special properties. First, remember that these figures are all parallelograms; therefore, they possess the same properties as any parallelogram. However, because these figures are special parallelograms, they also have additional properties.

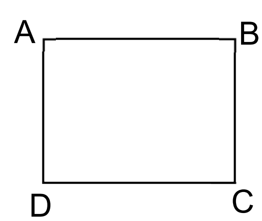
What are the properties of special quadrilaterals? How can you use these properties to differentiate one from the other? How can these properties help you identify the best way to solve problems involving quadrilaterals? You will discover these special properties by doing an investigation.

1.2.1 Rectangles

In this section you will deepen your knowledge on special parallelogram called rectangle. What makes it special? How is it different from the other types of parallelograms? Discover answers to these questions by doing the next activity.

ACTIVITY 11a **When Am I a Rectangle?**

Read and answer the questions below about rectangles.



A rectangle is a parallelogram with equal angles
What is the full meaning of this definition?
If the rectangle is to be equiangular, what is the measure of each angle?
Draw the diagonals. What relationship exist between the diagonals?

Summarize your answer in the table below.

	If a parallelogram a rectangle , then...	EXAMPLE
SIDES		
ANGLES		
DIAGONALS		

Verify your answer by accessing the same website. This time, click rectangles and angles. Click on diagonals. Observe. Do the measures of the interior angles change when you increase or decrease the length of the rectangle?

Now let us go back to our previous activity about quadrilateral let us see if you have now a better understanding.

Lesson 1.1 Quadrilaterals

What are quadrilaterals? How do we use them? Where do we see them in real life? Quadrilaterals are everywhere. We see them on signs, buildings, work of art, books, computers, floor designs and many more. A polygon with four sides is a quadrilateral. In this lesson you will know more about quadrilaterals. Start by doing the next Activity.

ACTIVITY 12a **Map It**

Arrange the boxes to form a concept map that will show the relations between and among the different shapes.

Quadrilaterals	Parallelograms	Trapezoids
Squares	Rhombi	kites
Rectangles	Isosceles Trapezoids	Right Trapezoids

Your concept map here.

Questions to Answer:

1. What is the basis of your arrangement?
2. How can you differentiate a shape from the other?
3. How can we use the properties of quadrilaterals to create designs and solve problems?

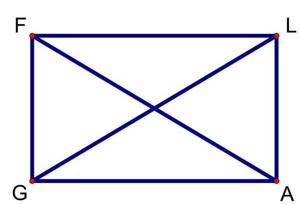
Write your answers here….

Proving that the Diagonals of Rectangles are Congruent

ACTIVITY 13a Are we Congruent?

Given: Rectangle FLAG.

Prove: $\overline{FA} \cong \overline{LG}$



Do this by supplying the reasons for each of the given statement.

We know that	Because…
FL = GA	
$\angle LFG \cong \angle FGA$	
FG = FG	
$\Delta GFL \cong \Delta GAL$	
GL = FA	

What did you realize about the diagonals of a rectangle? Write it down.

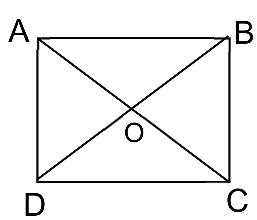
Diagonals of rectangles are ____ .

Now probe deeper into the properties of rectangles. You have discovered that diagonals of rectangles are congruent. Now prove that the diagonals bisect each other.

Proving Properties of Rectangles

ACTIVITY 14a **Mutually Bisecting Diagonals?**

ABCD is a rectangle. Prove the diagonals of a rectangle bisect each other.



We know that	Because…
AB//DC	
∠BAC≅∠ACD	
∠BDC≅∠ABD	
∆AOB ≅ ∆DOC	
AO=OC	
DO=OB	
Conclusion:	

Now generalize the properties of a rectangle by completing the table below.

	A parallelogram is a rectangle if …
Sides	
Interior angles	
diagonals	

Now that you have been writing proofs for the different properties of parallelograms, reflect on your experiences of learning to write proofs.

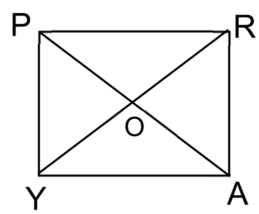
ACTIVITY 15a Auto—math-ography

What does it mean to write a mathematical proof? Write in few sentences your explanation.

Your explanation here

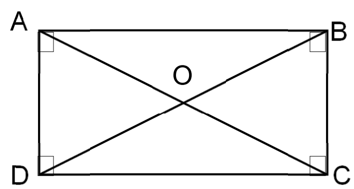
Now use the properties to answer the exercises below.

ACTIVITY 16a Rectangles Challenge



1. Given: PA = 18, m∠RYA = 35°. Find: RY, PR, PO, m∠RPA, m∠POY

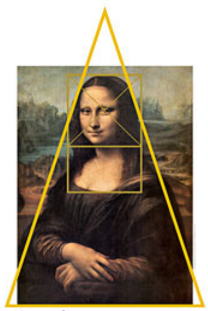
2. In figure below , find BD, *AO, OC, DO,* and OB. Given: AC = 16



Your answers here.

ACTIVITY 17a My Golden Rectangle

The Golden Rectangle is proposed to be the most aesthetically pleasing of all possible rectangles.



This is the reason why it has been used extensively in art and architecture. The most prominent and well known uses of the Golden Rectangle in art were created by the great Italian artist, inventor, and mathematician, Leonardo da Vinci.

In da Vinci's "Mona Lisa" Golden Rectangle frames central elements in the composition. If you draw a rectangle whose base extends from the woman's right wrist and extend the rectangle vertically until it reaches the very top of her head, you will have a Golden Rectangle.

Then, if you draw squares inside this Golden Rectangle you will discover that the edges of these new squares come to all the important focal points of the woman: her chin, her eye, her nose, and the upturned corner of her mysterious mouth.

Questions to Answer:

1. Why is it called a Golden Rectangle?
2. How can one draw a Golden Rectangle?
3. What are the other uses of Golden Rectangles in real life?
4. Make your own presentation using the golden rectangle. As soon as done share it with your teacher.

Your answers here.

Go to the website: http://www.youtube.com/watch?v=suiDK61jAc8 (The Golden Ratio).
Or go to: http://goldenratiorocks.wordpress.com/golden-ratio-real-life-examples/
You will see more examples on the uses of golden rectangles and watch a video.

My Golden Rectangle

When this activity is done, set an appointment with your teacher for a chat. Make sure that you did all the task and have answered questions embedded in each activity. Your teachers will ask you questions related to what you have studied.

ACTIVITY 18a Let's Chat

Answer the questions of your teachers to the best you can. Don't hesitate to ask your own questions if you have any at the end of your chat.

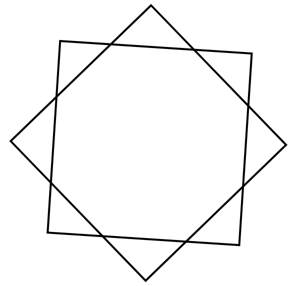
In the next activity you will deepen your understanding on the properties of squares.

ACTIVITY 19a The Power of the Square

The Power of the Center explains why most painting prefers squarer shape . As we move from the center things lose importance. Also, as we'll see, a squarer format is consistent with rest, repose, dignity, and timelessness; things that artists often want their paintings to convey.

But the square format has one property that the rectangular does not have; it gives a scene stillness and serenity, a calm and dignity associated with the round format. This makes it ideal for a subjects such as a Madonna.

Other than art the square is also used in architecture. One of the most famous structure the made use of squares is the Petronas Twin Tower of Malaysia. The design of the tower is composed of an 8-point star formed by intersecting squares. This is a common characteristic of a Muslim architecture.



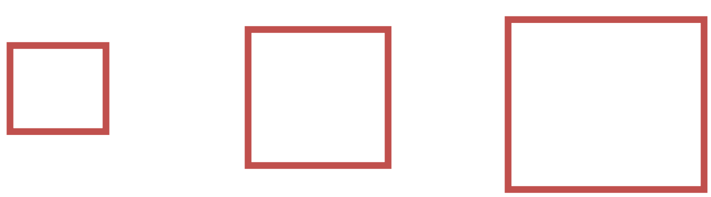
Questions to Answer:

1. Where else in real life do we usually find squares?
2. Cite an instance where square is a better option than the other parallelograms.
3. What are the properties of the squares that make them so useful?

Your answers here.

ACTIVITY 20a Closer Look at the Square

Make three different sizes squares. Investigate the relationships of the sides and the angles.

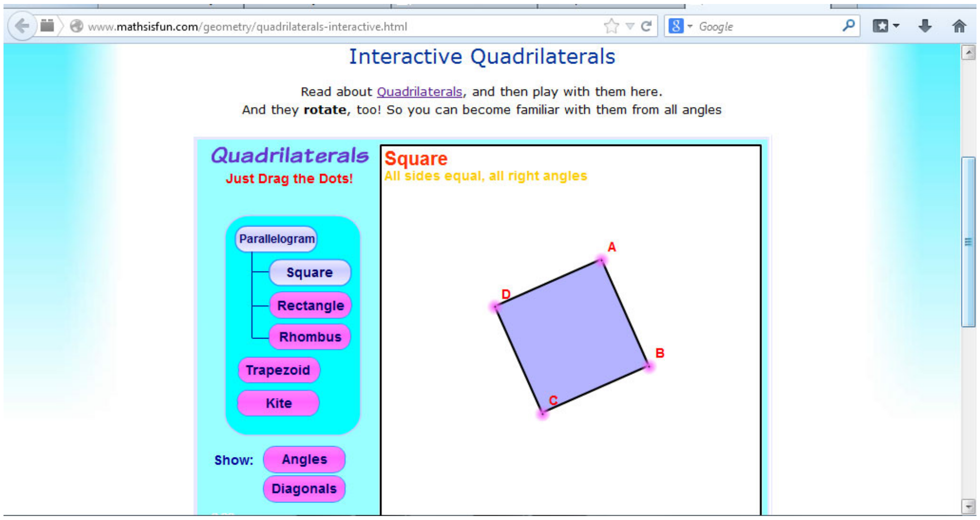


Questions to Answer:

1. Fold the biggest square so that the opposite sides coincide. Are the opposite sides equal? Do the same for the other squares. Is your observation the same for the smaller squares?
2. Draw the diagonals and measure. What can you say about the measures of the diagonals?
3. Fold the squares so that the four vertices coincide. Are the angles equal? What are the measures of the angles? What theorem supports your answer.
4. What kind of quadrilateral is a square? Based on this fact what are the other properties of a square?
5. Summarize your findings by completing the table below.

	If a parallelogram a square , then...	EXAMPLE
SIDES		
ANGLES		
DIAGONALS		

Now check your findings by going back to the interactive site: http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html. Click on squares and angles. Drag the points to verify your findings. Click on diagonals. Observe. Are your findings consistent with what you have observe?



Now you know the special properties of the squares. These are the properties that makes them very useful. Challenge yourself to use these knowledge by doing the next activity.

ACTIVITY 21a Designing with a Square

Look at ads, magazines, brochures, logos, and other printed projects and try to find as many different examples of square shapes. Study the designs. Identify examples of square shapes that convey the attributes of honesty, stability, equality, comfort, or familiarity. Which designs convey rigidity or uniformity?

Design your own presentation using a square. What is the most important feature of your design? Use the resources of voki.com to explain your output. When done share your design by publishing it in a social media. Tag your teacher for the evaluation of your output.

Your Output here

Now you know two of the very special parallelograms: rectangles and squares. The third type is the rhombus. Discover its properties by doing the next activity.

1.2.3 Rhombus

A rhombus is a special kind of parallelogram. Many architectural structures and art pieces make use of rhombi. Knowing about the special properties of a rhombus is important to identifying and using these special parallelograms. *Access the following sites to see examples.*

1. http://www.youtube.com/watch?v=i2a4B4M5L1M
   Watch how a rhombus can be used to make a flexible paper structure.
2. http://www.youtube.com/watch?v=S-nNib5HzUA
   Gives another type of flexible paper structure.

3. **http://www.youtube.com/watch?v=p9xKxEV1FkY**
   Demonstrate how to make an Origami Fireworks making use of rhombi shapes.

4. http://www.youtube.com/watch?v=knMEBSXM6WU
   Demonstrate how to make use of rhombi to make an origami flexiball.

5. http://rhombusspace.blogspot.com/
   Gives examples of art pieces using rhombi.

6. http://www.ysjournal.com/article.asp?issn=0974-6102;year=2009;volume=2;issue=7;spage=35;epage=46;aulast=Khair
   Gives examples of the uses of rhombi in architecture

7. www.photoxpress.com/photos-skyscraper-lozenge-rhombus-4723361
   Gives photos depicting how rhombi are used in architecture

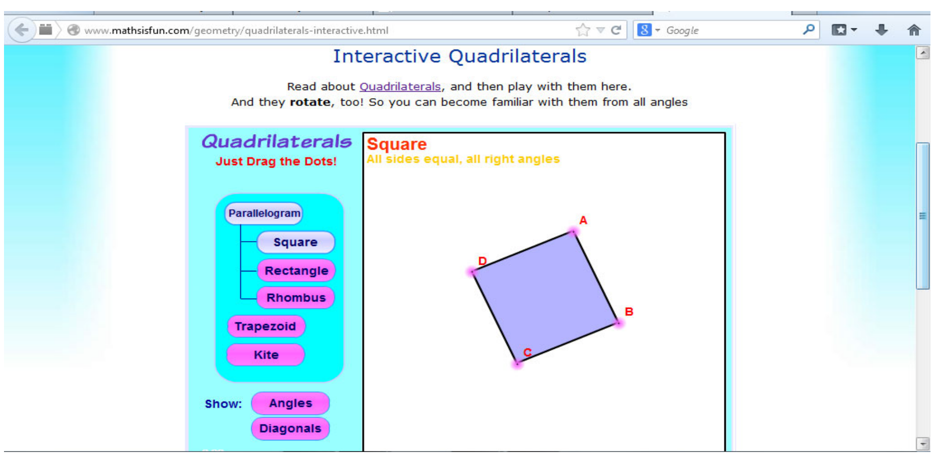
British Museum has glass, tessellated

What makes rhombus very useful as a shape? What makes it flexible? Know more about the rhombus in the next activities. Take note of these questions as you do the activities.

Your answers here.

ACTIVITY 22a Rhombus under Scrutiny

Access: http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html. Click on rhombus and drag the points. Observe. Are there changes in the lengths of sides? Click on angles and drag. Observe what happens to the measures of the angles. Click on diagonals. Drag and Observe.



Questions to Answer:

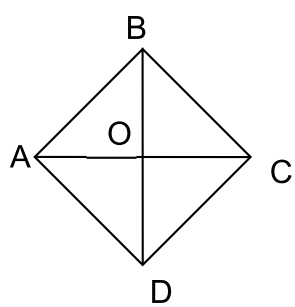
1. What relationships exist among the consecutive sides? The opposite sides?
2. What relationships exist between the opposite angles? Consecutive angles?
3. What relationship exist between diagonals?
4. Summarize your findings below.

	If a parallelogram is a rhombus, then...	EXAMPLE
SIDES		
ANGLES		
DIAGONALS		

What meaningful insight did you gain from the activity? Write this insight in your Learning Log. Have you discovered what makes rhombi flexible? The next activity will deepen your understanding of rhombi. You will investigate on the relationship between diagonals.

ACTIVITY 23a **Always at the Right!**

Given: ABCD is a rhombus. Show that its diagonals AC and BD are perpendicular.

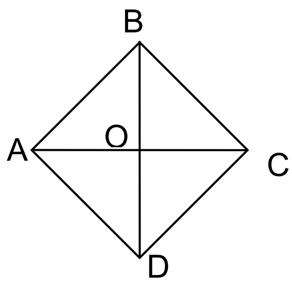


We know that…	Because…
1. AC bisect BD	
2. AB = BC, AD = DC	
3. AC⊥BD	

You have established that diagonals of a rhombus are perpendicular to each other. You will not stop here. Investigate some more. This time on the relationship of diagonals and angles.

ACTIVITY 24a Great Angle Dividers

Show that Perpendiculars of a rhombus bisect the angles.



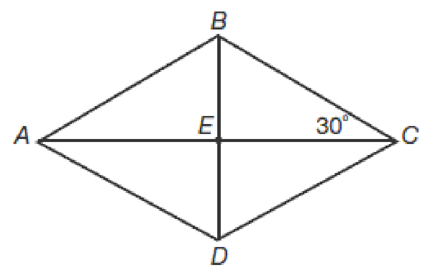
We know that…	Because…
1. $\Delta BCD \cong \Delta BAD$	
2. $\angle CBD \cong \angle ABD$, $\angle CDB \cong \angle ADB$	
3. BD bisect $\angle ABC$ and $\angle ADC$	
4. $\Delta ABC \cong \Delta ADC$	
5. $\angle CBD \cong \angle ABD$, $\angle CDB \cong \angle ADB$	
Thus:	

Now that you have investigated on the properties of the rhombi, use your knowledge by answering the next activity.

ACTIVITY 25a The Rhombus Challenge

Task: Given ABCD is a rhombus. Find:

a. m∠DCE
b. m∠BAE
c. m∠EAD
d. m∠ECD
e. m∠EBA
f. m∠EBC

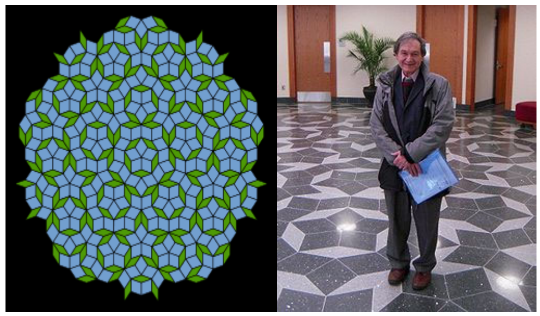


We know that	Because…
1. m∠BEA =	
2. m∠DCE =	
3. m∠DAB = m∠DCB	Opposite angles of quadrilaterals are congruent
4. m∠BAE =	
5. m∠EAD =	
6. m∠DAB + m∠ABC = 180°	Consecutive angles of a parallelogram are supplementary
7. m∠ABC =	
8. m∠ABE =	
9. m∠ADC =	
10. m∠ADE =	

Proving relationships between sides and angles is a good exercise to sharpen your reasoning skills which is a very important skill in problem solving. In the next activity you will investigate on some real life uses of a rhombus. Write down ideas as you do the activity.

ACTIVITY 26a Beautiful and Flexible Rhombi

The Penrose rhombuses are a pair of rhombuses with equal sides but different angles.



Penrose tiling at Mitchell Institute
for Fundamental Physics and Astronomy

Where else in real life are rhombi used? Create a list. Now create your own design using rhombi only. What kind of rhombi did you use in your design? Share your output at the discussion forum. Make sure that you attach your output or picture of your output. Output could be an art piece , an origami or structural design.

You can use tessellation tools for tessellation output. Access the following sites for practice.

http://www.shodor.org/interactivate/activities/Tessellate/

You can start by selecting shape then try changing corners and edges then tessellate.

Your Output here

Now rate your progress in understanding of the lesson based on your performance in activities 1 to 22.

			
I need to shine my star!	Leveling up!	Good job!	Excellent!

Now that you have knowledge quadrilaterals, do the next activity to ensure that you acquire skills in the construction of the following quadrilaterals.

ACTIVITY 27a **Measure your Progress?**

Access the website below and take the quiz. How well did you perform?

http://library.thinkquest.org/20991/textonly/quizzes/geo/q6/test.html

Now build up your skills in construction by doing the next activity

ACTIVITY 28a **(Level 1 Scaffold). Let's Construct**

(Your skills acquired in this activity will help you later in the making of a three dimensional model.)

Use one of the web 2.0 tools to construct the following quadrilaterals.
a. Geometry Skecthpad
b. GeoGebra

1. General Parallelograms
   a. One angle measures 43˚
   b. Shorter side is 2 inches and one angle measures 105˚.

2. Rectangles
   a. shorter side is 1 inch and longer side is 3 inches.
   b. longer side is 3 inches diameter is 4 inches.

3. Square

a. side is 3 inches

4. Rhombus
   a. smallest angle is 50˚
   b. one side measure 2 inches and the other measures 5 inches.

How did you fare in this activity? How can you apply the skills that you have gained in construction in problem solving involving quadrilaterals?

Your Answers Here

It is expected that at this point you have gained deep understanding of quadrilaterals and their applications. Express this understanding by revising your original concept map to reflect your new realizations. It is expected that this time your map will be more comprehensive and will reflect the relationships between and among shapes being considered.

ACTIVITY 29a Do Is See A Bigger Picture Now?

<u>Activity 29a.</u> Do Is See A Bigger Picture Now?

Go back to your concept map. Revised based on what you have learned about parallelograms and make it more comprehensive.

Your Answer Here

Questions to Answer:

1. What changes did you make?
2. What misconceptions were you able to correct?
3. How can your knowledge of parallelograms help in identifying the best way to solve problems involving efficiency of the use of materials and space?

Your Answers Here

ACTIVITY 30a **Let's Sum It Up!**

In the table below summarize what you have learned about parallelograms.

Parallelograms	Properties	Where best to use it?
Rectangles		
Squares		
Rhombi		

Questions to Answer:

Given a problem involving quadrilaterals, how can your knowledge of its properties help determine the best shape to use? What other factors would you consider to identify the best solution to the problem?

Your answer here.

Post your answers in http://whiteboard.com

End of DEEPEN

In this section you were able to deepen your knowledge on parallelograms by classifying them into three subsets: rectangles, squares and rhombi. You have learned to construct this figures using web 2.0 technologies. In the next section, you will use your knowledge and skills gained in many situations in life to better appreciate what you are learning.

TRANSFER

In the previous sections, you gain understanding on quadrilaterals and its sub-set parallelograms. In the next activity describe insights you have gained from the various activities. Use the questions below to guide you in your reflection.

ACTIVITY 31a **Journal Writing**

- How can you tell one quadrilateral from the other?
- How are quadrilaterals used in real life?
- How can models be used to show solutions to problems involving quadrilaterals?

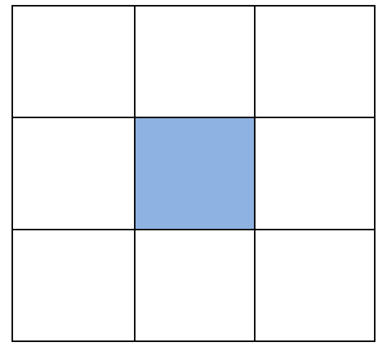
Your Answer Here

Should you have questions related to the questions above, click Discussion Forum and post your question

Now sum up what you have learned about quadrilaterals. Should you have questions, post these questions in the Discussion Forum. In the next activity you will challenge yourself to use what you have learn to solve the problem.

ACTIVITY 32a Tiling Challenge

You are task to study the number and size of tiles needed for the floor of the receiving room. The room is a square with an area of 81 square meters. The whole area must be divided into 9 congruent squares, the middle square must be divided again into 9 congruent squares and the middle square must be divided again into nine congruent squares. What is the side of the smallest middle square in the pattern? Can you use the same pattern for other number of squares? Show your solution.



Your solution here.

What guided you in answering this challenge? How did you identify the best solution?

In the next activity use the insight that you have gained to identify the best way to solve the problem below.

ACTIVITY 33a Architect's Square Parquet Floor

After making a parquet floor in an office building, the carpenters had left-over pieces of wood in the shape of right triangles with sides of 1, 2, and 5. The architect would like to use these pieces for a parquet floor in his own house. He wants to know: can he make a perfect square from 20 of these triangles? If so, what will it look like?

Questions to Answer:

1. How did you solve the problem? What properties of quadrilaterals did you use?
2. What other Math concepts were useful in solving the problem?
3. Is there another way of solving the problem? Which of the process do you think is the best way to solve the problem? Justify.

Your Answer Here

Congratulations! You have were able to finish studying the section on parallelograms. You are now ready to study the two other subsets of quadrilaterals: trapezoids and kites. The knowledge and skills that you will gain will certainly help you acquire confidence in the use of quadrilaterals to solve problems or create designs.

END OF TRANSFER:

In this section, your task was to make different quadrilaterals with the use of web 2.0 with different conditions.

How did you find the transfer task? How did the task help you see the real world use of the topic?

You have completed this lesson. But you have three more lessons before you finish this module. You need to learn more about trapezoid and kites, triangle similarity, and special right triangles to complete what you need in doing your performance task.

Lesson 2: Trapezoids and Kites

In this lesson you will learn the following:

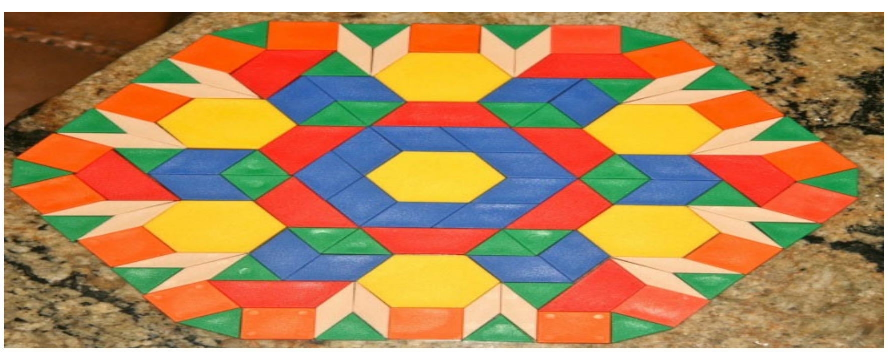
1. Identify trapezoid, kites and their properties
2. Explore certain websites indicated in the module that would be of great help for your better understanding of the lessons on trapezoids and kites and work on the interactive activities.
3. Take down notes of the important concepts of trapezoids and kites and follow a logical sequence of statements to come up with proofs of the different theorems about trapezoids and kites.
4. Perform the specific activities or tasks and complete the exercises and assessments provided.
5. Collaborate with the teacher and peers.

EXPLORE

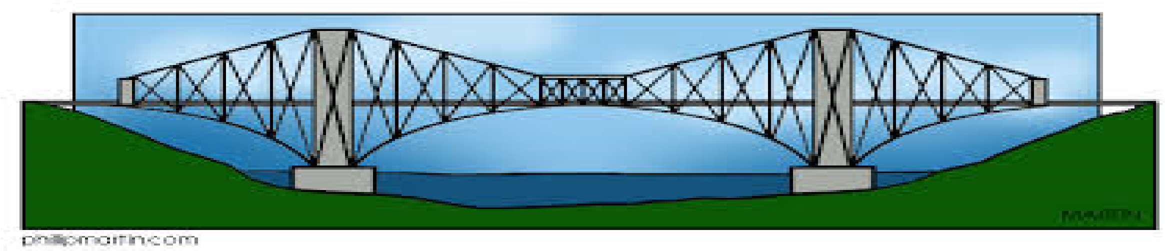
You have already studied the different parallelograms, now you need to explore other kinds of quadrilaterals and how they will be of use to the real-life situations.

ACTIVITY 1b **What's in me?**

DESCRIPTION: (Brainstorming)
Take a look at the pictures (a bridge and a tiling design) and note the different polygons found in it. Share your observations with a partner.



http://www.google.com/url?sa=i&rct=j&q=designs%20using%20different%20triangles%20and%20quadrilaterals&source=images&cd=&cad=rja&docid=ZHtUpKb7CtSd8M&tbnid=_4BboANCoJ0G_M:&ved=0CAMQjhw&url=http%3A%2F%2Fwww.mathpuzzle.com%2FAug52001.htm&ei=bXHNUrCeBsyxrgeVk4HoBA&psig=AFQjCNHLO5aKfHFDuC4OQ-24M5oWKkAA9Q&ust=1389277514813593



http://www.google.com/url?sa=i&rct=j&q=pictures%20of%20beams%20of%20hanging%20bridge&source=images&cd=&docid=&tbnid=&ved=0CAMQjhw&url=&ei=Hm3NUpDSL4qJrAeW8IBQ&psig=AFQjCNHQ-BrH9gtvfkQPYCgIlpXcyCtf-Q&ust=1389280206982361

After sharing your observations of the given pictures, record your ideas in the first column of the generalization table below. Write in the column your ideas about the question, what is the best way to solve problems involving quadrilaterals and similar triangles?

MY INITIAL THOUGHTS	MY FINDINGS AND CORRECTIONS	SUPPORTING EVIDENCE	QUALIFYING CONDITIONS	MY GENERALIZATIONS

ACTIVITY 2b I KNOW NOT

Directions: Based on your observations to the pictures presented, answer each of the following process questions. Write your answer in the box below.

PROCESS QUESTIONS:
1. What do you see in the pictures shown?
2. What kind/s of polygons is/are found in the picture?
3. What will happen if only one geometric figure is used in these pictures say triangles or squares?
4. What do you think are the reasons why they used those figures?
5. What makes up an architectural structure and design?
6. How do you solve problems on the efficient use of materials or spaces?

7. How do you ensure the accuracy of solutions in solving problems?
8. What is the best way to solve problems involving quadrilaterals and similar triangles?

End of EXPLORE:

You have given your thoughts and heard the ideas of others, now you will proceed by validating or correcting your ideas by doing the next activity. The concepts that you will learn in this lesson will help you accomplish the required project/task at the end which is a miniature model of a house.

FIRM-UP

In this section your goal is to explore the other types of quadrilaterals specifically trapezoids and kites and their properties and understand the proofs of their theorems.

ACTIVITY 3b HANDS ON!

DESCRIPTION: Investigation Activity about Trapezoids and Kites
Directions: Answer each of the following questions below. Write your answer on the box provided.

In a triad, make a specific parallelogram using toothpicks of the same length numbered as 1-4. Cut a portion of side 1 and record the answer of the following questions;

1. What happened to the parallelogram?
2. Can you still form a quadrilateral out of the 4 toothpicks?
3. If yes, what did you do to form the quadrilateral?
4. What kind of a quadrilateral is form?
5. What are the properties of such a quadrilateral?
6. If you lengthen one of the 3original sides using the portion being cut, what kind of a quadrilateral is formed?
7. What are the properties of the new/second quadrilateral?

Cut a portion of toothpick 2 such that it should be of the same length as the first.

1. Can another quadrilateral be formed? Discuss.
2. What are its characteristics? Explain.

WRITE YOUR ANSWERS HERE…

ACTIVITY 4b I AM WHAT I AM

Concept Attainment on trapezoids and kites

You have seen three other kinds of quadrilaterals so now present your findings in tabular form;

	Quadrilateral 1	Quadrilateral 2	Quadrilateral 3	Quadrilateral 4
Sketch of the figure				
Properties of the quadrilateral				
Kind of quadrilateral				
Parts of the quadrilateral				

To summarize, complete the statement by giving the definition of the given term.

1. A trapezoid is a quadrilateral with ___________________________
2. The bases of the trapezoid are ______________________________
3. An isosceles trapezoid is a quadrilateral _______________________
4. The legs of an isosceles trapezoid are _________________________
5. The base angles of an isosceles trapezoid are ___________________
6. A scalene trapezoid is a quadrilateral _________________________
7. A kite is a quadrilateral with _______________________________

Compare your answers with the concepts written inside the box below:

If you think that everything is clear, proceed by doing the next exercise;

If you fail to get the correct answers and you need to be clarified on some things, you may refer to this site for more information.
http://www.onlinemathlearning.com/properties-of-polygons.html
This site contains video lessons on the properties of trapezoids and kites.

Learning more on the reasons on how such properties exist and why, will easily convince you to believe and understand. To help you come up with evidence it should be back up with proofs which you will do in the next activity.

ACTIVITY 5b LOOK & SEE

Modelled Instruction on proving theorems about trapezoids

Trapezoids have certain properties that you need to learn in order for you to have a better understanding of how they would affect their functions. You have to go through and work on the succeeding activities to come up with proofs of the different theorems.

Theorem 1: Base angles of an isosceles trapezoid are congruent.

Take a look at the proof of theorem 1 and see how the statements flow to arrive at the final conclusion.

Given: CARE is an isosceles trapezoid where AC//RE
Prove: ER

Statement	Reason
1. CARE is an isosceles triangle where AC//RE	Given
2. CE ≅ AR	Definition of an isosceles trapezoid
3. Draw CS⊥ER, AD⊥ER	From one point, there is only one line that can be drawn perpendicular to a given line
4. ∠CSE & ∠ADR are right Angles	Definition of perpendicularity
5. ▽CSE & ▽ADR are right Triangles	Definition of right triangles
6. CS≅AD	Two parallel lines are everywhere equidistant
7. ▽CSE≅▽ADR	H-L Congruence Theorem (If in a right triangle the hypotenuse and a leg are congruent to the corresponding hypotenuse and leg of another right triangle, then the 2 right triangles are congruent.)
8. ∠E ≅∠R	Corresponding Parts of Congruent Triangles are Congruent (CPCTC)

Theorem 2: If the base angles are congruent, then the trapezoid is isosceles.

Fill in the missing statement or reason to complete the proof of theorem 2.

Statement	Reason
1. Trapezoid LIFE with LI//EF & ∠ELI≅∠FIL	Given
2. Draw EA ⊥ LI and FA ⊥ LI	From a point to a line there is exactly one perpendicular line that can be drawn
3. ∠EAL &∠FBI are right angles	
4.	Definition of a right triangle
5. EA≅FB	Parallel lines are everywhere equidistant
6. ΔEAL≅ΔFBI	LAA Theorem (If a leg and an acute angle of one right triangle are congruent to the corresponding leg and an acute angle of another right triangle, then the 2 right triangles are congruent
7.	CPCTC
8. Trapezoid LIFE is isosceles	

Compare your answer with the complete proof of theorem 2 and check on how far you have gone with your understanding of the concepts.

Proof of Theorem 2:

Statement	Reason
1. Trapezoid LIFE with LI//EF & ∠ELI≅∠FIL	Given
2. Draw EA ⊥ LI and FA ⊥ LI	From a point to a line there is exactly one perpendicular line that can be drawn
3. ∠EAL &∠FBI are right angles	Definition of perpendicularity
4. ΔEAL & ΔFBI are right triangles	Definition of a right triangle
5. EA≅FB	Parallel lines are everywhere equidistant
6. ΔEAL≅ΔFBI	LAA Theorem (If a leg and an acute angle of one right triangle are

	congruent to the corresponding leg and an acute angle of another right triangle, then the 2 right triangles are congruent
7. EL≅FI	CPCTC
8. Trapezoid LIFE is isosceles	Definition of an isosceles trapezoid

Theorem 3: The diagonals of an isosceles trapezoid are congruent

Another way of showing the proof is the use of flow chart. The flow of the statements is indicated by the arrows. The following is the proof of theorem 3.

The flow chart is the visual and alternative way of the most common 2-column proof shown below.

Statement	Reason
1. LOVE is an isosceles trapezoid where $LO // EV$ & $OV \cong LE$	Given
2. $\angle OVE \cong \angle LEV$	Base angles of an isosceles trapezoid are congruent.
3. $VE \cong EV$	Reflexive Property
4. $\triangledown OVE \cong \triangledown LEV$	SAS Congruence Postulate
5. $OE \cong LV$	CPCTC

To prove the next theorem you need to know the meaning of certain term/word. Read the text inside the box and proceed by doing the task that follows.

Theorem 4: MIDLINE THEOREM:
The median of a trapezoid is parallel to the bases and its measure is one-half the sum of the measures of the bases.

This theorem can be proven to be true after you perform this modelling activity.

Instructions:
1. Draw trapezoid ABCD on a piece of paper and measure the base angles.
2. Measure AD and BC in millimeter and mark the midpoint as X and Y.
3. Connect points X & Y and measure the angles with vertices X and Y
4. Measure AB, XY and DC to the nearest millimeter.
5. Make a conjecture based on your observations.
6. Verify the result using 2 other trapezoids.
7. Give your generalization.

Theorem 5: The diagonals of a kite are perpendicular.

LOOK BACK:
To prove the next theorem it is important to remember the converse of the perpendicular bisector theorem which states that if a point is equidistant from the endpoints of a segment, then it is on the perpendicular bisector of the segment.

Answer the following questions to prove theorem 5.
1. What triangle is congruent to ∆EFG? Justify your answer.
2. Why is FEHDEH?
3. Why is ∆FEH∆DEH?
4. Why is FHDH?
4. Why is EHFEHD?
5. Why areEHF andEHD right angles?
6. Why is DF EG?

Since you have discovered for yourself the proofs of these theorems, you are already certain that these are true statements. For ease in remembering these properties and characteristics of trapezoids and kites and be ready for their applications, it is better to outline them.

ACTIVITY 6b **DON'T FOOL ME!**

Writing Proofs
Sketch the figure and write a complete proof of the following by giving the appropriate statements or reasons: (You may use a 2-column proof or flow chart.)

1. Given: FIND is an isosceles trapezoid with FD IN
   Prove:NFDDIN

Statements	Reason
1. FIND is an isosceles trapezoid with FD IN	1.

Statements	Reason
2. FNID	2.
3. DNND	3.
4. ∆FDN∆IND	4.
5. NFDDIN	5.

2. Given: ∆GIF ∆IGT
   Prove: GIFT is an isosceles trapezoid

Statement	Reason
1.	1. Given
2.	2. CPCTC
3.	3. Definition of an isosceles trapezoid
Alternative	Proof
1.	1. Given
2.	2. CPCTC
3.	3. If the base angles of a trapezoid are congruent, then it is isosceles.

3. Given: B and F are the midpoints of AC & AE of ∆ACE.
   AC AE
   Prove: BFEC is an isosceles trapezoid

Statement	Reason
1.	
2.	
3.	
4.	
5.	

Check yourself by answering the following questions.

Questions to Answer:

1. How is your proving experience? Which part was clear? Which part was confusing to you?
2. Were you able to derive the correct conclusions and give the supporting reasons?

3. What difficulty did you encounter?
4. What do you intend to do to cope with such difficulty?

To further enhance your skills, you have to accomplish the set of practice exercises below.

ACTIVITY 7b **WANNA PRACTICE?**

Practice Exercise on drawing out conclusions and giving of reasons:

To demonstrate your mastery of the concepts and skills about trapezoid, fill in the appropriate conclusion and reason.

1. Hypothesis: CORE is an isosceles trapezoid where CO//RE
   a. Conclusion: ______________________________
      Reason: ______________________________
   b. Conclusion: ______________________________
      Reason: ______________________________
   c. Conclusion: ______________________________
      Reason: ______________________________
2. Hypothesis: In trapezoid HOPE where HO//PE,H O
   Conclusion: ______________________________
   Reason: ______________________________
3. Hypothesis: DATE is a kite with DT & AE are diagonals
   Conclusion: ______________________________
   Reason: ______________________________
4. Hypothesis: In kite RULE, RU=RE
   Conclusion:______________________________
   Reason: ______________________________
5. Hypothesis: In trapezoid ACER, the diagonals AECR
   Conclusion: ______________________________
   Reason: ______________________________
6. Hypothesis: O & U are the midpoints of the legs PR & ST of trapezoid PRST
   a. Conclusion: ______________________________
   Reason: ______________________________

b. Conclusion: ________________________________
Reason: ___________________________________

ACTIVITY 8b **SQUEEZE IT!**

Drawing out conclusions applying the different theorems on trapezoids

THINK AND DISCUSS within the group of 4 members (you may sketch the figure)

1. In an isosceles trapezoid MARE where MA//ER, what is the relationship betweenM &A?E &R? Explain
2. What is the relationship between M &E? A &R? Explain.
3. WXYZ is an isosceles trapezoid, how do you compare WY & XZ? Why?
4. A & B are midpoints of the legs TQ and SR of trapezoid QRST, what is the relationship between AB & QR? AB & TS? Explain why. What do you do to determine the measure of AB? Why?
5. M & N are the midpoints of the legs BE and AS of trapezoid BASE. If MN= 25 and BA=35, what is ES? Explain.
6. In trapezoid ABCD if AC = BD, what can you say about ABCD? Why is that so?
7. If BA = DE in trapezoid BADE, what can you conclude about BADE? Why?
8. If R A in trapezoid RAIN where RA//IN, What kind of a trapezoid is RAIN? Why?
9. If HAVE is an isosceles trapezoid where HA//VE, what is the relationship between

HE and VA? How did you know? What can you conclude about ∆HEV & ∆VAE? Justify your answer. Is there another way to justify your conclusion? Explain how.
10. In kite RSTV, RS=RV & TS=TV, what can you conclude about ∆RTV and ∆RTS?

Justify your answer.

You may now revisit your generalization table and fill up the second and third columns. Review your ideas in the explore part and compare them with your recent findings, insights and understanding.

MY INITIAL THOUGHTS	MY FINDINGS AND CORRECTIONS	SUPPORTING EVIDENCE	QUALIFYING CONDITIONS	MY GENERALIZATIONS

END OF FIRM - UP

In this section, the discussion was about trapezoids, kites, their properties and theorems.

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? What new learning goal should you now try to achieve?

Now that you know the important ideas about this topic, let's go deeper by moving on to the next section.

Your goal in this section is to take a closer look at some aspects of the topic and explore how these knowledge and skills be put to use.

Work on the next activity and apply the skills acquired to find the measure of the specified parts.

ACTIVITY 9b READY, GET SET

Oral/Drill Exercise on the applications of the theorems on trapezoids (Think Aloud by Pair)

Find the measure of the sides and angles of the following figures and explain why it is like that and how it should be done. A sketch of the figure will help you find the answer.

1. In an isosceles trapezoid MARE where MA//ER if the $mA=74^0$, what is the mE, mM, mR?
2. If ME= 16, what is AR?
3. If S & T are the midpoints of ME & AR respectively, what is MS? and AT?
4. If MA=20 and ER=34, what is ST?
5. If ST= 18 and MA=12, what is ER?
6. If ST= 35 and ER=45, what is MA?
7. If MR=19, what is AE?
8. In trapezoid REAP, if R&E are right angles and mA= 68^0, what is the mP?

9. In trapezoid TUNE where TU//EN, B is the midpoint of TE and BC is a median. What is the value of x if TU=3x-8, BC=15, EN=4x + 10?
10. In kite ANTE where AN=AE & TN=TE, what angles are congruent? If the *mE*=100^0 and the *m*T= 55^0 what is the *mA*?

Submit your answer.

Questions to Answer:

1. How did you find the activities?
2. Were you able to perform all the activities? If no, explain why.
3. What did you do to improve your performance?
4. What insights do you have about the lesson on trapezoid?
5. Do you think this would be of great help to you? Explain in what way.
6. How did you find the best solution to solve the problems?

ACTIVITY 10b GOING TECHY

Interactive Activity on the properties of trapezoids and kites

To further improve your knowledge and skills about trapezoids and kites, visit the site given below to work on those exercises and take note of your score and do not forget to review the answers especially those items not correctly answered.

http://www.ixl.com/math/geometry/properties-of-trapezoids
This site contains interactive exercises about trapezoids and their theorems.

http://www.mathopolis.com/questions/q.php?id=621&site=1&ref=/quadrilaterals.html&qs=621_622_623_624_763_764_2128_2129_3230_3231
This site contains a quiz about quadrilaterals.

After you have answered the quiz and found out that you have learned a lot, you now proceed to look deeper by checking on the applications of these concepts.

ACTIVITY 11b CHECK ON ME!

Identify objects in the surroundings or parts of a house with trapezoidal design; explain your choice of the objects.

http://ph.images.search.yahoo.com/search/images;_ylt=A2oKiavkUe5SZRsAAji0Rwx.?p=real-life+applications+of+trapezoids+and+kites&ei=utf-8&iscqry=&fr=sfp
This site contains pictures of real-life applications of trapezoids and kites.

Also include in your sharing the answers of the follow-up questions.

Questions to Answer:

1. What do you see in these pictures?
2. Why do you think they are trapezoidal?
3. What are the advantages/disadvantages of these designs?
4. What do you think will result if different shapes are used?
5. Why is it important to use trapezoids?

Write the answers of the following questions in your journal using Evernote.
Please refer to this site, www.Evernote.com

1. What have you realized about the lesson on trapezoids?
2. What are the benefits of learning the concepts?

To prepare you with the performance task, one skill you should have is to draw figures to scale so that you will have a proportional drawing whether you reduce or enlarge a desired figure, you will need problem solving technique which is the purpose of the next activity.

ACTIVITY 12b I GOT IT!

Problem Solving using the concepts of trapezoids and kites

To make all these concepts relevant, you have to apply these in the different real-life situations:

1. The perimeter of a kite is 64 feet. The length of one of its sides is 8 feet more than the other side. What are the lengths of each side of the kite?

Let x = be the length of one side
X+ 8 = the length of the other side

Equation: $x+x+x+8+x+8=64$

$$4x+16=64$$
$$4x=64-16$$
$$4x=48$$
$$X = 12$$

Therefore, 2 sides measure 12 inches each and the other 2 sides measure 20 inches each.

2. Part of the window of the World Financial Center in New York City is made from 8 congruent isosceles trapezoids that create an illusion of a semicircle. What are the measures of the base angles?

Let x = be the measure of the base angles

Since the measure of a semi-circle is 180 divide it by 8 = 22.5°, that is the measure of the vertex angle.

Equation: $x + x + 22.5 = 180$ because the sum of the measure of the angles of a triangle is 180

$$2x = 180 - 22.5$$
$$2x = 157.5$$
$$X = 78.75^{\circ}$$

Thus, the measure of each base angle is 78.75°.

3. Large sailboats have a keel to keep the boat stable in high winds. A *keel* is shaped like a trapezoid with its top and bottom parallel. If the root chord (the one on top) is 12.4 feet and the tip chord (the one at the bottom) is 9.6 feet, what is the length of the mid-chord?

Let x = be the length of the mid-chord

Equation: $x = \frac{12.4 + 9.6}{2}$

$$X = \frac{22}{2}$$
$$X = 11$$

Therefore, the length of the mid-chord of the keel is 11 feet.

Before you fill-up the last 2 columns of the generalization table, take a closer look at the picture below and answer the following questions.

Questions to Answer:

1. Why do beams of the first bridge take the form of a trapezoid?
2. What do you see in the beams which have the shape of a parallelogram?
3. What shape is now formed with the braces?
4. What do the braces do to the structure?
5. Which shape is more flexible?
6. Which shape is more stable?
7. Which is preferred in a bridge structure, flexibility or stability? Explain.
8. What is the best solution to a problem?

Fill-up the fourth column of the generalization table and submit.

MY INITIAL THOUGHTS	MY FINDINGS AND CORRECTIONS	SUPPORTING EVIDENCE	QUALIFYING CONDITIONS	MY GENERALIZATIONS

PAUSE AND EVALUATE YOURSELF:
Draw a star below the icon that best describes your knowledge/ understanding of the lesson

RATE YOURSELF		
I still don't get it	I acquire the basic concepts/skills of trapezoids & kites	I understand the concepts of trapezoids& kites

END OF DEEPEN

In this section, the discussion was about the applications of the knowledge and skills pertaining to trapezoids and kites in the different real-world situations. These will help you accomplish the task in creating a miniature house model which makes use of the different quadrilaterals and similar figures. The design must be chosen in such a way to maximize spaces and efficiently use the materials.

You have to answer the following questions to check on your understanding and prepare for the succeeding activities and life in general. What new realizations do you have about the topic? What new connections have you made for yourself? What helped you make these connections?

Now that you have gained deeper understanding of the lesson, you are ready to use them in a particular context in the next section.

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.

To test if you have already enough knowledge and skills in problem solving and posing, try to accomplish the Quiz below.

ACTIVITY 13b MAKE A PROBLEM OUT OF ME

Problem Posing: Follow the procedure below and answer the questions. Do your work in short type writing and then send the soft copy to your teacher through the discussion board or email. You may also submit your work face – to – face.

From the given situations, formulate problems, present solutions and explain.

1. Dress up an octagonal room with furniture and fixtures in such a way that the room appear to be spacious and must reflect the efficient use of materials.

2. The beams of most bridges are trapezoidal; determine the measure of the sides, braces and angles with the least number of known measures.

Questions to Answer:

1. How did you go about answering the activity?
2. What is the best way to solve the problems?
2. Why is it necessary to learn about trapezoid and its properties?
3. What happens if you do not have a clear knowledge about trapezoids?

To transfer your understanding you may now do the transfer task below.

ACTIVITY 15b **Sum it up!**

To reflect on the learning process, you may now complete the generalization table by writing your final answer on the last column.
Fill-up the last column of the generalization table and submit.

MY INITIAL THOUGHTS	MY FINDINGS AND CORRECTIONS	SUPPORTING EVIDENCE	QUALIFYING CONDITIONS	MY GENERALIZATIONS

END OF TRANSFER:

In this section, your task was to make trapezoid and kites with different qualifications with the use of web 2.0.

How did you find the task? How did the task help you see the real world use of the topic?

You have completed this lesson. But you have two more lessons before you finish this module. You need to learn more about triangles to complete what you need in doing your performance task.

Lesson 3: Triangle Similarity

In this lesson you will learn the following:

1. Describe a proportion.
2. Illustrates similarity of figures.
3. Proves the conditions for similarity of triangles
   SAS Similarity Theorem
   SSS Similarity Theorem
   AA Similarity Theorem
4. Right Triangle Similarity Theorem

EXPLORE

You learned from lesson 2 the different concepts of quadrilaterals which are very essential in solving problems related to geometric figures.

In this lesson, you will learn the concepts of proportion and how to use it in many situations. You will also learn the concepts of triangle similarity and the different theorems related to these lessons which are useful in solving real world problems. You will also gather ideas to answer the question "What is the best way to solve problems involving triangle similarity?" These concepts will also help you visualize situations and create solutions to the problems that you encounter. Answers to the question above will also help you do your performance task.

In this section you need to analyze picture by answering different questions for you to discover important concepts. You will also do self-monitoring activity as you fill up the map of conceptual change.

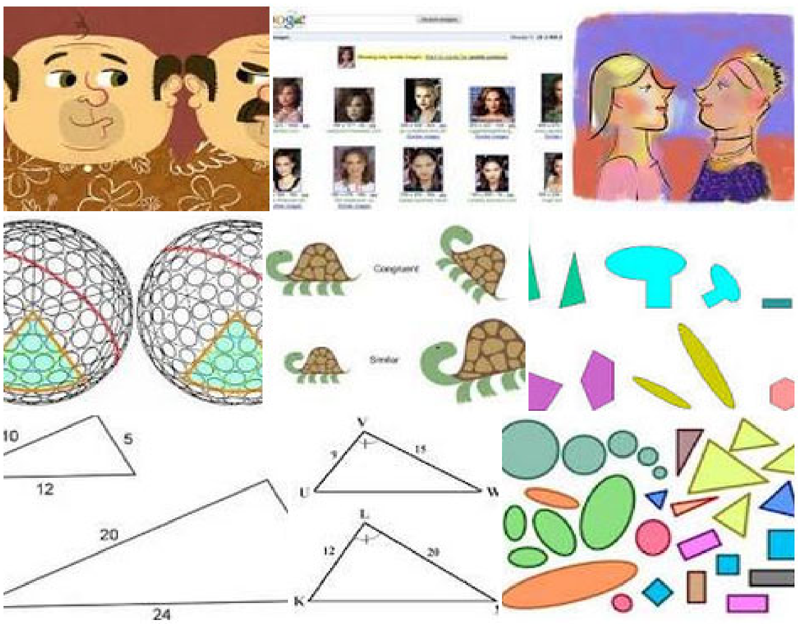
Let's us start the lesson by analyzing the pictures and answering the questions that follow.

Triangle Similarity

What is the best way to solve problems involving triangle similarity?
Let's answer these questions by doing the activities below.

ACTIVITY 1c **Picture Analysis**

(Eliciting of prior Knowledge, Motivation, Hook)
Observe the pictures below and answer the questions.



https://www.google.com.ph/#q=SIMILAR+PICTURES

Questions to Answer:

14. Do you have a look alike? Why did you say that?

15. Can figures be that similar? In what way?

16. What would you consider to determine that two figures are similar?

17. Why is it important to know two similar figures?

18. Focusing on the triangles, how would you know that two triangles are similar?

19. What is the best way to solve problems involving triangle similarity?

CONCEPTUAL UNDERSTANDING CHECK

In the table below, write your answers on the initial part for the question what is the best way to solve problems involving triangle similarity?

INITIAL ANSWER

REVISED ANSWER

FINAL ANSWER

End of EXPLORE:

You just have tried to find out how mathematics can help you determine the best way to solve problems involving triangle similarity. Let us now strengthen that insight by doing the succeeding activities. What you will be learning in this section will help you perform well in your final performance task which will challenge you to use what you know to create a model and solve problems involving structures, space and aesthetic appeal.

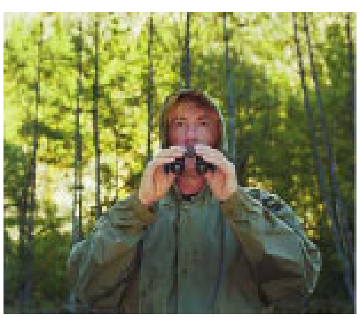
Now move to the next activity to learn the knowledge and skills you need to be a good problem solver and respond to different situations accurately.

FIRM-UP

Your goal in this section is to learn and understand key concepts of proportion which are important in solving problems involving triangle similarity. In this section there are activities which will help you discover and understand the different theorems and postulates which are useful tools in solving real life problem related to triangle similarity.

ACTIVITY 2c Situational Analysis

In the previous activity you are task to determine similar figures based from the given pictures. Now, let's see if you can be able to develop the concepts that you learned to respond to the situation below.



You are a newly hired employee of an organization who is working for the improvement of the environment. As your initial task, you need to estimate the number of trees of a 10 hectare forest near your place. This will be part of your company's report to plan for improvement. When you visit the forest you observe that trees are planted consistently which is about 20 meters from each other.

Questions to Answer:

1. What concept would you use to solve the problem above? How would you use it?

2. What is the estimated number of trees of the 10 hectare forest?

3. How is proportionality used in this situation?

In the previous activity you learned the importance of proportion in answering problems in real life. Now, you will improve your knowledge in proportion by answering the activities below.

ACTIVITY 3c Let's Consult the Expert

Directions: Click any of the videos below which explain the concepts of proportion with step by step procedure on how to solve problem related to the topic. After watching the video do the exercises below.

http://www.youtube.com/watch?v=D8dA4pE5hEY

http://www.youtube.com/watch?v=2d578xHNqc8

http://www.youtube.com/watch?v=G8qy4f7GKzc

These sites contain videos which explain the concepts of proportion with step by step procedure on how to solve problem related to the topic.

Solve the proportion by determining the value of the variable.

GIVEN	SOLUTION AND REASON		ANSWER
EX. $\frac{5}{10}=\frac{6}{X}$	$\frac{5}{10}=\frac{6}{X}$	write original proportion	12
	5 (X) = 6 (10)	cross product property	
	5X = 60	multiply	
	X = 12	divide each by 5	
1. $\frac{5}{10}=\frac{x}{16}$			
2. $\frac{1}{y+1}=\frac{2}{3y}$			
3. The perimeter of a rectangle is 154 cm. The ratio of the length to the width is 10:1. Find the length and width.			

Questions to Answer:

1. What did you learn about proportion?

2. How do we solve proportion?

3. Why should we learn proportion?

Now that you have enough exercises in solving proportion, you are ready for a short quiz. However, if you feel you are not yet ready for the quiz, you may try the practice quiz below. Click the interactive website and take the sample quiz.
http://www.softschools.com/quizzes/math/proportion_word_problems/quiz3766.html
This site contains interactive quiz about proportion.

ACTIVITY 4c QUIZ

Directions: Read each statement below and decide whether the statement is true or false. Tick (√) the column of your answer.

Are these statements true or false?	TRUE	FALSE
1. 3:5 and 12:20 are equal ratios.		
2. $\frac{4}{5} = \frac{16}{18}$		
3. 6 for 0.85 m is longer than 8 for 1 m		
4. 7 km in 10 minutes = 3.5 km in 5 minutes		
5. 5 cm in 2 seconds is faster than 9 km in an hour		
6. If $\frac{x}{15} = \frac{12}{36}$, then x = 3.		
7. If cross products are equal, the ratios are equal.		
8. $\frac{3}{5} = \frac{6}{10}$, so 3 x 6 = 5 x 10.		

After learning proportion, you are about to learn the concepts of triangle similarity which will help you answer other problems in geometry. To start your journey in triangle similarity, do the next activity to discover important concepts of the lesson.

ACTIVITY 5c LET'S DISCOVER!

Directions: Follow the procedure below and answer the questions.
Materials: Ruler and protractor

Reflecting Question: What can you conclude about two triangles if you know two pairs of corresponding angles are congruent?

Step 1: Draw ΔABC so that $m\angle A = 40^0$ and $m\angle B = 50^0$.

Step 2: Draw ΔDEF so that $m\angle D = 40^0$ and $m\angle E = 50^0$ and ΔDEF is not congruent to ΔABC.

Step 3: Calculate $\angle C$ and $\angle F$ using the Triangle Sum Theorem. Use a protractor to verify that your results are true.

Step 4: Measure and record the side lengths of both triangles. Use a ruler.

Step 5: Repeat steps 1 to 4, use different angle measures.

Questions to Answer:

1. What can you conclude about two triangles if you know two pairs of corresponding angles are congruent?

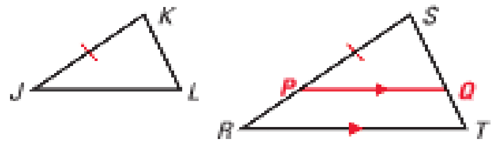
2. Are the triangles similar? Explain your reasoning.

3. Make a conjecture about two triangles with two pairs of congruent corresponding angles.

The things that you learned from this activity will have an important role in the next activity. So you better remember your conclusion, to help you remember it you may use this codes **A-for angles** and **S- for sides**.

ACTIVITY 6c PROVE IT!

Directions: Analyze the figures below and then complete the table to complete the proofs for triangle similarity

Given: $\frac{RS}{JK} = \frac{ST}{KL} = \frac{TR}{LJ}$ Locate P on $\overline{RS}$ so that PS = JK. Draw $\overline{PQ}$ so that $\overline{PQ} \parallel \overline{RT}$ Prove: ΔRST ~ ΔJKL	
Statement	Reason
1. ΔRST ~ ΔPSQ	1. AA Similarity Postulate
2. $\frac{RS}{PS} = \frac{ST}{SQ} = \frac{TR}{QP}$	2.
3. PS = JK, SQ = KL and QP = LJ	3. SSS Congruence Postulate
4. ΔPSQ ≅ ΔJKL	4.
5.	5. AA Similarity Postulate

9.

10. Questions to Answer:

11.

1. How did you prove triangle similarity?

2. What theorem have you discovered?

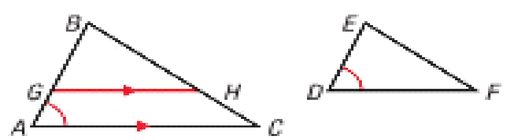
3. Why do we need to prove theorems of similar triangles?

4. What is the best way to solve problems involving triangle similarity?

Now that you learned how to show the proof of similar triangles step by step you are now ready to do it independently. In the next activity you will complete the table to prove another theorem involving similar triangles.

ACTIVITY 7 Do it alone!

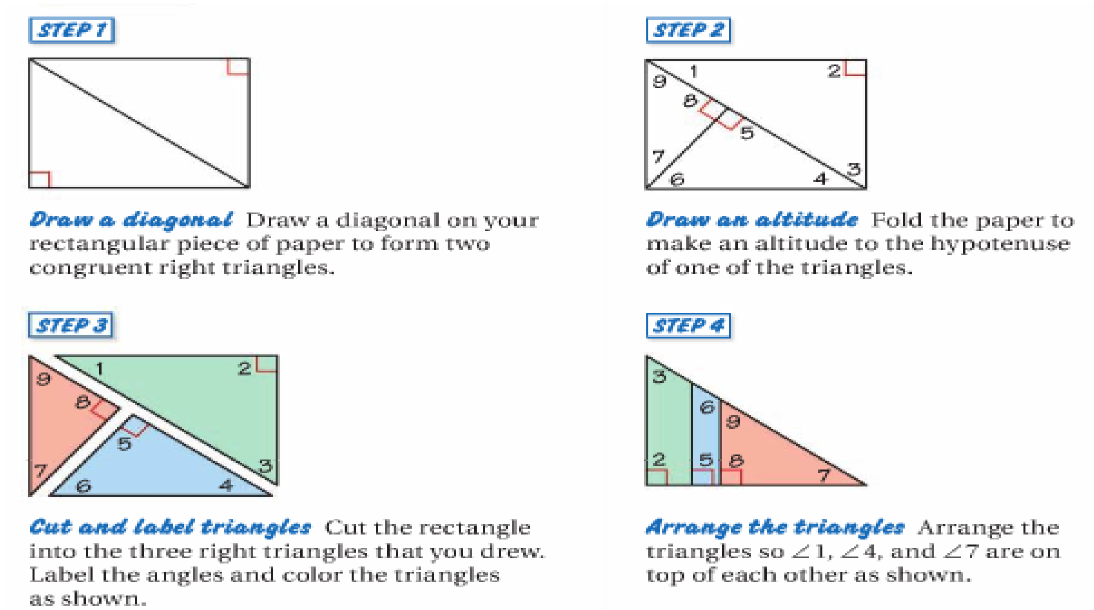
Directions: Analyze the figures below and then complete the table to complete the proofs of another theorem related to similar triangles.

Given: $\angle A \cong \angle D$, $\frac{AB}{DE} = \frac{AC}{DF}$ Prove: $\Delta ABC \sim \Delta DEF$	
Statement	Reason
1. $\angle A \cong \angle D$	1. Given
2. $\frac{AB}{DE} = \frac{AC}{DF}$	2. Given

You learned how to prove similar triangles through guided exercises and independent practice. In the next activity you will use your observation to learn another theorem about similar triangles.

ACTIVITY 8c Watch and Learn

Directions: Observe the picture below and answer the questions to discover similar right triangles, and then answer the questions below?



12. Questions to Answer:

13.

1. How are the two smaller right triangles related to the large triangle?

2. Explain how you would show that the green triangle is similar to the red triangle.

3. Explain how you would show that the red triangle is similar to the blue triangle.

4. Why is it important to prove theorems involving similar triangles?

5. What is the best way to solve problems involving triangle similarity?

You learned different ways on proving theorems involving similar triangles through guided proving, independent proving and using your observation. Now to deepen your understanding about these concepts, you will do another activity with the use of technology.

ACTIVITY 9c **Meet the Digital Native**

Directions: Click the website below and watch the video presentation on how to prove theorems related to similar triangles. Answer the questions below.

http://www.youtube.com/watch?v=EbN_tDggldA
This video contains detailed discussion about the proving of similar triangles (AA, SAS, SSS).

http://www.youtube.com/watch?v=QCyvxYLFSfU
This video contains detailed discussion about the proving of similar triangles (Right Triangle Similarity Theorem.)

Questions to Answer:

1. What new things did you learn from the video?

2. Did you encounter any inconsistency between the concepts and procedures you learned from the video and the previous activities?

3. How are similar triangles solved?

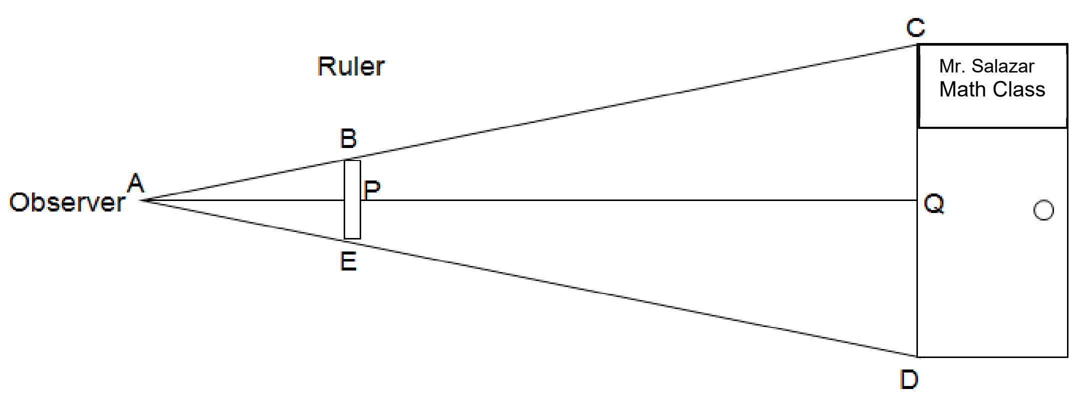
4. What is the best way to solve problems involving triangle similarity?

ACTIVITY 10c Let's Use It!

Directions: Read the situation below and follow the procedure carefully then answer what is asked.

Note: Your answers for this activity will be submitted in a soft copy. Do this activity in MS Word and then send the file to your teacher. To do that just go to **student dashboard** – **click message** – **attach file** – and send it to your teacher.

a. Find a door or object of similar height that can be easily measured later to verify your results. Extend a 12 inch ruler in front of your body so that it is vertical and *parallel* to the door. Adjust your distance from the door or object so that your line of sight causes the ends of the ruler to correspond with the top and bottom of the door or object. See diagram below.



$\Delta ABE \sim \Delta ACD$ by the AA Postulate.

b. In the diagram above, BE is parallel to CD. Write a similarity statement using triangle ΔABE and another triangle in the diagram. Justify your statement with a postulate or theorem.

c. In the diagram above, AP is proportional to AQ. According to the similarity statement you wrote in part *b*, BE is proportional to which other segment length?

d. Write a proportion in terms segment length that will allow you to find the height of the door by indirect measure.

e. Have your partner measure the following lengths to the nearest quarter inch. Record the lengths in the diagram above.

1. The distance your eye is from the ruler, AP.
2. The distance the ruler is from the door, PQ.
3. Add the previous lengths to find AQ.

f. Substitute the measures from part *e* into the proportion you wrote in part *d* and solve for CD, the height of the door.

Questions to Answer:

1. What did you learn from this activity?

2. How would you relate your personal daily experiences to the situation that you encountered?

3. Can you site any advantages of learning this lesson? Discuss.

4. What is the best way to solve problems involving triangle similarity?

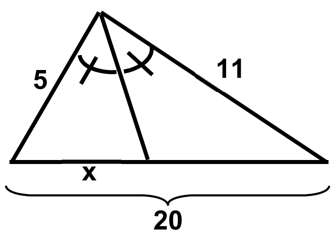
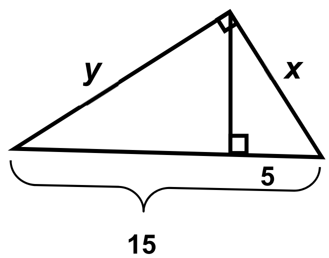
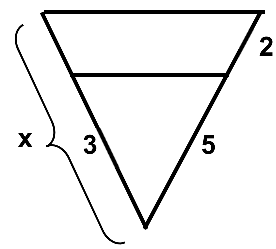
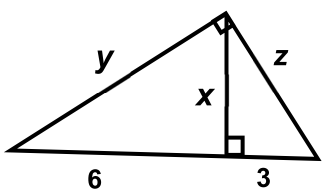
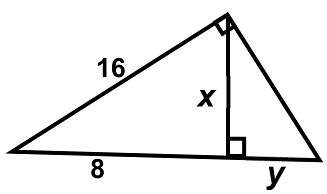
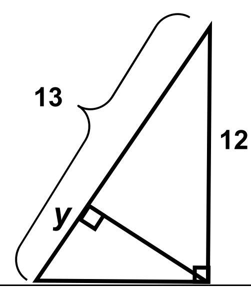
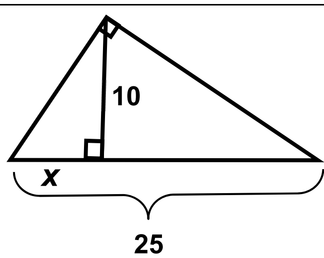
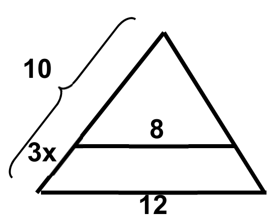
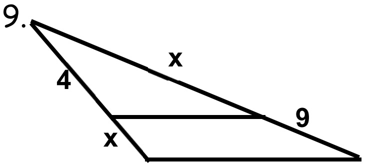
Note: It's time to consolidate your answers now and send it to your teacher. If you have questions or things to clarify do not hesitate to type your questions to the discussion board.

You encountered problem about triangle similarity but that is not the only situation where similar triangles are used. There are many situations where you can use the theorems and postulates about similar triangles. To help you master the skills in solving problems related to this topic, complete the next activity.
You may encounter some difficulties in doing the next worksheet to help you do it; you may click the website below.

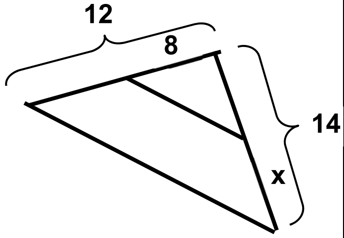
http://www.youtube.com/watch?v=PXBFDBmBP0I
This website contains video which explains the step by step procedure in solving problem related to similar triangles.

ACTIVITY 11c Let's Practice

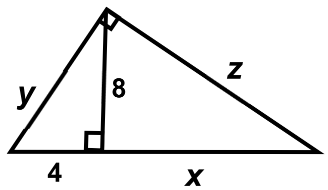
Directions: Find the value of the variables. Write your answers on the space provided for below. You don't have to include your solution in fact if you can do it mentally, the better. (Note: Lines that appear parallel are parallel.)

1. 	2. 	3. 
4. 	5. 	6. 
7. 	8. 	9. 

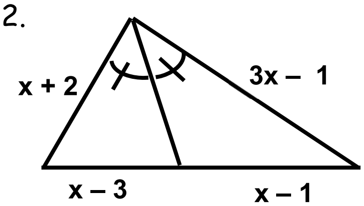
10.



11.



12.



Write your answers here.

1.	**2.**	**3.**
4.	**5.**	**6.**
7.	**8.**	**9.**
10.	**11.**	**12.**

Questions to Answer:

1. What concept did you use to answer the worksheet above?

2. How did you use it?

3. Why is it important to learn many concepts in solving problems related to similar triangles?

4. What is the best way to solve problems involving triangle similarity?

You encountered a lot of concepts related to triangle similarity. Now it's time to pause for a while and reflect to your learning process by doing the 3 – 2 – 1.

3	What are the 3 most important things you learned?
2	What are the 2 things you are not sure about?
1	What is 1 thing that you want to clarify immediately?

Your answer in the last part may also send to your teacher for immediate response through the discussion forum. To do that, **go to student dash board – message – conversation**.

ACTIVITY 12c Interactive Quiz

Directions: Click the website below and answer the interactive quiz. You may try this as many as you can.

http://www.regentsprep.org/regents/math/geometry/MultipleChoiceReviewG/Triangles.htm
This website contains interactive quiz about triangle similarity. This may be used as practice exercises to develop more the knowledge, process and analysis of the students for them to answer more complicated problems. After answering the 20 questions answers will appear.

http://www.classzone.com/etest/viewTestPractice.htm?testId=4545
This website contains interactive quiz about triangle similarity. This contains 5 items multiple choice more on word problems which you may encounter in your quiz. After answering each item you may click the feedback button for the answer and solution. This is helpful for to check your work immediately.

Questions to Answer:

1. What new things did you learn from the interactive quizzes?

2. What item or lesson appears confusing for you?

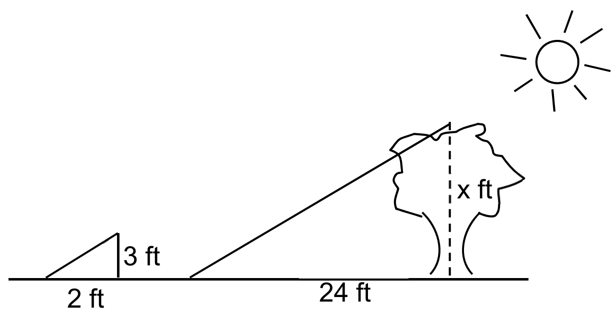
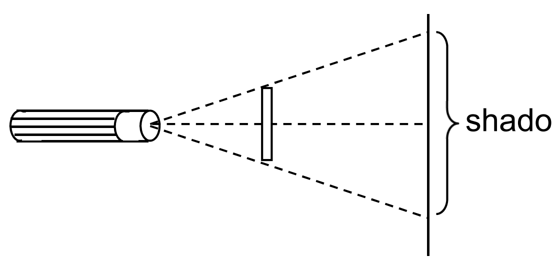
3. How do the questions help you develop your critical thinking and problem solving skills?

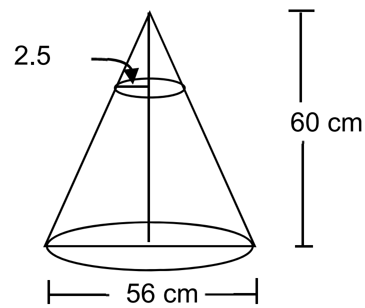
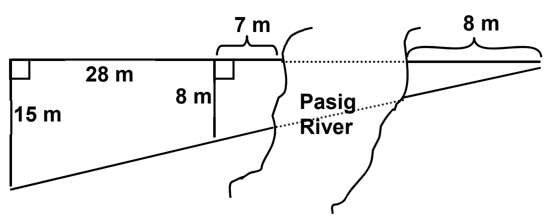
4. What is the best way to solve problems involving triangle similarity?

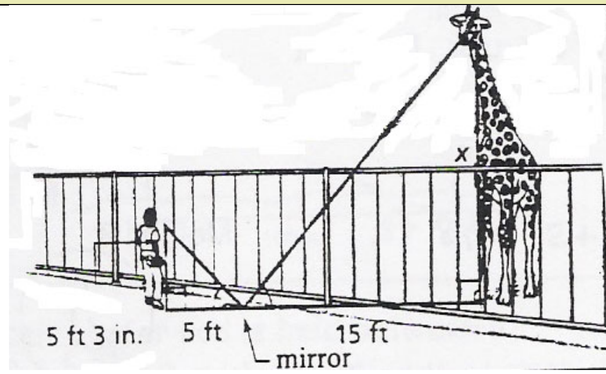
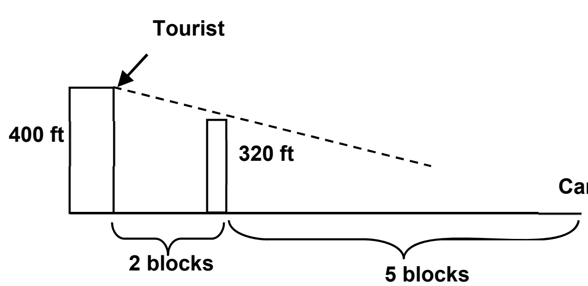
After doing a lot of activities – proving the theorems, analysing situations, watching videos, interactive quizzes, etc., you are now ready for your quiz on problem solving about triangle similarity. This quiz will challenge you connect and apply the things that you learned about triangle similarity.

ACTIVITY 13c (Problem Solving)

Directions: Read and analyse each problem carefully. Complete the table below by writing the theorem or postulate appropriate for each problem, your reason or justification, solution and final answer.

Problem # 1	Illustration	Theorem/ Postulate
1. If a tree casts a 24-foot shadow at the same time that a yardstick casts a 2-foot shadow, find the height of the tree.		
Reason/ Justification	**Solution**	**Final Answer**
Problem # 2	**Illustration**	**Theorem/ Postulate**
2. A 12-centimeter rod is held between a flashlight and a wall as shown. Find the length of the shadow on the wall if the rod is 45 cm from the wall and 15 cm from the light.		
Reason/ Justification	**Solution**	**Final Answer**

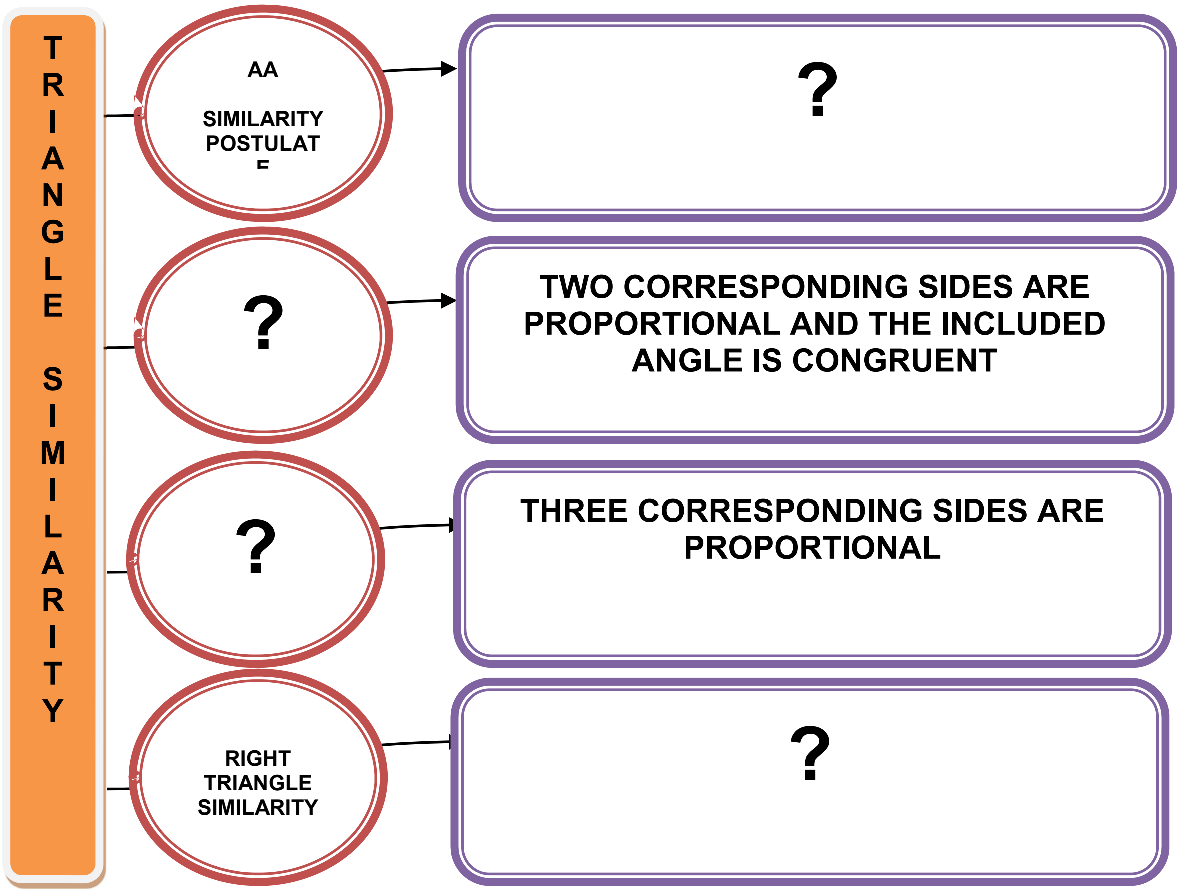
Problem # 3	Illustration	Theorem/ Postulate
3. The cheerleaders of a DSS School make their own megaphones by cutting off the small end of a cone made from heavy paper. If the small end of the megaphone is to have a radius of 2.5 cm, what should be the height of the cone that is cut off?		
Reason/ Justification	**Solution**	**Final Answer**
Problem # 4	**Illustration**	**Theorem/ Postulate**
4. Find the width of this section of the Pasig River.		
Reason/ Justification	**Solution**	**Final Answer**

<table>
<tr><th>Problem # 5</th><th>Illustration</th><th>Theorem/ Postulate</th></tr>
<tr><td>5. Find the height of the giraffe in the diagram below.</td><td>
</td><td></td></tr>
<tr><th>Reason/ Justification</th><th>Solution</th><th>Final Answer</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><th>Problem # 6</th><th>Illustration</th><th>Theorem/ Postulate</th></tr>
<tr><td>6. A tourist on the observation deck of a building looks east, facing another building 320 ft high and two blocks from the first building. Her view is 400 ft above street level. Her car is parked five blocks east of the second building. If no other buildings are seen in her line of sight, can she see her car? Justify.</td><td>
</td><td></td></tr>
<tr><th>Reason/ Justification</th><th>Solution</th><th>Final Answer</th></tr>
<tr><td></td><td></td><td></td></tr>
</table>

To help you summarize and remember important concepts that you learned about triangle similarity, try to complete the graphic organizer below.

ACTIVITY 14c Do the Map

Directions: Observe the diagram below and complete the missing parts.



END OF FIRM - UP

In this section, the discussion was about proportion and how similar triangles are solved with the use of postulates and theorems.

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? What new learning goal should you now try to achieve?

Now that you know the important ideas about this topic, let's go deeper by moving on to the next section.

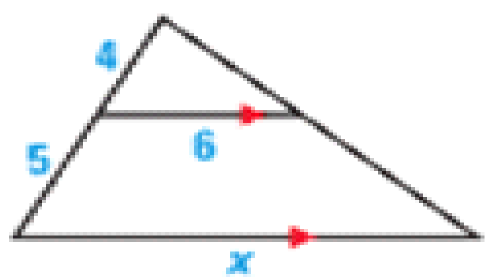
DEEPEN

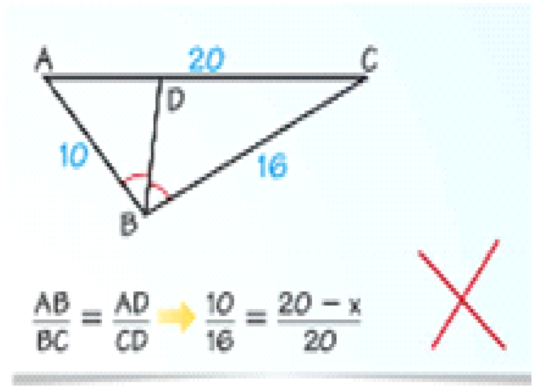
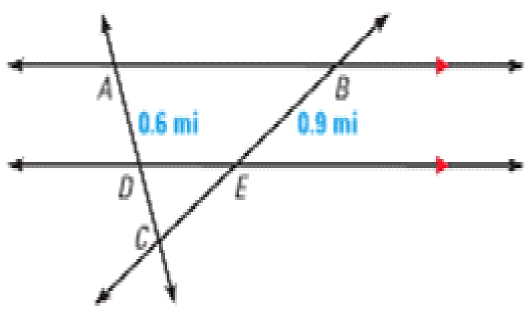
Your goal in this section is to take a closer look at some aspects of the topic. With the activities that you have accomplished, do you think you are now ready for more challenging situations? Can you assess now what is the best way to solve problems involving triangle similarity?

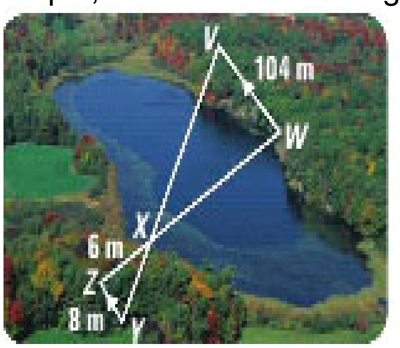
To test your analysis and understanding of the concepts let's see if you can be able to identify mistakes and be able to correct it with justification. This activity will also help you check your understanding and possible misconceptions you absorb from the previous activities.

ACTIVITY 15c Watch Your Error

Analyze each situation carefully and write your answer, solution and justification.

SITUATION	ANSWER / SOLUTION / JUSTIFICATION
1. Your classmate uses the proportion $\frac{4}{6} = \frac{5}{x}$ to find the value of x in the figure. Explain why this proportion is incorrect and write a correct proportion. 	
2. Your friend begins to solve for the length of $\overline{AD}$ as shown in the figure. Describe and correct your friend's error.	

SITUATION	ANSWER / SOLUTION / JUSTIFICATION
	
3. Two persons leave points A and B at the same time. They intend to meet at point C at the same time. The person who leaves point A walks at a speed of 3 miles per hour. How fast must the person who leaves point B walk?  A student who attempted to solve this problem claims that you need to know the length of $\overline{AC}$ to solve the problem. Describe and correct the error that the student made.	

SITUATION	ANSWER / SOLUTION / JUSTIFICATION
4. A man standing in his backyard measured the lengths of the shadows cast by him and a tree. What theorem/postulate would help him find the height of a tree? Write a proportion showing how he could find the height of a tree. A student who tried to answer this problem said that the best way to use is AA Similarity Postulate. Do you agree with this answer? Show your justification.	
5. You can measure the width of the lake below using a surveying technique, as shown in the diagram.  Your classmate said that SAS Similarity Theorem can be used to solve this problem since you are looking for a missing side and you have two given sides which are proportional. Justify if the answer of your classmate is right or wrong. Show your solution.	

Before you continue the learning process, it will be better if you stop and reflect. After taking different activities, what happened to your initial answers? You may now answer the R part of you IRF worksheet.

CONCEPTUAL UNDERSTANDING CHECK

In the table below, write your answers on the revised answer for the question what is the best way to solve problems involving triangle similarity?

INITIAL ANSWER

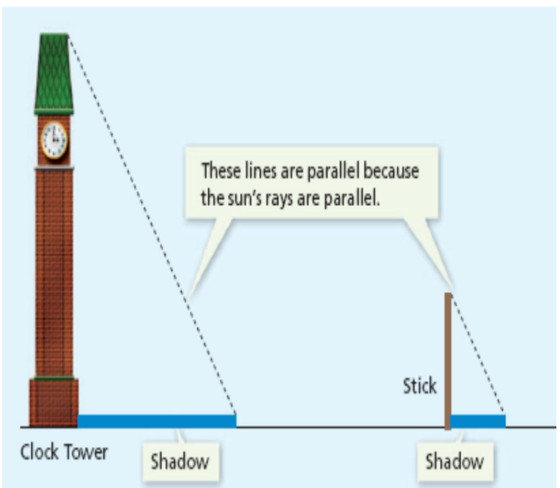
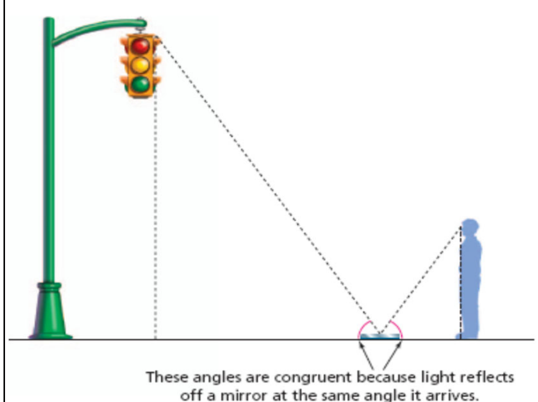
REVISED ANSWER

FINAL ANSWER

To deepen your understanding about the concepts of similar triangles, you will observe two different simple experiments and then answer the questions.

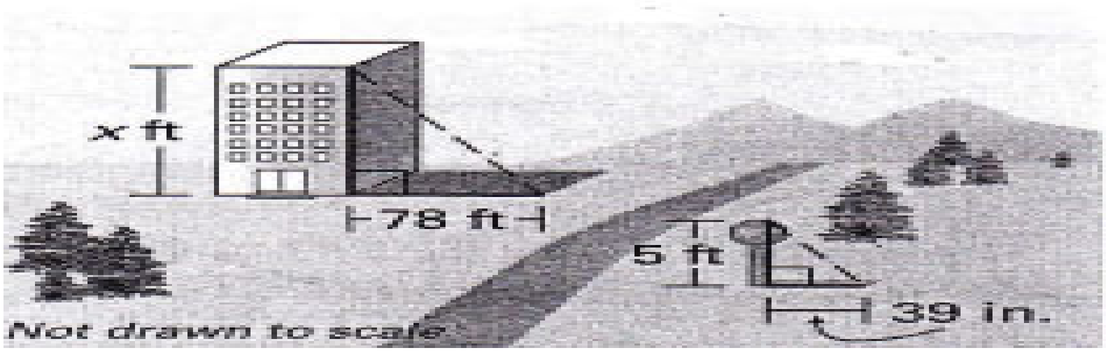
ACTIVITY 16c Experiment

Directions: Study the two situations below and analyze how to do each process. Answer the questions below in a paragraph form using the box provided after the two situations.

<table>
<tr>
<td>Situation 1: Use Your Shadow
Suppose you want to use the shadow method to measure the height of a building. You make the following measurements.
Materials: measuring device, stick
Given:
Length of the stick = 3 m
Length of the stick’s shadow = 1.5 m
Length of the building’s shadow = 8 m

</td>
<td>Situation 2: Mirror Yourself
Suppose you want to find the height of a traffic light for a very important purpose but your measuring devices are limited. You only have the following.
Materials: mirror, self
Given:
Height from the ground to your eyes = 150 cm
Distance of your feet from the middle of the mirror = 100 cm
Distance from the middle of the mirror to a point directly under the traffic signal = 450 cm

</td>
</tr>
<tr>
<td>Questions:
1. What concept would you use to solve the given problem? Justify your answer.
2. Why is it important to know how to measure things indirectly?
3. What are the advantages of estimation?
4. What is the best way to solve problems involving similar triangles?</td>
<td>Questions:
1. What concept would you use to solve the given problem? Justify your answer.
2. Why is it important to know how to measure things indirectly?
3. What are the advantages of estimation?
4. What is the best way to solve problems involving similar triangles?</td>
</tr>
</table>

Situation 3: Measure Measure
Suppose you want to use the shadow method to measure the height of a building with the use of a shorter post. You make the following measurements.
Materials: meter stick

Given:
Look for any post which can be measured with the use of a meter stick. Consider the illustration below.



Questions:
1. What concept would you use to solve the given problem? Justify your answer.
2. Why is it important to know how to measure things indirectly?
3. What are the advantages of estimation?
4. What is the best way to solve problems involving similar triangles?

ACTIVITY 17c **Experiment – My Observation, Analysis and Generalization**

____
____
____
____
____
____

Now that you have observed how to do an experiment using the concepts of triangle similarity, it's time for you to try it in your own situation. Try to observe around you, what are the things which are impossible for you to measure but now with the use of stick, mirror and shadow will be possible? How are the things that you learned in this lesson become useful in your daily life?
In the next activity you will improve your imagination and appreciation in the beauty of mathematics particularly triangle similarity. You may also explore the beauty of technology through different applications under **web 2.0**.

ACTIVITY 18c THINK, REFLECT AND DISCOVER

Directions: Using at least three different theorems or postulates that you learned, you will create a situation in the form of experiment similar to the previous activity. You may follow the procedure below.

Theorem / Postulate 1	**Theorem / Postulate 2**	**Theorem / Postulate 3**
Goal: Situation: Materials: Illustration: Conclusion: Justification:	Goal: Situation: Materials: Illustration: Conclusion: Justification:	Goal: Situation: Materials: Illustration: Conclusion: Justification:

Note: Write your work in a short type writing paper for each situation. To help you create a better illustration of the problem, you may use **geometersketchpad**. To do that, just download **geometersketchpad** and you may use it for free. You may submit your work online or face to face. To do the online submission, **go to student dash board** – **message** – **attached file - send**.

For your explanation and justification you may do it face to face or you may try another web 2.0 **present.me.** Here you may record your explanation, justification and generalization of the lessons. In your presentation, do not forget to answer the questions, ***what is the best way to solve problems involving triangle similarity?***

END OF DEEPEN

In this section, the discussion was about triangle similarity.

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

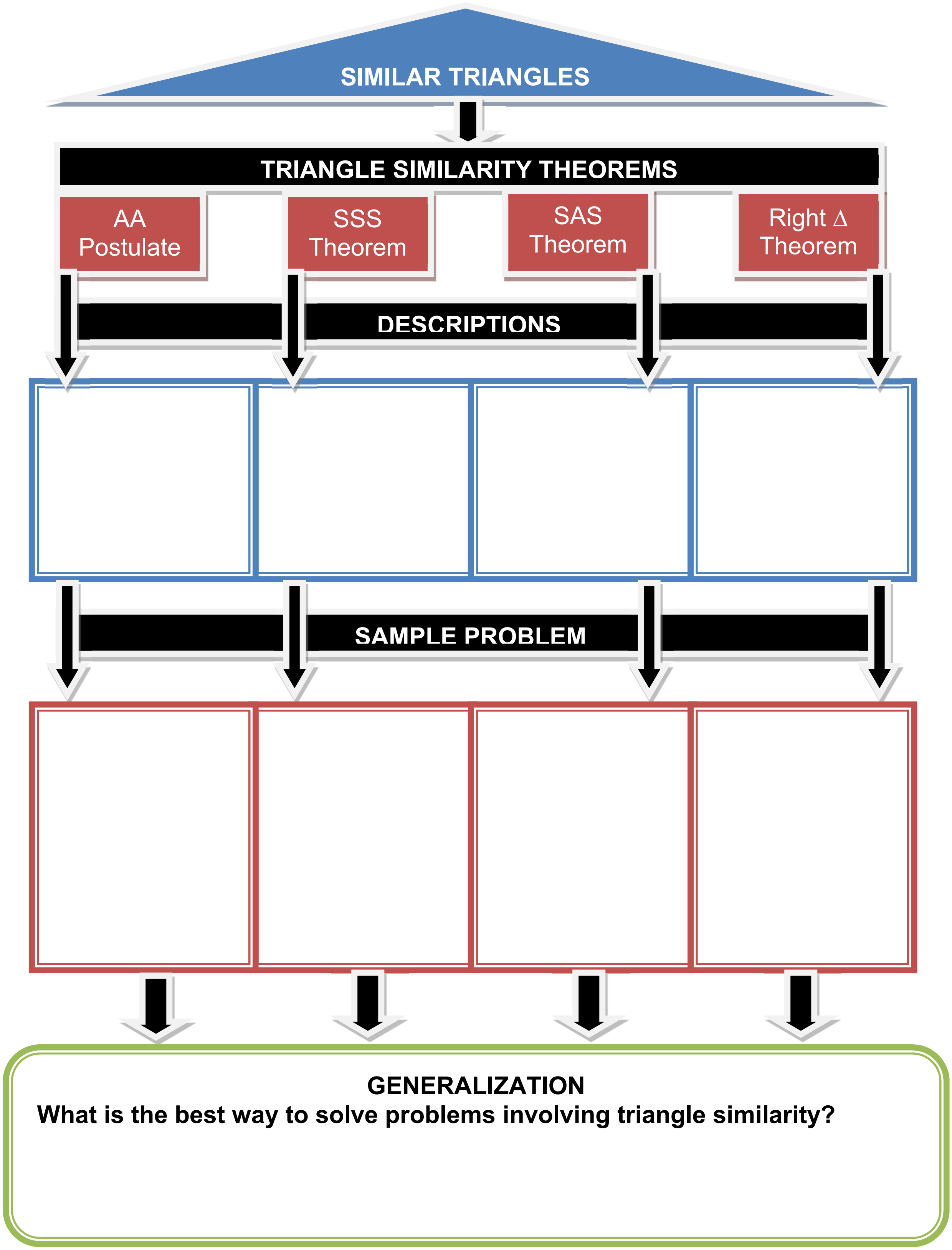
Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

TRANSFER

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

To help you summarize everything that you learned in this lesson, complete the concept map in the next page.

ACTIVITY 19c Concept Map



After completing the concept map, you may have enough knowledge, skills and understanding to do your transfer task. To assess what you learned and understand you will apply the concepts of the lesson in an actual situation by doing the transfer task of this lesson Scaffold 3.

ACTIVITY 20c SCAFFOLD 3

You are a newly hired designer of a company who develops condominiums and housing projects. The company is presently preparing for a bidding to develop a condominium with a floor area of 70 square meters. You are tasked by your superior to make a two dimensional design of all the faces of a condominium. It is important for you to show the scale and consider the different quadrilaterals and similar triangles to make your design appealing. You need also to solicit ideas from others to improve your work. You may post your work to any social network to solicit comments for improvement or you may present it to possible clients to get suggestions before you present your work to the higher officers of the company for approval.

Note: To make your design appealing and accurate you may use the **geogebra.** To do it, download **geogebra** then you may use it for free.

For your presentation and explanation, you may use **voki.com**. This will help you record your presentation in the most exciting way.

After doing your transfer task (Scaffold 3) it's time again to reflect on the learning process to check if there are ideas which you need to change, to revise or improve. You may now complete you IRF worksheet by writing your ideas on the F part.

CONCEPTUAL UNDERSTANDING CHECK

In the table below, write your answers on the final answer for the question what is the best way to solve problems involving triangle similarity?

INITIAL ANSWER

REVISED ANSWER

FINAL ANSWER

To complete the learning process, reflect again and complete the table below. This will also check if you have absorbed some misunderstanding which need to be corrected.

Let’s Reflect!

CORNELL' S NOTES	
TOPICS	**THINGS I LEARNED**
Questions I want to be answered:	

To summarize what you learned, you may complete the synthesis journal below.

Synthesis Journal

The lesson was on ________________________________. One key idea was ______________________________. This is important because ____. Another key idea was _________________________________. This is also important because ____. In summary, the lesson ____
____
____.

END OF TRANSFER:

In this section, your task was to make a two dimensional design of a condominium.

How did you find the task? How did the task help you see the real world use of the topic?

You have completed this lesson. But you have one more lesson before you finish this module. You need to learn more about triangles to complete what you need in doing your performance task.

Lesson 4: Pythagorean Theorem and Special Right Triangles

In this lesson you will learn the following:

1. Proves the conditions for similarity of triangles involving Special Right Triangle Theorems
2. Applies the theorems to show that give triangles are similar
3. Proves the Pythagorean Theorem
4. Solves problems that involve triangles similarity and right triangles.

EXPLORE

You have just finished with the different theorems on similar triangles and polygons. In this lesson you will be dealing with theorems involving similarity theorems on special right triangles which are useful in analysis and solving problem involving geometric designs and figures.

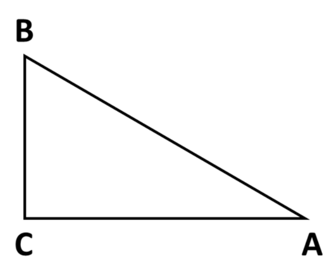
Before we discuss the main lesson, let's find out what you know about the topic. Bear in mind as you go through this module you are to answer the question:

What is the best way to solve problems involving quadrilaterals and triangle similarity?

Answer the first column of the ARG by clicking on the AGREE or DISAGREE column. Click A if you agree with the statement and click B if you disagree. Please answer all items. As you go through this module, look for the best correct answer to the statements included in this guide.

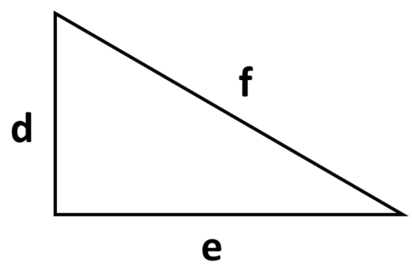
ACTIVITY 1d Agree or Disagree?

Anticipation Reaction Guide
Directions: Answer the first column of the ARG by clicking on the AGREE or DISAGREE column. Click A if you agree with the statement and click B if you disagree. Please answer all items.

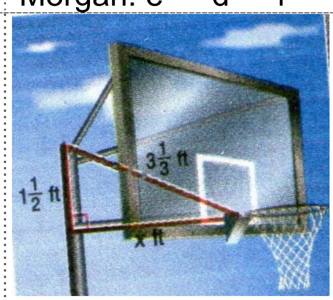
Before Discussion		Statements	After Discussion	
Agree	Disagree		Agree	Disagree
A	B	1. The hypotenuse of a right triangle is the longest of all its three sides..	A	B
		2. In a right triangle, the measure of the hypotenuse is equal to the sum the measure of its legs.		
		3. The numbers 3, 4, and 5 represent a Pythagorean triple.		
		4. In an isosceles right triangle, the side opposite the right angle is $\sqrt{2}$ times as long as either of the legs.		
		5. In a 30-60-90 triangle, the side opposite the smallest angle is twice as long as the longest side.		
		6. In rt. ΔBCA, the measure of $\overline{AC}$ is x$\sqrt{3}$ if $\overline{BC} = x,\ \angle A = 30^0$, $\angle B = 60^0\ and\ \angle C = 90^0$. 		
		7. The Pythagorean theorem is applicable to any triangle.		

8. A square mirror 7 ft on each side must be delivered through the doorway 3 ft x 6.5 ft. Can the mirror fit through the doorway?

9. Cathy, Luisa and Morgan are writing an equation to find the length of the third side of a right triangle given below. Only Luisa wrote the correct equation.



Cathy: $f + e = d$
Luisa : $f^2 = d^2 + e^2$
Morgan: $e^2 = d^2 - f^2$



10. The support for a basketball goal forms a right triangle as shown. The length x of the horizontal portion of the support is approximately 2.98 ft.

End of EXPLORE:

You have just finished answering a pre-assessment activity. What you will learn in the next sections will also enable you to do a final project which involves creating a model or structural design that will help you use materials efficiently or maximize the use of space. We will start by doing the next activity.

FIRM-UP

Your goal in this section is to have a good understanding of the Pythagorean Theorem and theorems involving special right triangles. The activity focus will be the formal proof of these theorems. Formative assessments on the relationships of the sides of the special right triangles will also be provided.

Start by performing the Activity 2d and learn how the theorems are derived applied.

ACTIVITY 2d A Man Named PYTHAGORAS!

DESCRIPTION: In this activity you are to read an article about the works of a certain mathematician who is best remembered today because of his theorem which deals with the relationships among the sides of a right triangle. Take note of the words you have encountered by highlighting or underlining it then summarize in your own words what you have read.

Click the website below, read and answer the questions that follow.

http://www.themathlab.com/Algebra/lines%20and%20distances/pythagor.htm
This website gives pertinent information about the life of Pythagoras and how he derived his Pythagorean Theorem. The following information comes from a wonderfully readable math history book by Julia E. Diggins called, **STRING, STRAIGHT-EDGE, & SHADOW, THE STORY OF GEOMETRY** .

Questions to Answer:

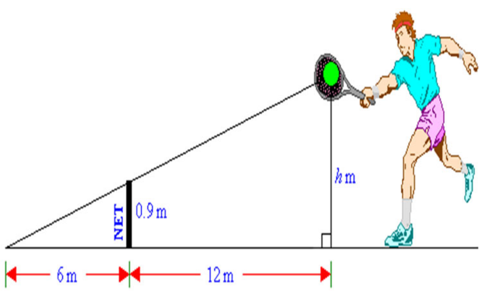
- What is the reading all about?
- Do you agree to the statement " Without Pythagoras, school may never have been invented nor much of what we know of mathematics"?
- How did the early engineers make use of the "rope - stretchers" in building structures like the Great Pyramid of Egypt?
- How did Pythagoras of Samos derived his remarkable theorem on right triangles?
- Do you think the concept or idea of quadrilaterals and triangles is the best way to ensure quality foundation of structures and designs?

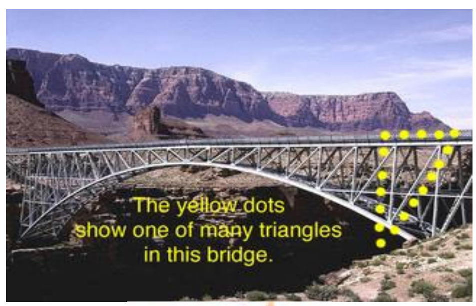
Write your answers here.

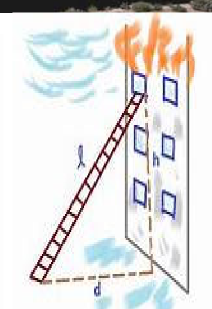
ACTIVITY 3d

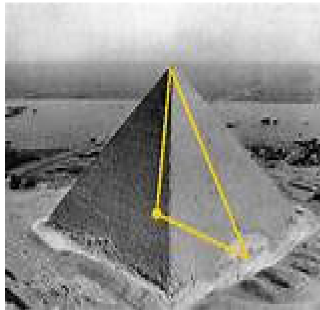
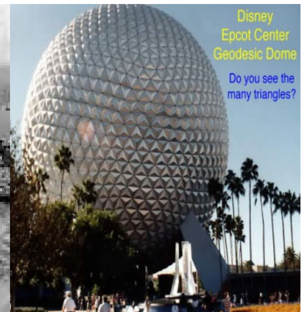
Focus: Identifying Use of Pythagorean Theorem in Real Life

Below are some pictures of right triangles as applied in the real world. Can you identify them? Explain why such shape was used.








ACTIVITY 4d Different Ways of Proving the Pythagorean Theorem

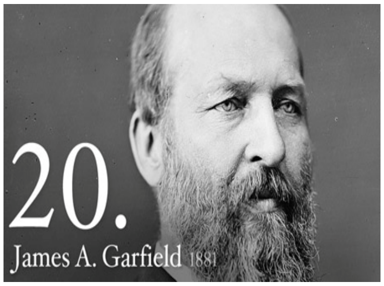
Description: Click the websites below and see how the proof is shown through illustrations, Algebra, paper cutting and others.

http://www.mathsisfun.com/pythagoras.html - This website gives the discussion of the derivation of Pythagorean Theorem using the concept of area.

http://www.brainingcamp.com/content/pythagorean-theorem/manipulative.php. This is an interactive site where the Pythagorean Theorem is proven using the concept of area. To show the proof, click the Show Proof icon under Action button and drag the parts of the violet and green squares to form a bigger square in the orange square.

http://www.mathisfun.com/geometry/pythgorean-theorem-proof.html - Algebra Proof of Pythagorean Theorem

http://www.watchknowlearn.org/Video.aspx?VideoID=54330&CategoryID=5370 This website shows video of the proof of Pythagorean Theorem by James Garfield the 20th century President of the United States. He derived the theorem using the concept of the area of the trapezoid.



Additional website showing some other ways of deriving the proof of Pythagorean Theorem. Click the website below and you will see the other proofs of the theorem.

http://www.cut-the-knot.org/pythagoras/index.shtml- This website gives the list of 100 proofs of the Pythagorean Theorem.

Questions to Answer:

1. How was the Pythagorean theorem derived in the different sites? Write your answers in the table below.

2. Is the theorem applicable to all kinds of triangles? What is its limitation?

3. Do the different proofs of the theorem lead to the same conclusion? Explain.

4. Which of the different proofs presented made you understand clearly? Discuss.

5. Do you think the theorem will help you understand and solve problems involving right triangles? Explain.

ACTIVITY 5d The Triangle and the Theorem

www.shodor.org/interactive/activities/SquaringTheTriangle/ - This applet allows users to explore right triangles and the Pythagorean Theorem. This can also be used to explore the angle measurements of the triangles. This activity will develop an understanding of the Pythagorean Theorem. It displays a right triangle with a square against each side. Each square has sides that are equal in length to the side of the triangle it is against. By adjusting the lengths of the sides of the triangle, the user can visually experience the Pythagorean Theorem.

Questions to Answer:

The questions below can be obtained by clicking the “Learner” icon and then click the Worksheet Squaring the triangle Exploration Questions.

1. What defines a right triangle?
2. What is the area of the square?
3. How are the angles and the sides opposite them related?
4. How are the blue squares related?
5. How are the two non-right angles related?
6. How are the sides related in a right triangle
7. If the triangle is NOT right, will the theorem still hold?
8. What generalization can you make based on the Pythagorean Theorem?

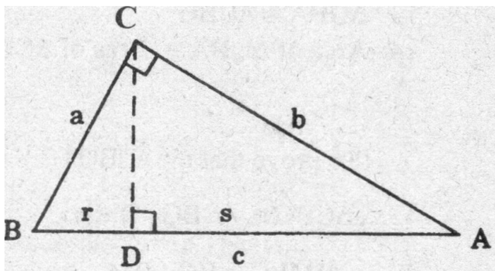
14. Write your answers here.

ACTIVITY 6d The Formal Proofs

DESCRIPTION: In this activity, the students will derive the mathematical proof of Pythagorean theorem by supplying the corresponding reason of the given statements.

Given: $\triangle$ABC with $\angle$C a right angle and $\overline{CD}$ is the altitude of $\triangle$ABC.

Figure:



Prove: $c^2 = a^2 + b^2$

Proof: Supply the corresponding reason for each of the given statement.

Statements	Reasons
1. $r + s = c$	1.Definition of Betweeness
2. $a^2 = cr$ and $b^2 = cs$	2. ?
3. $a^2 + b^2 = cr$	3. Addition Property of Equality
4. $a^2 + b^2 = c(r + s)$	4. ?
5. $a^2 + b^2 = c(c)$	5. Substitution
6. $a^2 + b^2 = c^2$	6. Product Rule on Exponent
7. $c^2 = a^2 + b^2$	7. ?

Questions to Answer:

1. How was the theorem proven? ______________________(insert a box for the students to answer)
2. How does it differ from the previous proof shown in Activity 6c? ___________ (insert a box for the students to answer)
3. Does it lead to the same conclusion? Explain.

ACTIVITY 7d Formal Proof of the Converse of Pythagorean Theorem

DESCRIPTION: In this activity, the students will derive the geometric proof of the converse of Pythagorean theorem by supplying the corresponding reason of the given statements.

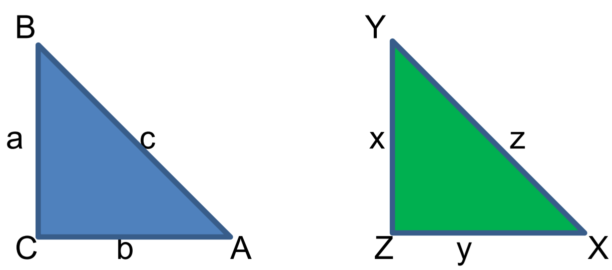
Proof of the Converse of Pythagorean Theorem

Converse of the Pythagorean Theorem

If in a triangle, the square of the length of one side is equal to the sum of the square of the lengths of the other two sides, then the triangle is a right triangle and the right angle is opposite the longest side.

Given : $\triangle$ ABC with $a^2 + b^2 = c^2$
Prove : $\triangle$ ABC is a right triangle

Figure:



Proof:

Statements	Reasons
1. Let XYZ be a right triangle with legs of length x and y and hypotenuse of length z	1.By Construction
2. $x^2+y^2 = z^2$	2. ?

3. $a^2 + b^2 = c^2$	3. Given
4. $c^2 = z^2$ or $c = z$	4. Transitive Property of Equality
5. $\Delta ABC \cong \Delta XYZ$	5. SSS Congruence Postulate
6. $\angle C \cong \angle Z$	6. ?
7. $m\angle C \cong m\angle Z$	7. Definition of congruent angles
8. $m\angle Z = 90$	8. ?
9. $m\angle C = 90$	9. Transitive Property of Equality
10. $\angle C$ is a right angle	10. Definition of a right angle
11. ΔABC is a right triangle.	11. ?

The Pythagorean Theorem describes the relationship between the lengths of the legs and the hypotenuse of any right triangle. You can use the Pythagorean Theorem to find the length of a side of a right triangle when you know the other two sides.

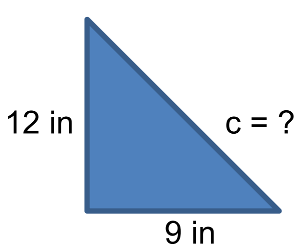
To understand the above theorems, study the given examples how the theorems are used or applied in solving problems involving right triangles.

ACTIVITY 8d Looking for the Third Side!

Consider the problems below:

Write an equation you could use to find the length of the missing side of each right triangle. Then find the missing length. Round to the nearest tenth if necessary.

1.



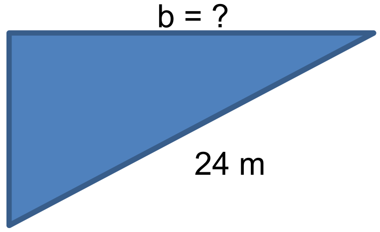
$a^2 + b^2 = c^2$ Pythagorean Theorem

$12^2 + 9^2 = c^2$	Substitution
$144 + 81 = c^2$	Evaluate $12^2 + 9^2$
$225 = c^2$	Add 81 and 144
$\pm\sqrt{225} = c$	Taking square root of both sides of the equation
$c = 15$ or -15	Simplify

The equation has two solutions, 15 and -15. However, the length of a side must be positive. So, the hypotenuse is 15 inches long.

Check:
$$a^2 + b^2 = c^2$$
$$12^2 + 9^2 = 15^2$$
$$144 + 81 = 225$$
$$225 = 225$$

2.



$a^2 + b^2 = c^2$	Pythagorean Theorem
$8^2 + b^2 = 24^2$	Substitution
$64 + b^2 = 576^2$	Evaluate $8^2 + 24^2$
$64 - 64 + b^2 = 576 - 64$	Subtracting 64 both sides of the equation
$b^2 = 512$	Simplify
$b = \pm\sqrt{512}$	Taking square root of both sides of the equation
or $b \approx 22.6$ m	

The length of side b is about 22.6 meters.

3. The measure of the three sides of a triangle are 5 inches, 12 inches, and 13 inches. Determine whether the triangle is a right triangle.

$a^2 + b^2 = c^2$	Pythagorean Theorem
$5^2 + 12^2 = 13^2$	Substitution
$25 + 144 = 169$	Evaluate $5^{2,}$ $12^2$and 13^2
$169 = 169$	Simplify

Since both sides of the equation are equal, then the triangle is a right triangle.

4. Geo claims that the following sides of triangle 4 m, 7 m , 5 m and 30 km, 122 km, 125 km determine a right triangle. Justify if his claim is TRUE.

$a^2 + b^2 = c^2$	Pythagorean Theorem
$4^2 + 5^2 \stackrel{?}{=} 7^2$	Substitution
$16 + 25 \stackrel{?}{=} 49$	Evaluate 4^2, 5^2 and 7^2
$41 \stackrel{?}{=} 49$	Simplify

Since the sum of the squares of two sides is not equal to the square of the longest side, then the sides do not form a right triangle. Therefore Geo's claim is not true.

$a^2 + b^2 = c^2$	Pythagorean Theorem
$30^2 + 122^2 \stackrel{?}{=} 125^2$	Substitution
$900 + 14\,884 \stackrel{?}{=} 15\,625$	Evaluate 30^2, 122^2 and 125^2
$15\,784 \stackrel{?}{=} 15\,625$	Simplify

Since the sum of the squares of two sides is not equal to the square of the longest side, then the sides do not form a right triangle. Therefore Geo's claim is not true.

From the example problem in item 4 since the sides of a triangle do not determine a right triangle, what kind of triangle is formed?

From these examples it further leads to the theorem regarding the kind of triangle if the sum of the squares of two sides is greater or lesser than the square of the other side. This theorem is called the Pythagorean Inequality Theorems.

If the sum of the squares of the lengths of the shorter sides of a triangle is greater than the square of the length of the longest side then the triangle is acute.

If the sum of the squares of the lengths of the shorter sides of a triangle is less than the square of the length f the longest side then the triangle is obtuse.

For further acquisition and comprehension of the concepts regarding right triangles, and the visual and algebraic proofs of Pythagorean Theorem, visit the website below

ACTIVITY 9d Pythagorean, A Second Look

Click the website below as a second look of the discussion of Pythagorean Theorem. This further discusses the theorem coupled with formative assessment.

www.brainingcamp.com/content/pythagorean-theorem/lesson.php.This website consists of the discussion on the visual and algebraic proofs of the Pythagorean Theorem.

ACTIVITY 4i Test me in the Web

To check if you understand the presented lessons and examples , perform the exercises given below as formative assessment using Pythagorean Theorem

www.brainingcamp.com/content/pythagorean-theorem/questions.php. This website gives a 10-item questions involving facts and computations of sides of a right triangle using Pythagorean Theorem. To check if the given answers are correct, click the submit icon.

For the website given below, solve for items 1 to 21(odd numbers only).

hotmath.com/help/gt/genericprealg/section_8_5.html - This site contains 43 practice problems with solutions on Pythagorean Theorem and its converse.

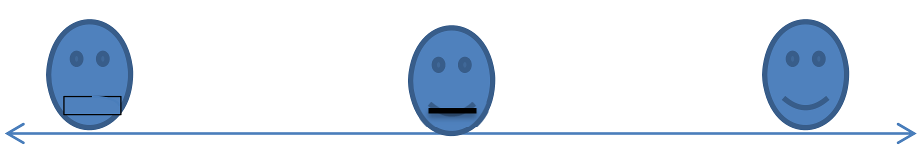
www.glencoe.com/sec/math/studytools/cgi-bin/msgQuiz.php4?isbn=1-57039-850-X&chapter=8&lesson=5 – This is a 5-item self-check quiz about Pythagorean Theorem

http://www.shodor.org/interactivate/activities/PythagoreanExplorer/ - Interactive website determining the 3rd side of a right triangle using Pythagorean Theorem. You can choose 3 levels of difficulty and check your answer by clicking the corresponding icon and determine your score.

After you have browsed and answered the given questions in the different sites, what do you think is the best way to solve problems involving triangle similarity specifically Pythagorean Theorem?

ACTIVITY 10d Rate Yourself!

How confident are you about using the Pythagorean Theorem? Check the box that applies.



☐ ☐ ☐ ☐ ☐

Not Confident Confident Very Confident

ACTIVITY 11d Are We the Threesome Numbers?

Description: In this activity you are to determine whether the given three numbers represent a Pythagorean triple.

Three numbers can be called a Pythagorean triple if $a^2 + b^2 = c^2$ where a, b and c are positive integers.

Given a set of three numbers, show that these represent a Pythagorean triple.

1. Fill in the table with the correct value and tell whether the set represents a Pythagorean triple.

	a	b	c	a^2	b^2	c^2	a^2+b^2	Is $a^2 + b^2 = c^2$?
i.	3	4	5					
ii.	6	8	10					
iii.	5	12	13					
iv.	7	24	25					
v.	10	24	26					
vi.	9	12	15					

2. Explain why i, iii and iv above are more important than the others?
3. Observe the following triples.

   3, 4, 5
   5, 12, 13
   7, 24, 25

   What can be said about the smallest number in the triple?
   What is unique with the difference between the other number?

4. What are the other two numbers in a triple if the smallest is 9? 11?13?

5. Do you think these set of numbers will guide and help solve problems involving right triangles? Explain.

Answer:

1. Fill in the table with the correct value and tell whether the set represents a Pythagorean triple.

	a	b	c	a^2	b^2	c^2	a^2+b^2	Is $a^2 + b^2 = c^2$?
i.	3	4	5	9	16	25	25	Yes
ii.	6	8	10	36	64	100	100	Yes
iii.	5	12	13	25	144	169	169	Yes
iv.	7	24	25	49	576	625	625	Yes
v.	10	24	26	100	576	676	676	Yes
vi.	9	12	15	81	144	225	225	Yes

2. Explain why i, iii and iv above are more important than the others? ii and vi are multiple of i; v is a multiple of iii. i, iii and iv are important because they are not multiples of the other triples.
3. Observe the following triples.
   3, 4, 5
   5, 12, 13
   7, 24, 25

   What can be said about the smallest number in the triple? The smallest number in the triple is an odd number.
   What is unique with the difference between the other number? The difference between the other number is 1.

4. What are the other two numbers in a triple if the smallest is 9? 11?13? 9, 40, 41; 11, 60, 61; 13, 84, 85

ACTIVITY 12d Are We Really the TRIO?

Click the website below and answer the given questions
www.math.com/school/subject3/practice/S3U3L4/S3U3L4Pract.html - This website gives 8 sample sets of numbers and determine whether each set represents the sides of a right triangle.

ACTIVITY 13d Finding My Threesome

We have learned that if three numbers satisfy the Pythagorean Theorem, they are called Pythagorean triples. The numbers a, b, and c are a Pythagorean triple if,

- $a = m^2 - n^2$
- $b = 2mn$
- $c = m^2 + n^2$

  Where m and n are relatively prime positive integers and m>n.

  Example: Choose m = 5 and n = 2.
  $a = m^2 - n^2$ $b = 2mn$ $c = m^2 + n^2$ Check: $a^2 +$

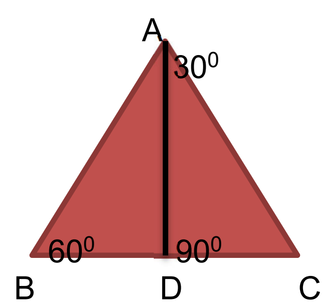
$b^2 = c^2$
$= 5^2 – 2^2$ $= 2(5)(2)$ $= 5^2 + 2^2$ $20^2 +$
$21^2 = 29^2$
$= 25 – 4$ **$= 20$** **$= 25 + 4$** **$400 +$**
$441 = 841$
$= 21$ $= 29$
$841 \quad = 841$

ACTIVITY 14d Pythagorean Triples

Use the following values of m and n to find Pythagorean triples.

1. m = 3 and n = 2
2. m = 4 and n = 1
3. m = 5 and n = 3
4. m = 6 and n = 5
5. m = 10 and n = 7
6. m = 8 and n = 5

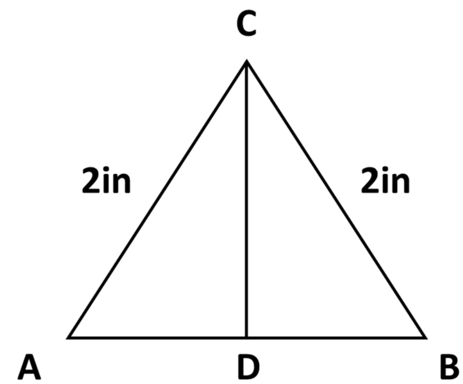
Source:
www.ed.gov.nl.ca/edu/k12/curriculum/documents/mathematics/gr8/pythagorean_triples.pdf
One of the theorems in right triangle is the 30-60-90 Triangle Theorem. Read the text below before performing Activity 4i to derive the 30-60-90 TriangleTheorem .



An equilateral triangle has three equal sides and three equal angles. Because the sum of the measures of the angles in a triangle is 180º, the measure of each angle in an equilateral triangle is 60º. If you draw a median from vertex A to side $\overline{BC}$, the median bisects the angle A. The median of an equilateral triangle separates it into two 30-60-90 triangles. In the figure above AD is the median.

ACTIVITY 15d Hands-On Geometry

Materials Needed : compass, protractor and ruler



Procedures:

Step 1. Construct an equilateral triangle with sides 2 inches long. Label its vertices A, B, and C.

Step 2. Find the midpoint of $\overline{AB}$ and label it D. Draw $\overline{AD}$, a median.

Step 3. Use the protractor to measure $\angle ACD\ \angle A\ and\ \angle CDA$. Use the ruler to measure $\overline{AD}$ and use the Pythagorean Theorem to find $\overline{CD}$. Write the answers for the measure of sides in simplest form. Use the table below to write the needed data.

Side AC	$\angle ACD$	$\angle A$	$\angle CDA$	AD	CD
2 in					
4 in					
3 in					

Step 4. Suppose the length of a side of an equilateral triangle is 10 inches. What values would you expect for AC(hypotenuse), AD (shorter leg), and CD (longer leg)?

Step 5. From the activity, what can be deduced regarding the relationships between the hypotenuse , the length of the shorter leg and the length of a longer leg in a 30-60-90 triangle?

Answers:

Side AC	$\angle ACD$	$\angle A$	$\angle CDA$	AD	CD
2 in	30^0	60^0	90^0	1 in	$\sqrt{3}$ in
4 in	30^0	60^0	90^0	2 in	$2\sqrt{3}$ in
3 in	30^0	60^0	90^0	1.5 in	1.5 $\sqrt{3}$ in

If the measure of the side of an equilateral triangle is 10 inches, the hypotenuse is 10 inches, the shorter leg is 5 inches and the longer leg is $5\sqrt{3}$ inches.

In a 30-60-90 triangle, the hypotenuse is twice the length of the shorter leg, and the longer leg is $\sqrt{3}$ times the length of the shorter leg.

Remember that the shorter leg is always opposite the 30^0 angle, and the longer leg is opposite the 60^0 angle.

This further leads to the 30-60-90 Triangle Theorem, which states that in a 30-60-90 triangle, the side opposite the 30^0 angle is half as long as the hypotenuse and the side opposite the 60^0 angle is $\sqrt{3}$ times as long as the side opposite the 30^0 angle.

ACTIVITY 16d Geometric Proof of the 30-60-90 Triangle Theorem

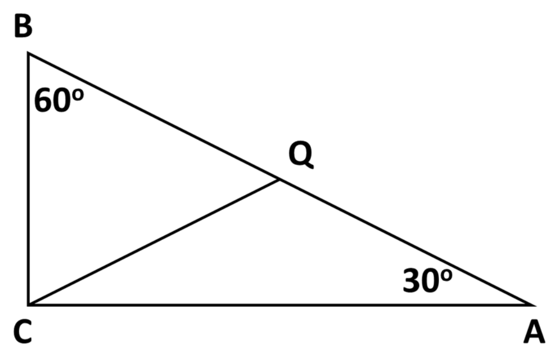
After deriving the theorem, you are to derive the same theorem using the geometric proof. You will be provided with statements and its corresponding reasons as you go through its proof.

Given: Right △ ABC with m∠A = 30, m∠B = 60 and m∠C = 90.

Prove : a. BC = $\frac{1}{2}AB$

b. AC = $\sqrt{3}BC$

Figure:



Proof:

Statements	Reasons
1. Right ΔABC with m∠A = 30, m∠B = 60 and m∠C = 90	1. Given
2. Let Q be the midpoint of AB	2. Every segment has exactly one midpoint.
3. Construct, $\overline{CQ}$ the median to the hypotenuse.	3. The Line Postulate/Definition of median of a triangle.
4. CQ = $\frac{1}{2}AB$	4. The Median Theorem
5. AB = BQ + AQ	5. Definition of Betweeness
6. BQ = AQ	6. Definition of median of a triangle
7. AB = AQ + AQ	7. Substitution(5 and 6)
8. AB = 2AQ	8. Combining Similar Terms
9. CQ = $\frac{1}{2}(2AQ)$	9. Substitution(4 and 8)
10. CQ = AQ	10. Multiplicative Inverse

Statements	Reasons
11. CQ = BQ	11. Transitive Property of Equality(6 and s10)
12. $\overline{CQ} \cong \overline{AQ}; \overline{CQ} \cong \overline{BQ}$	12. Definition of Congruent Segments
13. ∠B ≅ ∠BCQ	13. Isosceles Triangle Theorem
14. m∠B = m∠BCQ	14. Definition of Congruent Angles
15. m∠BCQ = 60	15. Transitive Property of Equality(1 and 14)
16. m∠B + m∠BCQ + m∠BQC = 180	16. The sum of the measures of the angles of a triangle is equal to 180.
17. 60 + 60 + m∠BQC = 180	17. Substitution(1 and 15)
18. m∠BQC =60	18. Simplification/APE
19. Δ BCQ is equiangular and therefore equilateral.	19. Definition of equiangular triangle.
20. BC = CQ	20. Definition of equilateral triangle.
21. BC = $\frac{1}{2}AB$	21. Transitive Property of Equality(8, 10 and 20)

To prove that AC = $\sqrt{3}BC$, we simply apply the Pythagorean Theorem.

$$c^2 = a^2 + b^2$$

$$AB^2 = \left(\frac{1}{2}AB\right)^2 + AC^2$$

$$AB^2 = \left(\frac{AB^2}{4}\right) + AC^2$$

$$\frac{3}{4}AB^2 = AC^2$$

$$\frac{\sqrt{3}}{2}AB = AC$$

$$\frac{\sqrt{3}}{2}2(BC) = AC$$

$$\sqrt{3}BC = AC$$

$$AC = \sqrt{3}BC$$

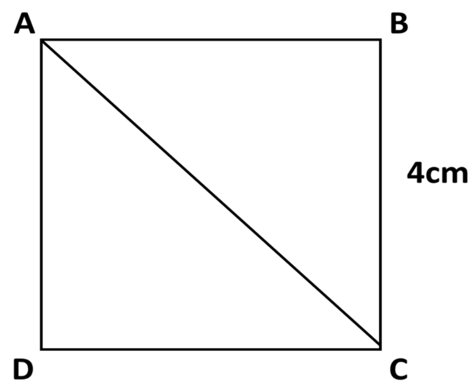
This further states that in a 30-60-90 triangle, the side opposite the 30^0 angle is half as long as the hypotenuse and the side opposite the 60^0 angle is $\sqrt{3}$ times as long as the side opposite the 30^0 angle..

Another Right Triangle Theorem is the 45-45-90 Triangle Theorem, perform Activity 4k to derive the theorem and see how the theorem was formally proved geometrically.

The 45-45-90 Triangle Theorem or the Isosceles Right Triangle Theorem

ACTIVITY 17d **Hands-On Geometry**

Materials Needed; Ruler and Protractor



Procedures:

Step 1. Draw a square with sides 4 centimeters long. Label its vertices A, B, C, and D.

Step 2. Draw the diagonal $\overline{AC}$.

Step 3. Using a protractor and Pythagorean theorem measure $\angle CAB$ $\angle ACB$ *and* $\overline{AC}$ respectively. Express $\overline{AC}$ in simplest form. Use the table below to write the needed data.

Step 4. Repeat the steps 1 – 3 for squares using 6 cm long and 8 cm long.

Side of a square	m$\angle CAB$	m $\angle ACB$	m$\overline{AC}$
4 cm			
6 cm			
8 cm			

Step 5. Make a conjecture about the length of the diagonal of a square with sides 7 cm long.

Step 6. From the activity, what can be deduced regarding the relationship of the hypotenuse and the length of a leg in a 45-45-90 triangle?

Answer:

Side of a square	m$\angle CAB$	m $\angle ACB$	m$\overline{AC}$
4 cm	45^0	45^0	$4\sqrt{2}$
6 cm	45^0	45^0	$6\sqrt{2}$
8 cm	45^0	45^0	$8\sqrt{2}$

If a square has side 7 cm long, then the diagonal is $7\sqrt{2}$ cm. In a 45-45-90 triangle, the hypotenuse is $\sqrt{2}$ times the length of a leg.

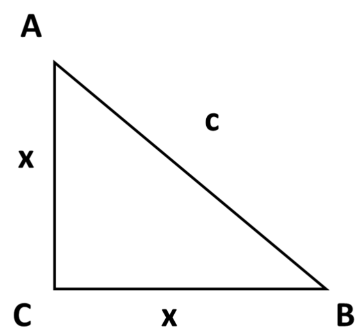
This further leads to the 45-45-90 Triangle Theorem which states that in a 45-45-90 Triangle, an isosceles right triangle, the hypotenuse is $\sqrt{2}$ times as long as either of the legs.

ACTIVITY 18d Geometric Proof of the theorem

Activity 18d. Geometric Proof of the theorem

Given : ΔABC is an isosceles triangle with AC = BC = x, AB = c and $m\angle C = 90$.

Figure:



Prove: c = $x\sqrt{2}$

Proof:

Statements	Reasons
1. ΔABC is an isosceles triangle, with AC = BC = x, AB = c and $m\angle C = 90$.	1. Given
2. $c^2 = x^2 + x^2$	2. Pythagorean Theorem
3. $c^2 = 2x^2$	3. Simplification/Combining similar terms
4. c = $x\sqrt{2}$	4. Extracting Square root of both sides of the Equation

From the given proof it further states that in a 45-45-90 Triangle or in an isosceles right triangle, the hypotenuse is $\sqrt{2}$ times as long as either of the legs.

You have just presented with the different theorems on right triangles, to further understand the concepts and its derivation, visit the websites below

ACTIVITY 19d The Web

In this activity, you are to see how the theorems were discussed and derived

http://www.ixl.com/math/algebra-1/special-right-triangles – interactive exercises about special right triangle.

http://www.regentsprep.org/regents/math/algtrig/ATT2/PracSpecial.htm – interactive website on Special Right Triangle.

http://www.mrperezonlinemathtutor.com/G/3_3_Using_30_60_90_and_45_45_90_ratios.html – Discussion on Special Right Triangle.

http://exchange.smarttech.com/search.html?q=%20special%20right%20triangles

Questions to Answer:

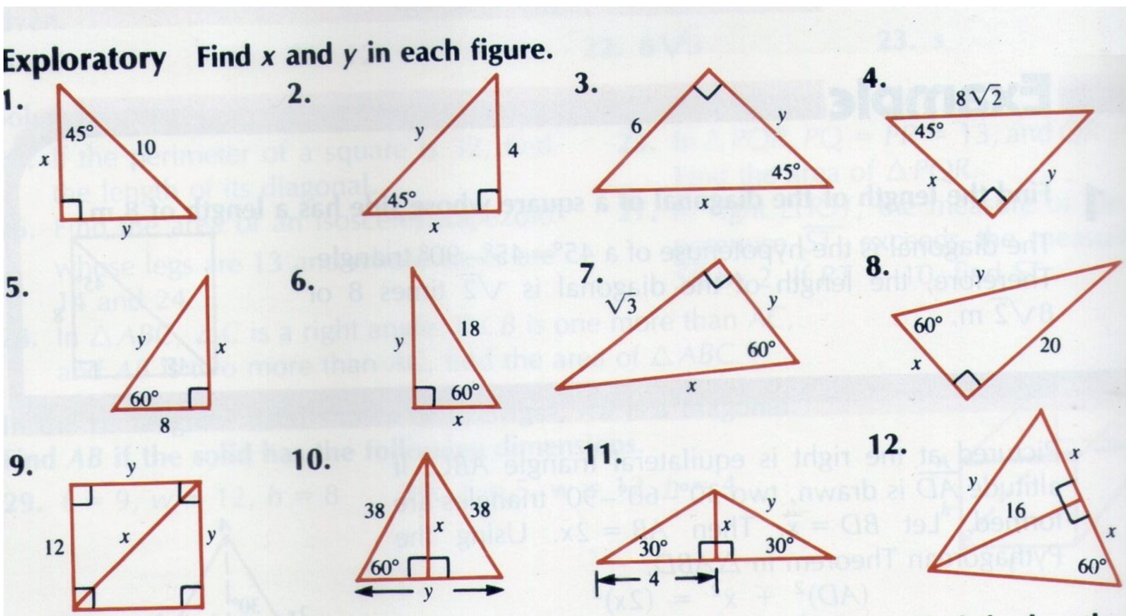
1. What are the websites all about?
2. How the website facilitates the concept formation?
3. From the given websites, what are the characteristics a 45-45-90 and 30-60-90 triangles?
4. Compare and contrast the 30-60-90 Triangle Theorem and the 45-45-90 Triangle Theorem.

Write your answers here….

After looking at the examples and browsing the websites, find out if you can perform the exercises by answering the following problems given in the next Activity.

ACTIVITY 20d Solve ME

In this activity you will be solving problems involving right triangles and use the concept of special right triangle theorems. After solving the given exercises, answer the questions given at the end of the activity.



2. Use Figure M to find each measure.

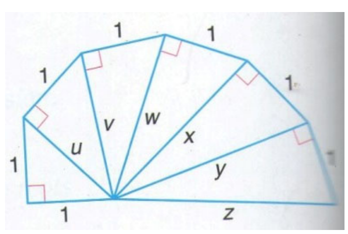
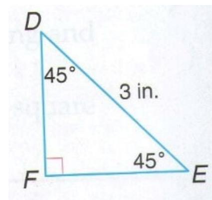


Figure M

a. u
b. v
c. w
d. x
e. y
f. z



3. Norman says that the length of a leg of a $\triangle$DEF is $3\sqrt{2}$ inches. Dale says the length of a leg is $\frac{3\sqrt{2}}{2}$ inches. Who is correct? Explain your answer.

4. Draw and label a 30-60-90 triangle in which the sides are 5 inches, 10 inches and
$5\angle 3$ inches.

5. www.shodor.org/interactivate/activities/PythagoreanExplorer/ - This is an interactive site solving for the third side of a right triangle using Pythagorean theorem. It has 3 levels of difficulty to choose from. Click the icons below the figure to use its application.

6. http://www.themathlab.com/Algebra/pythagorean%20theorem%20intro%20to%20trig/pythagtest.htm - This is a treasure hunt website. It contains 9 problems to be solved to answer the puzzle. The answers are given in the box for you to choose from. After you have answered correctly all the problems, the password will be used to claim your treasure.

Questions to Answer:

1. How did you find the exercises?
2. Were you able to solve correctly the problems?
3. Were there difficulties encountered in performing the activity?
4. What is the best way to solve problems involving triangle similarity specifically Pythagorean Theorem and theorems on Special Right Triangles?

Write your answers here….

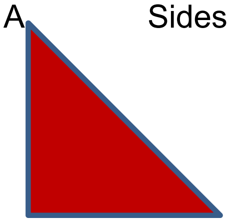
ACTIVITY 21d Fill Me

To check if you understood the lesson, fill up the table below to check your understanding of the lesson about the Pythagorean Theorem.

Draw a Right Triangle and label the three sides.	Describe the sides: Legs: Hypotenuse:
Write the Theorem	The Formula:

Pythagorean Theorem

Answer:

<table>
<tr>
<td>Draw a Right Triangle and Label the Three Sides.
Sides $\overline{AB}$ or c, $\overline{AC}$ or b, $\overline{CB}$ or a

A
C B</td>
<td>Describe the Sides:

Legs: These are sides opposite the acute angles of a right triangle. The sides that include the right angle. In the figure the legs are $\overline{AC}$ or c and $\overline{CB}$ or a.

Hypotenuse: This is the side opposite the right angle. It is considered the longest side of a right triangle. In the figure , $\overline{AB}$ or c is the hypotenuse.</td>
</tr>
<tr>
<td colspan="2">Pythagorean Theorem</td>
</tr>
<tr>
<td>Write the Theorem

In any right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.</td>
<td>The Formula:

$\overline{AB}^2 = \overline{CB}^2 + \overline{AC}^2$ or
$c^2 = a^2 + b^2$</td>
</tr>
</table>

END OF FIRM - UP

In this section, the discussion was about the Pythagorean Theorem and the Special Right Triangle theorems on how were these proven and used in solving problems

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? What new learning goal should you now try to achieve?

Now that you know the important ideas about this topic, let's go deeper by moving on to the next section.

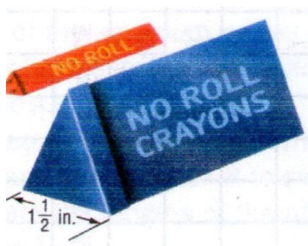
DEEPEN

Your goal in this section is to take a closer look at some aspects of Pythagorean Theorem and Special Right Triangle Theorems. Real- life problems involving these theorems will be given in this section and will be asked to solve related problems.

ACTIVITY 22d The Crayon and the Panel

A thorough discussion was given on solving triangles using the Pythagorean theorems and special right triangle. In this activity, real world problems will be presented. You will guided in solving these problems by answering the questions provided.

Consider the two problems given below:



Problem No. 1. A company makes crayons that "do not roll off tables" by shaping them as triangular prisms with equilateral bases. Sixteen of these crayons fit into a box shaped like a triangular prism that is 1 ½ inches wide. The crayons stand on end in the box and the base of the box is equilateral. What are the dimensions of each crayon?

You will be guided to solve the problems by answering the questions given below.

Understand:

- What are the given information and data of the problem?
- What are the required data ?
- How many crayons will fit into the box?
- What shape will the box be?

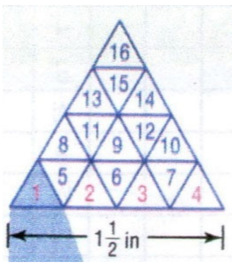
Plan: What are the things you need to consider to solve for the problems?

- Is sketching of the possible placement or position of the crayons needed? If so, draw a sketch so that 16 crayons be accommodated in the box shaped like a triangular prism.
- How is the width of each crayon be determined?

- What theorem will be used to solve for its altitude?

Solve:

- What should be the sketch drawing to show that the total number of crayons will fill into the box?

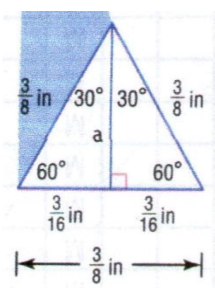


- If the width of the box is 1 ½ inches, so what is the width of one crayon? Answer 1 ½ ÷ 4 or 3/8 inch.
- Draw an equilateral triangle representing one crayon. Its altitude forms the longer leg of two 30-60-90 triangles. Using the theorem, find the approximate length of altitude a.

Answer: longer leg length = shorter leg $\bullet \sqrt{3}$

$$a = \frac{3}{16} \bullet \sqrt{3}$$

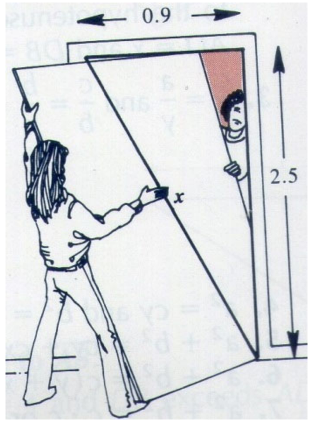
$$a \approx 0.3 \text{ inch}$$



Each crayon is $\frac{3}{8}$ or about 0.4 inch by about 0.3 inch

Check: Find the length of the box using the 30-60-90 Triangle Theorem. Then divide by four, since the box is four crayons high. The result is a crayon height of about 0.3 inch.

2. The walls in the ABC Recreation Center are being covered with wall paneling. The doorway is 0.9 m wide and 2.5 m high. What is the widest rectangular panel that can be taken through the doorway?



Understand:

- What are the given data of the problem?
- What are the required data?

Plan:

- What is your plan in solving the given problem?
- How would you solve the problem?

The widest panel would be taken through diagonally, as shown in the figure. Let x be the measure of the panel.

Solve:

- What theorem will be used to solve the problem? Answer: Using Pythagorean theorem to find x, $(0.9)^2 + (2.5)^2 = x^2$. Solving for x, x ≈2.66 m. A width of 2.66 m would be a tight fit. To allow extra clearance, a narrower panel could be chosen.

Check: To check that the obtained value is correct, let x = 2.66 m and substitute it to the formula using Pythagorean Theorem. To accommodate the rectangular panel enter the door, the value of x must be less than 2.66 m.

You have just presented how the problems were solved using the concept of Pythagorean Theorem and the Theorems on Special Right Triangles. Summarize how the process was made in the Plan, Understand, Solve and Check stages based on the two problems presented.

In the next activity, solve the given problems by giving the necessary information/data in the Plan, Understand, Solve and Check Stages.

ACTIVITY 23d The Baseball and the Ladder.

It is time to look at another situation where the Pythagorean Theorem and Special Right Triangle Theorems can be used to model real life problems. Use the websites below and solve the given problems. In solving the problems, use the table below and fill in the Plan, Understand, Solve and Check stages.

www.pbs.org/wgbh/nova/proof/puzzle/baseball.html - The Pythagorean theorem and Baseball. This website gives a sample problem on the application of Pythagorean Theorem in baseball.

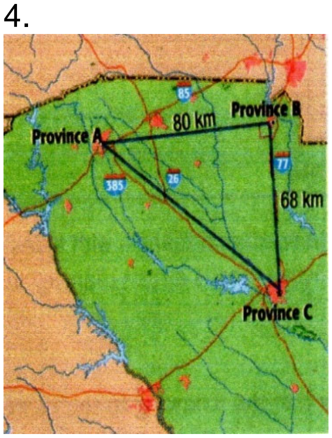
www.pbs.org/wgbh/nova/proof/puzzle/ladder.html - The Pythagorean Theorem and ladders. This website gives a sample problem on the application of Pythagorean theorem.

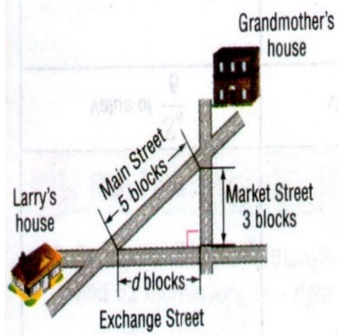
Problem	
Plan	
Understand	
Solve	
Check	

Problem	
Plan	
Understand	
Solve	
Check	

ACTIVITY 24d COMPLETE ME!

Given the data/information , compose a problem and show the needed data/information for each stage.

Data/Information	Problem	Understand	Solve	Check	Final Answer
1. A rectangular picture frame Ratio of the length to the width to be 3:1 Diagonal of the frame is 12					
2. Three pieces of wood 65 cm, 72 cm, and 97 cm long					
3. a 15-feet ladder m $\angle A = 60$ m $\angle A = 45$					
4. 					
5.					

Questions to Answer:

1. How did you find the activity?

2. Did you experience difficulty in framing a problem and solving it? Explain.

3. What generalization can you make about the Pythagorean Theorem and Special Right triangle Theorems as given in the problems above?

4. How can we frame or compose and solve real-life problems involving the theorems discussed?

5. What is the best way to solve problems involving Pythagorean Theorems and Special Right triangle Theorems?

ACTIVITY 25d Rate Yourself

Please check the appropriate box and finish the statement.

- [ ] I do understand how to apply the Pythagorean Theorem and Special Right Triangle Theorems because ________________.

- [ ] I still have questions about how to apply the Pythagorean Theorem and Special Right Triangle Theorems because ______________

END OF DEEPEN

In this section, the discussion was about the real life application of the Pythagorean theorem and theorems on Special Right triangles. Let us revisit the problems you composed earlier. If there will be changes in your answers, what would it be? Make your revision and give necessary justification and report it through this link. http://www.voki.com/create.php

Present your revised answer and justification in this link by creating your own video.

Now that you have a deeper understanding of the topic, 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 practical task which will demonstrate your understanding.

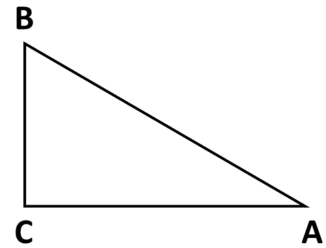
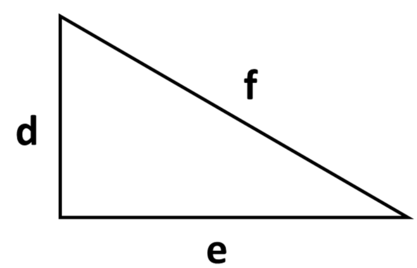
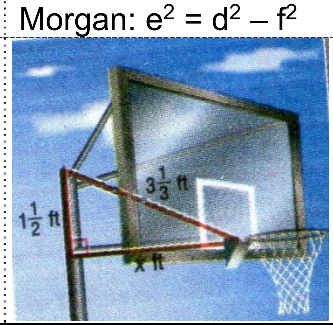
To help you correct your previous knowledge with new information, answer the ARG.

What new realizations do you have about the topic? What new connections have you made for yourself? What helped you make these connections? Go back to the ARG Chart and accomplish the After Discussion Column.

ACTIVITY 26d Agree or Disagree, Revisited! Anticipation Reaction Guide

Direction: Answer the last column of the ARG by clicking on the AGREE or DISAGREE column. Click A if you agree with the statement and click B if you disagree. Please answer all items. Since this ARG was given in the Explore part, if there are changes in the final answers explain the changes/correction made.

Before Discussion		Statements	After Discussion	
Agree	Disagree		Agree	Disagree
A	B	1. The hypotenuse of a right triangle is the longest of all its three sides..	A	B
		2. In a right triangle, the measure of the hypotenuse is equal to the sum the measure of its legs.		
		3. The numbers 3, 4, and 5 represent a Pythagorean triple.		
		4. In an isosceles right triangle, the side opposite the right angle is $\sqrt{2}$ times as long as either of the legs.		
		5. In a 30-60-90 triangle, the side opposite the smallest angle is twice as long as the longest side.		

Before Discussion		Statements	After Discussion	
		6. In rt. ΔBCA, the measure of $\overline{AC}$ is $x\sqrt{3}$ if $\overline{BC} = x,\ \angle A = 30^0,\ \angle B = 60^0\ and\ \angle C = 90^0$. 		
		7. The Pythagorean theorem is applicable to any triangle.		
		8. A square mirror 7 ft on each side must be delivered through the doorway 3 ft x 6.5 ft. Can the mirror fit through the doorway?		
		9. Cathy, Luisa and Morgan are writing an equation to find the length of the third side of a right triangle given below. Only Luisa wrote the correct equation.  Cathy: f + e = d Luisa : $f^2 = d^2 + e^2$ Morgan: $e^2 = d^2 – f^2$		
				

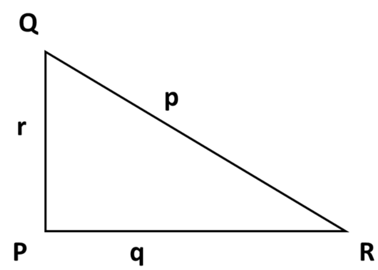
Before Discussion		Statements	After Discussion	
		10. The support for a basketball goal forms a right triangle as shown. The length x of the horizontal portion of the support is approximately 2.98 ft.		

To assess if you have mastered the knowledge and skills necessary in doing your performance task, answer the Quiz below.

ACTIVITY 27d QUIZ

Direction: Read each question below, choose the correct answer. Write the letter of your answer on the box provided below.

1. Which of the following equations you could use to find the length of one of the sides of the right triangle?



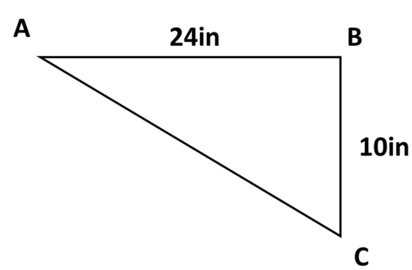
A. $r^2 = p^2 + q^2$
B. $p^2 = r^2 – q^2$
C. $p^2 = r^2 + q^2$
D. $q^2 – r^2 = p^2$

2. In item number 1, if q= 12 cm and r = 16 cm, what is the length of p?

A. 20 cm
B. 25 cm
C. 10.58 cm
D. 16.25 cm

3. What is the perimeter of triangle ABC?

A. 26 in
B. 60 in
C. 34 in
D. 68 in



4. Which of the following is NOT a Pythagorean triple?

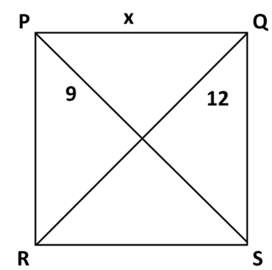
A. 3-4-5 B. 12-35-37 C. 3-5-7 D. 6-8-10

5. Why 7-14-16 determines an obtuse triangle?

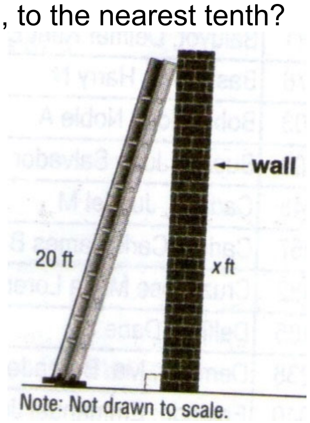
A. Because $7^2 + 14^2 > 16^2$
B. Because $7^2 + 14^2 = 16^2$
C. Because $7^2 + 14^2 < 16^2$
D. Because $7^2 + 14^2 \neq 16^2$

6. In square PQRS, what is the value of x?

A. 12 units
B. B. 15 units
C. 18 units
D. 20 units



7. According to you company's safety regulations, the distance from the base of a ladder to a wall that it leans against should be at least one fourth of the ladder's total length. You are given a 20-foot ladder to place against a wall at a job site. If you follow the company's safety regulations, what is the maximum distance x up the wall the ladder will reach, to the nearest tenth?

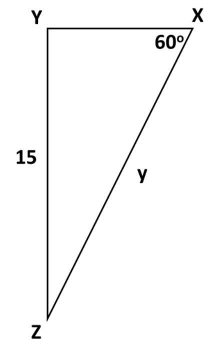


A. 12 ft B. 19.4 ft C. 20.6 ft D. 30.6 ft

8. What is the length ℓ of the hypotenuse of a 45-45-90 triangle if the leg length is 6 centimeters?

A. $\ell = 12\sqrt{2}$ cm B. $\ell = 3\sqrt{2}$ cm C. $\ell = 6\sqrt{2}$ cm D. $\ell = \sqrt{2}$ cm

9. What is the value of y in the given right triangle XYZ?
A. $10\sqrt{3}$ m
B. B. $5\sqrt{3}$ m
C. C. $15\sqrt{3}$ m
D. D. $20\sqrt{3}$ m



10. A square mirror 7 ft on each side must be delivered through the doorway 3 ft x 6.5 ft. Can the mirror fit through the doorway?
A. No, because the door has a maximum of length of 6.5 ft.
B. No, because the measure of the side of the square mirror is more than the length of the door.
C. Yes, because the given dimensions of the door and the mirror represent a Pythagorean triple.
D. Yes, because the dimension of the square mirror can be entered through the doorway in slant position.

WRITE YOUR ANSWERS HERE:

1.	**2.**	**3.**	**4.**	**5.**
6.	**7.**	**8.**	**9.**	**10.**

Now that you have a deeper understanding of the topic, you are ready to do the performance task of this unit

ACTIVITY 28d Performance Task: Architect in Action

As Architect you have been hired by a new couple to design their dream house. They want to have four bedrooms, a living room, a garage, a stock room , a prayer room, a music room and a library. Each room must be a quadrilateral whose shape is different from the others. The floor area must not be more than 90 square meters. Each part of the house must be tiled using not more than three different quadrilaterals.

The roof must also be composed of quadrilaterals. The house must be elegant but the design must be such that the owner will be able to maximize access to all areas. The house will stand on the lot 12 by 14 meters.

Draw your design and label all dimensions. Then make a model of the house that will fit in a box that is 2 feet by 1.5 feet by 1.5 feet. A final write-up must be presented to owner of house. You also must inform him of the amount of unused area available for landscaping. In addition, you will do an oral presentation to the panel while displaying your design.

Final product:

Your product will be evaluated based on the following criteria: mathematical concept, accuracy of computation, organization of report, presentation of output, quality of output, fluency of presentation, and effort.

Rubric for the Performance Task

	4 Excellent	3 Satisfactory	2 Developing	1 Beginning
Mathe-matical Concept	Demonstrates a thorough understanding of topic and use it appropriately to design and to construct a miniature of the house.	Demonstrates adequate understanding of the concepts and uses it to design and construct a miniature of the house.	Demonstrates incomplete understanding and has 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 serious
Organi-zation of the report	Highly organized, flows smoothly, logical and easy to understand.	Adequately 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.
Presentation of Output	Ability to verbally present work intelligently, clearly and succinctly.	Ability to verbally present work clearly and succinctly.	Ability to verbally present work adequately.	Poor verbal skills and little participation in class discussions, collaborations, peer reviews and juries, often with unrelated or inappropriate comments or remarks; poor team playing skills.

Quality of Output	The output was beautiful and patiently done. Appearance is appealing and shows craftsmanship.	The output was good and adequate. It shows craftsmanship.	The output shows minimal skill, carelessly done; adequate interpretation of the assignment, but lacking finish.	The output was poor, carelessly done, and inadequate.
Fluency of presentation	Fluent, confident and thoroughly explained each point by providing support that contains rich, vivid and powerful detail .	Generally fluent, confident and clearly explained the proposal.	Somewhat hesitant, less confident and failed to explain significant number of points	Hesitant, not confident. Explanation is missing.
Effort	*Completed on time, no modification needed. Effort exerted was beyond the requirement of the task*	*Completed yet more could have been done*	*Project was completed but needs improvement and finishing touches*	*Work was not completed adequately*

To reflect on the learning process you may now answer the reflection log.

Reflection Log- Answer the following questions.

Questions to Answer:

1. How did you find the performance task?
2. What are the important factors did you consider which contributed to the success of the Performance Task?
3. To what extent is your knowledge, skills and understanding of quadrilaterals and triangle similarity have helped you accomplish the task?
4. How did the task help you see the real world use of the topic? In what other real life situations can you apply the learning you've gained in this module?
5. What is the best way to solve problems involving quadrilaterals and triangle similarity?

Write your answers here….

To summarize your understanding, try to complete the synthesis journal.

Fill in the SYNTHESIS JOURNAL by completing the statements.

The lesson was about ________________. One key idea was __________. This is important because _____________. Another key idea was _________. This is also important because_________.
I was able to think that the best way solve problems involving Pythagorean Theorem and Special Triangle Theorem is ____________________________.
This further leads me to develop an essential understanding that ____________ _____________________.

Write your statements inside the box.

If there are some clarifications, write your questions and email it to your teacher or post it in the discussion forum.

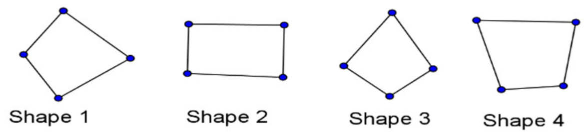
END OF TRANSFER:

In this section, your task was to make a scaled model of a house.

How did you find the performance task? How did the task help you see the real world use of the topic?

You have completed this module. But before you end answer the post assessment.

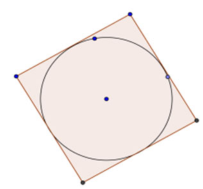
1. Which of the following statements about the shapes below is true?



A. Shapes 1 and 3 are kites if their diagonals intersect at right angles.
B. Shapes 2 and 4 are trapezoids if they have at two pairs of parallel sides.
C. All four shapes are parallelograms if they four sides and one pair of parallel sides.
D. Shapes 1,2 and 3 are parallelograms if they have two pairs of side with equal length.

2. Nora wants to enclose a circular garden with a square fence, as shown at the right.
If the circumference of the circular garden is about 20 meters, which of the following is the approximate length of fencing needed in meters?

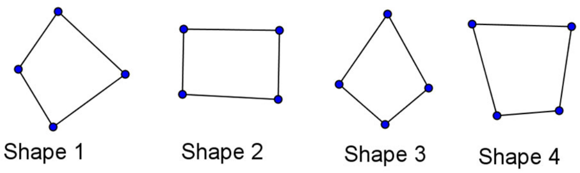
A. 6.4m B. 16m C. 25.5m D. 80π



3. I inherited a magic antique circular table. It is big enough to accommodate six people for dinner. The table is divided in the middle so that leaves can be added to make the table bigger, thus creating a rectangle with two semi-circular ends. Unfortunately the leaves for making the table bigger have been lost. I asked a carpenter to make for new leaves composed of three differently shaped quadrilaterals and a triangle.

Which set of quadrilaterals would be the best choice?
A. {rectangle, square, parallelogram}
B. {trapezoid, rhombus, square}
C. {kite, square, parallelogram}
D. {rectangle, trapezoid, parallelogram}

4. Which of the following statements about the shapes below is true?



A. Shapes 1 and 3 are kites if their diagonals intersect at right angles.
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C. All four shapes are parallelograms if they four sides and one pair of parallel sides.
D. Shapes 1,2 and 3 are parallelograms if they have two pairs of side with equal length.

5. If you are to design a room in the attic of a Victorian style house which looks like an isosceles triangle in the front and back view, furniture and fixtures are also designed in such a way to maximize the space. The possible thing/s which may happen includes the following;
   1. The floor area is wider than the ceiling.
   2. The ceiling is wider than the floor area.
   3. The bed can be attached to the side wall.
   4. The cabinets on the side wall are rectangular prisms.

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

6. In the isosceles trapezoid ABCD, the legs are
A. AB & DC
B. AD & BC
C. AB & BC
D. AD & DC

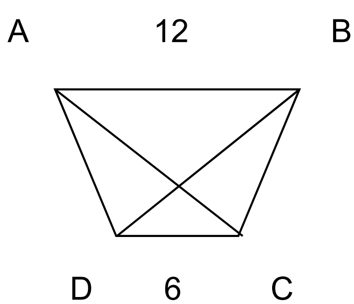


Figure 1

7. In figure 1, if the m∠ADC = 96^0, then the m∠ABC is
   A. 84^0
   B. 96^0
   C. 168^0
   D. 192^0

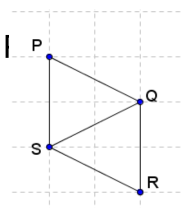
8. AC & BD are diagonals of the isosceles trapezoid ABCD, which of the following statements is TRUE;

   I. AC and BD are congruent.
   II. ΔADC & ΔBCD are congruent.
   III. Δ ABC & ΔBAD are congruent

   A. I only
   B. II only
   C. III only
   D. I, II & III

9. To provide more space to enhance creativity and balance, in designing a 3-layer round cake the most appropriate diameter of the cake should be
   A. 6, 9, 12
   B. 7, 9, 12
   C. 5, 7, 10
   D. 5, 8, 10

10. Given quadrilateral PQRS, PQ ≅ RS, and I
    Prove: ∠Q ≅ ∠S



Statement	Reason
1. PQ ≅ RS	Given
2. PQ||RS	Given
3. ∠PRS ≅ ∠QRP	Alternate Interior Angles Theorem
4. PR = PR	Reflexive Property
5. ΔPQR ≅ΔRSP	SAS
6. ∠Q ≅ ∠S	?

A. SSS Postulate
B. ASA Postulate
C. Definition of Congruent Angles
D. CPCTC

11. In a proportion if $\frac{a}{b}=\frac{c}{d}$ then which of the following statement is not true?

A. $\frac{b}{a}=\frac{d}{c}$ C. $\frac{a+b}{b}=\frac{c+d}{d}$

B. $\frac{a}{c}=\frac{b}{d}$ D. $\frac{a+d}{b}=\frac{b+c}{d}$


Photo 1


Photo 2

12. If photo 2 is a reduction of photo 1, what can you conclude about the relationships of sides and angles?
    A. Corresponding sides and corresponding angles are congruent.
    B. Corresponding sides and corresponding angles are not congruent.
    C. Corresponding sides and corresponding angles are proportionate.
    D. Corresponding sides and corresponding angles are not proportionate.

13. You are required by your teacher to create a map from Manila to Bicol which is about 400 km away from each other. Which of the following scales would you consider such that your map would fit to a short type writing paper?
    A. 1 in to 33 km C. 1 mm to 1250 m
    B. 1 cm to 14 km D. 1 cm 1200 m

14. Given the figure below with triangles ABG, ACF and ADE and BG, CF and DE parallel with one another, which postulate or theorem would you use to show that the three triangles that make up the racecar window net are similar? Justify your answer.

   A. SAS -Because the corresponding two sides and the included angle are congruent.
   B. SAS -Because the corresponding two sides are proportionate and the included angle is congruent.
   C. SSS –Because the three corresponding sides are proportionate.
   D. AA –Because there are at least two angles for each triangle are congruent.

15. A flagpole casts a shadow that is 50 feet long. At the same time, you who are 64 inches tall cast a shadow that is 40 inches long. How tall is the flagpole to the nearest foot?

    A. 12 feet C. 80 feet
    B. 40 feet D. 140 feet

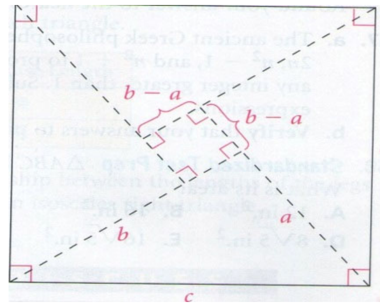
16. In a right triangle, what is TRUE about the hypotenuse?
    A. It is always the longest side.
    B. It is opposite the acute angle.
    C. It is always greater than the sum of the other two sides.
    D. The hypotenuse is always equal to the sum of the other two sides.

17. Which of the following statements is NOT TRUE?
    A. The altitude to the hypotenuse is the geometric mean between the segments into which it separates the hypotenuse.
    B. The leg of the right triangle is the geometric mean of the hypotenuse and the segment of the hypotenuse adjacent to the leg.
    C. The geometric mean is the product of the hypotenuse and the two legs of a right triangle.
    D. The geometric mean is the square root of the product of the hypotenuse and the segment of the hypotenuse adjacent to the leg.

18. What is the geometric mean of 4 and 18?
    A. 72
    B. $\sqrt{72}$
    C. $6\sqrt{7}$
    D. $6\sqrt{2}$

19. Which of the following lengths of the sides of a triangle determine a right triangle?
    A. 7, 9, 12
    B. 8, 15, 17
    C. 4, 5, 7
    D. All of the above

20. Show the proof that c2 = a2 + b2. What is the correct equation to prove the theorem?



Let m^2 = area of the big square

n^2 = area of the small square

P^2 = area of the right triangle

A. $m^2 = n^2 + p^2$
B. $m^2 = ½\, n^2 + 4\, p^2$
C. $m^2 = n^2 + 4p^2$
D. $m^2 = ½\, n^2 + 2p^2$

GLOSSARY OF TERMS USED IN THIS MODULE:

Parallelogram
A parallelogram is a quadrilateral with opposite sides parallel (and therefore opposite angles equal).

Quadrilateral
A polygon with four sides.

Rectangle
A parallelogram whose angles are all right angles.

Rhombus
Plural rhombi or rhombuses, is a simple quadrilateral whose four sides have the same length. Another name is equilateral quadrilateral, since equilateral means that all of its sides are equal in length.

Square
A rectangle with four equal sides.

Base angles
The angles between a base and its adjacent side.

Bases
The parallel sides of a trapezoid.

Scalene trapezoid
A trapezoid with no congruent sides.

Isosceles trapezoid
A trapezoid with a pair of congruent legs.

Kite
A quadrilateral with exactly 2 pairs of congruent adjacent sides
legs of the trapezoid – the non-parallel sides of a trapezoid
midline/midsegment – a segment joining the midpoints of the legs of a trapezoid.

Perpendicular bisector
A line/segment which divides a segment into equal parts and form right angles.

Perpendicular lines
Lines which intersect and form right angles.

Trapezium (US)
A quadrilateral with no parallel sides.

Trapezoid (US)
A quadrilateral with exactly one pair of opposite sides parallel.

Similar Triangles
Similar triangles are triangles that have the same shape but possibly different size. In particular, corresponding angles are congruent, and corresponding sides are in proportion.

AA Similarity Postulate
The angle-angle (AA) similarity test says that if two triangles have corresponding angles that are congruent, then the triangles are similar. Because the sum of the angles in a triangle must be 180°, we really only need to know that two pairs of corresponding angles are congruent to know the triangles are similar.

SAS Similarity Theorem
The side-angle-side (SAS) similarity test says that if two triangles have two pairs of sides that are proportional and the included angles are congruent, then the triangles are similar.

SSS Similarity Theorem
The side-side-side (SSS) similarity test says that if two triangles have all three pairs of sides in proportion, the triangles must be similar.

Right Triangle Similarity
When you drop an altitude from the right angle of a right triangle, the length of the altitude becomes a geometric mean. This occurs because you end up with similar triangles which have proportional sides and the altitude is the long leg of 1 triangle and the short leg of the other similar triangle.

Geometric Mean
The geometric mean between two positive numbers a,b is the number x such that $x = \sqrt{ab}$.

Proportion

A proportion is an equation written in the form $\frac{a}{b} = \frac{c}{d}$ stating that two ratios are equivalent.

In other words, two sets of numbers are proportional if one set is a constant times the other

REFERENCES AND WEBSITE LINKS USED IN THIS LESSON:

A. BOOKS AND OTHER PRINTED MATERIALS:

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Bass, Laurie E., et al. Geometry. Pearson Education South Asia Pte Limited. Pearson Prentice Hall. 2005.

Boyd, Cindy J., et al.Geometry.Oklahoma Edition. McGraw-Hill Companies, Inc. 2005.

Oronce, Orlando A. & Mendoza, Marilyn O. E- math Geometry. Manila. Rex Book Store, Inc. 2010.

Geometry Based on the 2002 BEC: 2002, The Bookmark, Inc.; Sr. Iluminada C. Coronel, Antonio C. Coronel

ALGEBRA 1 Equations, Graphs ,Applications: 2004, mcDouggal Little; Ron. Larson, Laurie Boswell, Timothy Kanold, Lee Stiff

GEOMETRY; 2005; The McGraw-Hill Companies, Inc.; Cindy Boyd, Jerry Cummins, Carol Malloy, John Carter, Alfinio Flores
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Integrated Mathematics Course 2; 1997, by Glecoe/McGraw-Hill; Douglas Bumby, Richard Klutch, Donald Collins, Elden Egbers

GEOMETRY 1980. Academe Publshing House; Myrna A. Cabansay

GEOMETRY, Tools for a Changing World; 1998, Prentice Hall; Laurie Bass, Basia Hall, Art Johnson, Dorothy Wood
GEOMETRY, Concepts and Applications; 2005 by The McGraw-Hill Companies, Inc; Jerry Cummins, Tim Kanold, Margaret Kenny, Carol Maloy, Yvonne Mojica

DYNAMIC MATH GEOMETRY; 2009, Phoenix Publishing House, Inc.; Edna Zuela, Luis Allan Melosantos

NEXT CENTURY MATHEMATICS Geometry; 2008 by Phoenix Publishing House, Inc; Fernando Orines, Jesus Mercado, Josephine Suzara

Mathematics 8; 2006 by Nealson; Bernard Beales, Maria Bodiam, Doug Duff, et. Al.

B. WEBSITES:

http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html.
An interactive resource to study properties of quadrilaterals.

http://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.SHAP&ID2=AB.MATH.JR.SHAP.SHAP&lesson=html/video_interactives/classifications/classificationsInteractive.html
This interactive mathematics resource explores the properties of triangles, quadrilaterals and regular polygons and allows students to classify shapes based on their properties. The resource includes print activities, solutions, learning strategies, and a shape guessing game.

http://www.onlinemathlearning.com/properties-of-polygons.html
This site contains video lessons on the properties of trapezoids and kites.

http://www.youtube.com/watch?v=suiDK61jAc8
Gives a video on the Golden Triangle in real life.

http://goldenratiorocks.wordpress.com/golden-ratio-real-life-examples/
Gives examples o0f the use of Golden Ratio in real life.

http://www.youtube.com/watch?v=i2a4B4M5L1M
Watch how a rhombus can be used to make a flexible paper structure.

http://www.youtube.com/watch?v=S-nNib5HzUA
Gives another type of flexible paper structure.

http://www.youtube.com/watch?v=p9xKxEV1FkY
Demonstrate how to make an Origami Fireworks making use of rhombi shapes.

http://www.youtube.com/watch?v=knMEBSXM6WU
Demonstrate how to make use of rhombi to make an origami flexiball.

http://rhombusspace.blogspot.com/
Gives examples of art pieces using rhombi.

http://www.ysjournal.com/article.asp?issn=0974-6102;year=2009;volume=2;issue=7;spage=35;epage=46;aulast=Khair
Gives examples of the uses of rhombi in architecture

www.photoxpress.com/photos-skyscraper-lozenge-rhombus-4723361
Gives photos depicting how rhombi are used in architecture

http://www.shodor.org/interactivate/activities/Tessellate/
An interactive site for tessellation. Option for shape, color and changing corners and edges are available,

http://www.ixl.com/math/geometry/properties-of-trapezoids
This site contains interactive exercises about trapezoids and their theorems.

http://www.mathopolis.com/questions/q.php?id=621&site=1&ref=/quadrilaterals.html&qs=621_622_623_624_763_764_2128_2129_3230_3231
This site contains a quiz about quadrilaterals.

http://ph.images.search.yahoo.com/search/images;_ylt=A2oKiavkUe5SZRsAAji0Rwx.?p=real-life+applications+of+trapezoids+and+kites&ei=utf-8&iscqry=&fr=sfp
This site contains pictures of real-life applications of trapezoids and kites.

http://www.google.com/url?sa=i&rct=j&q=designs%20using%20different%20triangles%20and%20quadrilaterals&source=images&cd=&cad=rja&docid=ZHtUpKb7CtSd8M&tbnid=_4BboANCoJ0G_M:&ved=0CAMQjhw&url=http%3A%2F%2Fwww.mathpuzzle.com%2FAug52001.htm&ei=bXHNUrCeBsyxrgeVk4HoBA&psig=AFQjCNHLO5aKfHFDuC4OQ-24M5oWKkAA9Q&ust=1389277514813593
This site contains images of quadrilaterals particularly kites and trapezoid.

http://www.google.com/url?sa=i&rct=j&q=pictures%20of%20beams%20of%20hanging%20bridge&source=images&cd=&docid=&tbnid=&ved=0CAMQjhw&url=&ei=Hm3NUpDSL4qJrAeW8IBQ&psig=AFQjCNHQ-BrH9gtvfkQPYCgllpXcyCtf-Q&ust=1389280206982361
This site contains different ways of arranging trapezoid and quadrilateral in an architectural design.

http://www.onlinemathlearning.com/properties-of-polygons.html
This site contains video lessons on the properties of trapezoids and kites.

http://www.ixl.com/math/geometry/properties-of-trapezoids
This site contains interactive exercises about trapezoids and their theorems.

http://www.mathopolis.com/questions/q.php?id=621&site=1&ref=/quadrilaterals.html&qs=621_622_623_624_763_764_2128_2129_3230_3231
This site contains a quiz about quadrilaterals.

http://ph.images.search.yahoo.com/search/images;_ylt=A2oKiavkUe5SZRsAAji0Rwx.?p=real-life+applications+of+trapezoids+and+kites&ei=utf-8&iscqry=&fr=sfp
This site contains pictures of real-life applications of trapezoids and kites.

https://www.google.com.ph/#q=SIMILAR+PICTURES
This site contains picture of similarity.

http://www.youtube.com/watch?v=D8dA4pE5hEY
http://www.youtube.com/watch?v=2d578xHNqc8
http://www.youtube.com/watch?v=G8qy4f7GKzc
These sites contain videos which explain the concepts of proportion with step by step procedure on how to solve problem related to the topic.

http://www.softschools.com/quizzes/math/proportion_word_problems/quiz3766.html
This site contains interactive quiz about proportion.

http://www.youtube.com/watch?v=EbN_tDggldA
This video contains detailed discussion about the proving of similar triangles (AA, SAS, SSS).

http://www.youtube.com/watch?v=QCyvxYLFSfU
This video contains detailed discussion about the proving of similar triangles (Right Triangle Similarity Theorem.)

http://www.youtube.com/watch?v=PXBFDBmBP0I
This website contains video which explains the step by step procedure in solving problem related to similar triangles.

http://www.regentsprep.org/regents/math/geometry/MultipleChoiceReviewG/Triangles.htm
This website contains interactive quiz about triangle similarity.

http://www.classzone.com/etest/viewTestPractice.htm?testId=4545
This website contains interactive quiz about triangle similarity.