9

Mathematics

Quarter 3-Week 8 – Module 8: Solving Problems Involving Triangle Similarity and Right Triangles

AIRs - LM

Mathematics 9
Quarter 3 Week 8- Module 8: Solving Problems Involving Triangle Similarity and Right Triangles
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Development Team of the Module

Writer: Leian Gretel D. Nerida
Editor: SDO La Union, Learning Resource Quality Assurance Team
Illustrator: Ernesto F. Ramos, Jr., *P II*

Management Team:

Atty. Donato D. Balderas, Jr.
Schools Division Superintendent

Vivian Luz S. Pagatpatan, PhD
Assistant Schools Division Superintendent

German E. Flora, PhD, *CID Chief*
Virgilio C. Boado, PhD, *EPS in Charge of LRMS*
Erlinda M. dela Peña, EdD, *EPS in Charge of English*
Michael Jason D. Morales, P*DO II*
Claire P. Toluyen, *Librarian II*

12. What is the length of the hypotenuse of a right triangle if the legs are 6 and 8?
A. 10 B. 14 C. 28 D. 48

13. The length of the shadow of your 1.6 meter height is 2.8 meters at a certain time in the afternoon. How high is an electrical post in your backyard if the length of its shadow is 20 meters?
A. 7.14 m B. 10.5 m C. 11.43 m D. 13.21 m

14. A tree 24 feet tall casts a shadow 12 feet long. If Brad's shadow is 3ft, how tall is he?
A. 6 ft. B. 8 ft. C. 9 ft. D. 12 ft.

15. The area of a square is 100 square inches. What is the perimeter of the square in inches?
A. 40 inches B. 80 inches C. 400 inches D. 625 inches

Were you able to answer all the questions? If not, don't worry because the next activity will help you better understand the lesson.

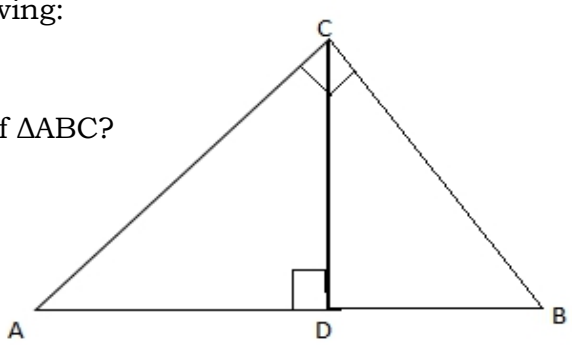
Solving Problems Involving Triangle Similarity and Right Triangles

Let's start this module by assessing your knowledge of the different mathematics concepts previously studied and your skills in performing mathematical operations. These knowledge and skills will help you understand solving problems involving similarity and right triangles. As you go through this lesson, think of this important question: "How are concepts of similarity and right triangles used in solving real-life problems and in making decisions? If you find any difficulty in answering the exercises, seek assistance of your teacher or refer to the modules you have gone over earlier.

Review

Activity 1. Let Me RECALL YOU!

A. Use the figure to answer each of the following:



1. Name the right angle of ΔABC
2. What is the altitude to the hypotenuse of ΔABC?
3. Name the hypotenuse of ΔABC
4. Two segments of the hypotenuse are $\overline{AD}$ and ____.
5. The hypotenuse of ΔBCD if $\overline{CD} \perp \overline{AB}$ is ____.
6. Name the right angle of ΔADC
7. Name the hypotenuse of right ΔBCD

B. True or False. Write T if the statement is true, otherwise write F.

1. In Pythagorean Theorem, the square of the hypotenuse is equal to the sum of the square of the legs.
2. Triangles with the same perimeter are similar.
3. In an isosceles right triangle, the length of the hypotenuse is equal to $\sqrt{2}$ times the length of a leg.
4. In a 30°-60°-90° Triangle Theorem, the length of the shorter leg is twice the length of the hypotenuse and the length of the longer leg is $\sqrt{3}$ times the length of the other leg.
5. If the length of the diagonal of a square is 10 units then the length of each side is 5 units

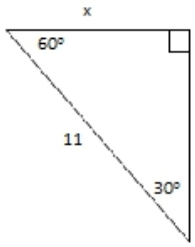
Were you able to recall the concepts on triangle similarity? I'm sure you were good at it. Now let us test your memory further.

Jumpstart

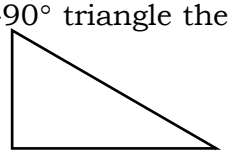
Activity 2: Illustrate Me!

A. Directions: Illustrate the problem completely. On a separate sheet of paper, copy each figure drawn below the problem then label using the given information.

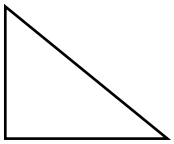
Example: In a 30°-60°-90° triangle, the length of the hypotenuse is 11 and the shorter leg is x.



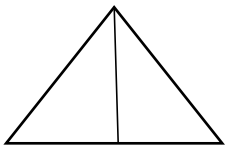
1. In a 30°-60°-90° triangle the length of the hypotenuse is 14 and the longer leg is $7\sqrt{3}$.



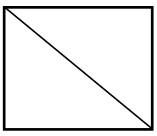
2. In a 45° - 45° - 90° triangle, the length of the hypotenuse is 16.



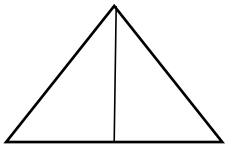
3. The length of the altitude of an equilateral triangle is x and the length of a side is 6.



4. The length of the diagonal of a square is 12 and the length of a side is $6\sqrt{2}$.



5. ΔBAC is a right triangle, $\angle C$ is right angle, $\overline{CD} \perp \overline{AB}$ AD = 14, DB = 6



B. Read the problem, and answer the questions below.

Maria is reading a book for her English class. Last night, she read 84 pages in 2 hours. Tonight she plans to read for 5 hours. If she reads at the same rate tonight as she read last night, how many pages will she read tonight?

1. What are the two related quantities that are being compared?
2. What information is given in the problem that relates the two quantities?
3. Does it make more sense to use this information in pages per hour or in hours per page?
4. Write the information from the problem as a ratio.
5. Use this ratio to set up a proportion that you could use to solve for p, the number of pages she reads in 5 hours.
6. Solve your proportion for p.

How did you find the activity? I am sure you did not find any difficulty in illustrating the problem. The next activity will help you fully understand the concepts behind this activity. But before doing the next activity, you have to read thoroughly and understand first some important notes on how to solve problems involving triangle similarity and right triangles.

Discover

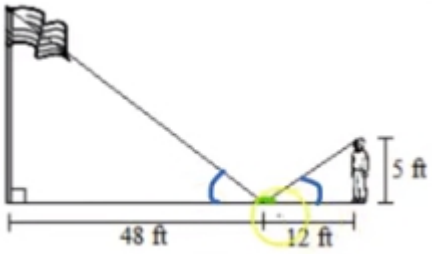
The above activity illustrates how the concept of triangle similarity can be used in solving real-life situations. In doing so, some helpful tips will guide on how to successfully come up with the correct solution.

1. Read the problem thoroughly.
2. Illustrate the problem.
3. Set up the equation.
4. Solve the equation.
5. Write a therefore statement.

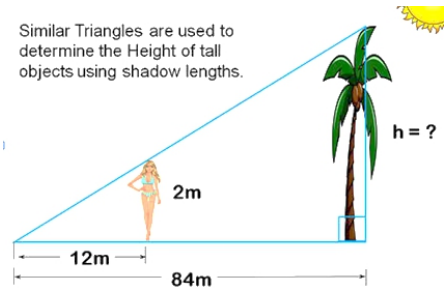
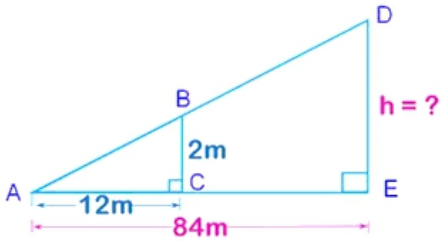
Consider the following examples:

Problem 1. *Keian wanted to measure the height of his school's flagpole. She placed a mirror on the ground 48 feet from the flagpole, then walked backwards until she was able to see the top of the pole in the mirror. His eyes were 5 feet above the ground, and she was 12 feet from the mirror. Using similar triangles, find the height in ft. of the flagpole.*

Solution:

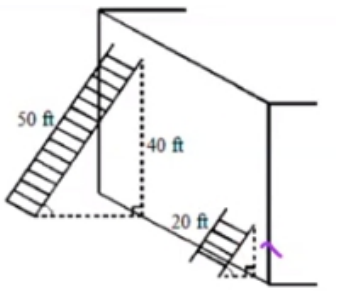
STEPS	SOLUTION
1. Read the problem carefully.	
2. Illustrate the problem. (Draw and label the triangle)	 https://www.youtube.com/watch?v=YCmaFkDdn4c
3. Set up the equation.	Establish the best proportion $\frac{x}{5} = \frac{48}{12}$
4. Solve the equation.	Setting up the ratios and then cross multiply. $\frac{x}{5} = \frac{48}{12}$ $(x)(12) = (48)(5)$ $12x = 240$ $\frac{12x}{12} = \frac{240}{12}$ $x = 20$
5. Write a therefore statement.	➢ Therefore, the height of the flagpole is 20 feet.

Problem 2. *The 2-meter tall lady makes a 12-meter long shadow, and the palm tree makes an 84m long shadow. What is the height in meter of the tree?*

STEPS	SOLUTION
1. Read the problem carefully. 2. Illustrate the problem. (Draw and label the triangle)	 Pairs of similar triangles are being formed. 
3. Set up the equation.	Establish the best proportion $\frac{h}{2} = \frac{84}{12}$
4. Solve the equation.	Setting up the ratios and then cross multiply. $\frac{h}{2} = \frac{84}{12}$ $(h)(12) = (84)(2)$ $12h = 168$ $\frac{12h}{12} = \frac{168}{12}$ $h = 14$
5. Write a therefore statement.	➢ Therefore, the height of the tree is 14 meters.

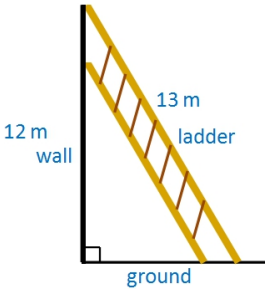
Problem 3. *Two ladders are leaning against a wall as shown, making the same angle with the ground. The longer ladder reaches 40 feet up the wall. How far up the wall does the short ladder reach?*

Solution:

STEPS	**SOLUTION**
1. Read the problem carefully. 2. Illustrate the problem. (Draw and label the triangle)	 https://www.youtube.com/watch?v=YCmaFkDdn4c
3. Set up the equation.	Establish the best proportion $\frac{x}{40} = \frac{20}{50}$
4. Solve the equation.	Setting up the ratios and then cross multiply. $\frac{x}{40} = \frac{20}{50}$ $(x)(50) = (20)(40)$ $50x = 800$ $\frac{50x}{50} = \frac{800}{50}$ $x = 16$
5. Write a therefore statement.	Therefore, the short ladder reach the wall up to 16 feet.

Problem 4. *A ladder 13 m long is placed on the ground in such a way that it touches the top of a vertical wall 12 m high. Find the distance of the foot of the ladder from the bottom of the wall.*

Solution:

STEPS	**SOLUTION**
1. Read the problem carefully. 2. Illustrate the problem. (Draw and label the triangle)	 https://www.youtube.com/watch?v=YCmaFkDdn4c
3. Set up the equation.	Applying the Pythagorean Formula: $a^2 + b^2 = c^2$ $x^2 + 12^2 = 13^2$
4. Solve the equation.	$x^2 + 12^2 = 13^2$ by SPE $x^2 = 13^2 - 12^2$ $x^2 = (13 + 12)(13 - 12)$ $x^2 = (25)(1)$ $x^2 = 25$ $x = \sqrt{25}$ $x = 5$
5. Write a therefore statement.	Therefore, the distance of the foot of the ladder from the bottom of the wall is 5m.

Explore

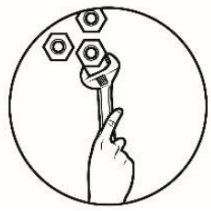
Here are some enrichment activities for you to work on to master and strengthen the basic concepts you have learned from this lesson.

Activity 3: Show Me More!

A man who is 6 feet tall casts a shadow that is 8 feet long. At the same time, a tree's shadow is 22 feet long. How tall is the tree?

Follow the steps in answering the problem.

a. Illustrate the problem.
b. Set up the equation.
c. Solve the equation.
d. Write a therefore statement.



Deepen

Activity 4: Performance Task

Directions: Make a comic strip using a situation in real life where the concept of triangle similarity or on right triangles is applied. Formulate and solve problems out of these situations.

Remember:

Similar triangles are different only in size. The corresponding angles still have the same measure.

The Pythagorean Theorem states that the square of the hypotenuse is equal to the sum of the square of the two legs. Thus, $c^2 = a^2 + b^2$, where a and b represent the legs of the right triangle and c represents the hypotenuse.

In solving word problems involving triangle similarity and right triangles, always remember the following tips to come up with the correct solution.

1. *Read the problem thoroughly.*
2. *Illustrate the problem.*
3. *Set up the equation.*
4. *Solve the equation.*