9

Mathematics

Quarter 4 - Module 4

Word Problems Involving Right Triangles

AIRs - LM

Mathematics 9

Quarter 4- Module 4: WORD PROBLEMS INVOLVING RIGHT TRIANGLES

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Region I

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Module 4 WORD PROBLEMS INVOLVING RIGHT TRIANGLES

Start the lesson of 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 you understand on word problems involving right triangles.

If you find any difficulty in answering the activities seek the assistance of your teacher or refer to the modules you have gone over earlier

Activity 1: YOU are MY MATCH

Directions: Using figures 1 and 2, match each trigonometric concept found in Column A with the correct ratio found in Column B. Angles R and S are right angles.

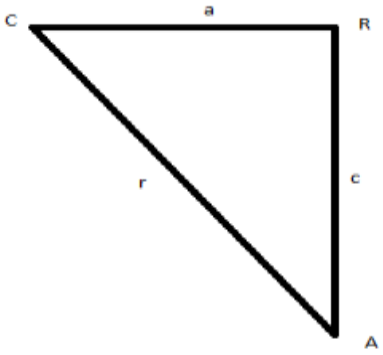


Figure 1

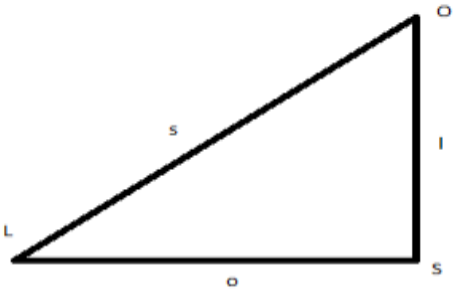


Figure 2

COLUMN A	**COLUMN B**
_____ 1. Sin A	a. $\frac{s}{l}$
_____ 2. Cos O	b. $\frac{l}{s}$
_____ 3. Tan L	c. $\frac{l}{o}$
_____ 4. Cot C	d. $\frac{a}{c}$
_____ 5. Sec O	e. $\frac{a}{r}$

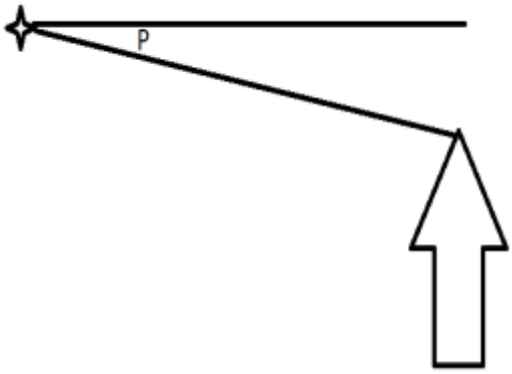
Jumpstart

For you to understand the lesson well, do the following activities. Have fun and good luck!

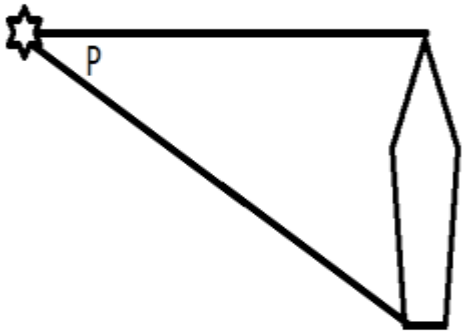
Activity 2: KNOW ME RIGHTLY

Directions: In each of the following diagrams, identify whether angle P is an **angle of elevation or angle of depression.**

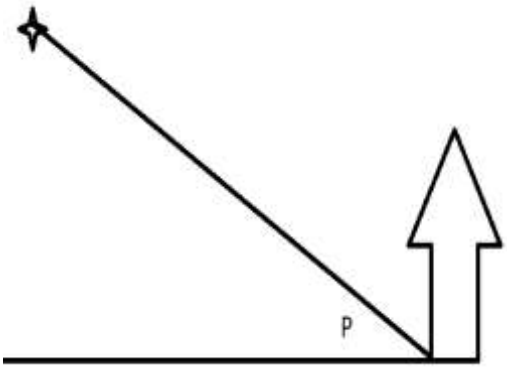
1._____



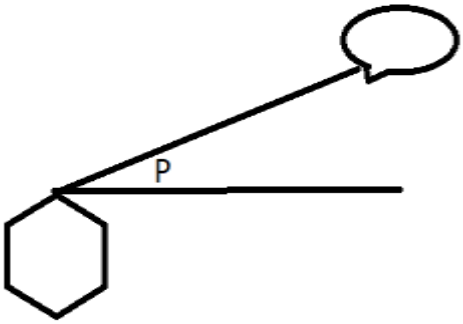
3. _____



2._____



4. _____



Questions:

1. What did you realize in the activity?
2. Did the activity help you remember the concept of angle of elevation and angle of depression?
3. How do you differentiate the angle of elevation from angle of depression?

Were you able to identify the given diagrams? In the next activity, you will illustrate correctly the diagram of the statement given

Activity 3: Know Me, Draw Me!

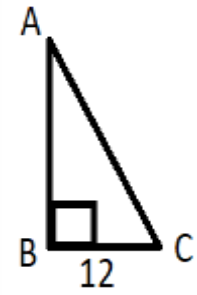
Directions: Using the following statements, illustrate the diagram and choose the answer below then write your answer on the sheet of paper.

_____1. In a right triangle ABC where angle B is a right angle and side b is 12.

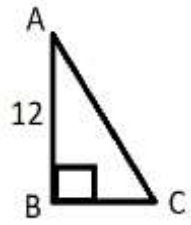
_____2. In a right triangle ABC where angle B is a right angle and side c is 12.

_____3. In a right triangle ABC where angle B is a right angle and side a is 12.

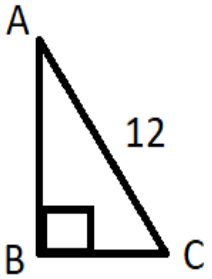
I



II



III

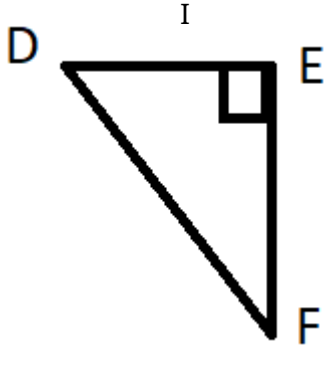


_____4. Right triangle DEF, DE is the hypotenuse

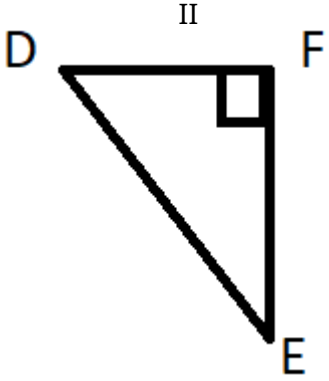
_____5. Right triangle DEF, EF is the hypotenuse

_____6. Right triangle DEF, DF is the hypotenuse

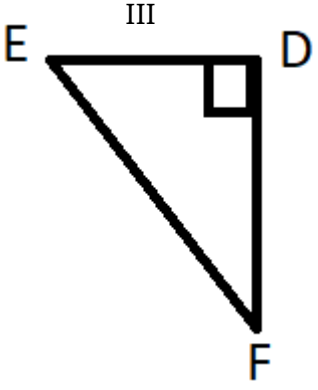
I



II



III

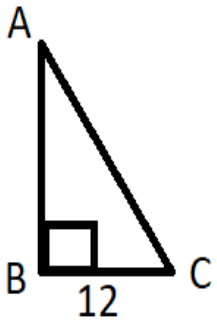


Were you able to illustrate the diagram of each statement? If YES then a new set of activity awaits you for the mastery of the subject matter in this module.

Activity 4: DIRECT Me SOHCAHTOA!

Directions: In this activity, you will be directed to use the mnemonic SOHCAHTOA. To solve word problems involving right triangle, the mnemonic SOHCAHTOA is very much important. Using the following given, state what trigonometric ratio will be used.

Use the illustration and example number as your guide to answer the activity.



1. If angle A is 35^0, illustrate side c. Tan $35^0 = \frac{12}{c}$

2. If angle A is 35^0, illustrate side b. _____

3. If side c is 22, illustrate angle A. _____

4. If side b is 32, illustrate angle A. _____

5. If side b is 32, find angle C. _____

6. If angle C is 15^0, find side c. _____

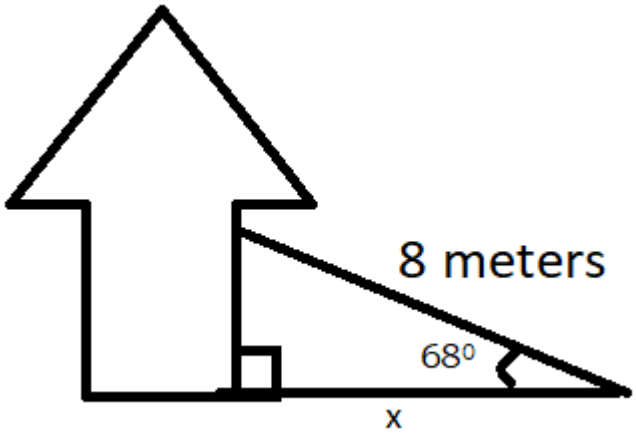
Were you able to determine the trigonometric ratio to be used in solving the problem? If YES, you are now ready to apply the concepts to solve problems involving right triangle. So, let us start to discover on how to solve word problems!

Discover

Pictures, illustrations, and diagrams were presented in the previous activities and your knowledge of the concept of angle of elevation and depression was assessed. These concepts are important for you to work the next activity.

So, let us try the following examples.

1. A ladder 8 meters long leans against the wall of a building. If the foot of the ladder makes an angle of 68^0 with the ground, how far is the base of the ladder from the wall?

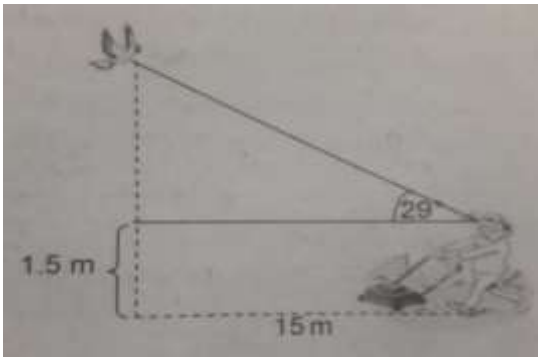


$\cos 68^0 = \frac{x}{8}$

X = 8 cos 68^0

X = 2.996 or *3* *The distance of the building to the base of the ladder is 3 m.*

2. Angelo is flying a kite. He is holding a string at a distance of 15 m above the ground. If the string is 20 meters long and makes an angle of 29^0 with the horizontal and Angelo is 1.5 m in height, how high is the kite above the ground?



$\sin 29^0 = \frac{x}{20}$

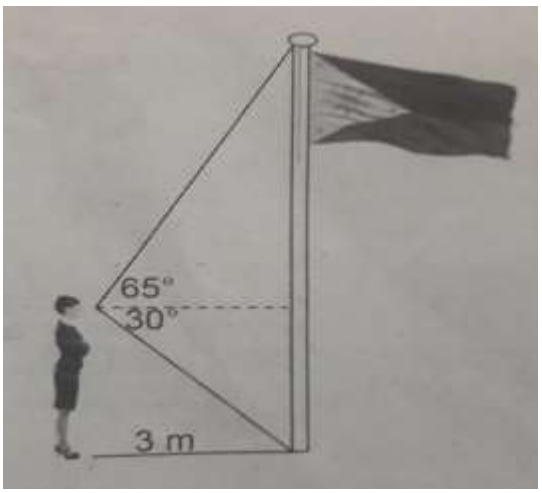
X = 20 sin 29^0

X = *9.70 m*

9.70 m + 1.5 m = 11.20

The height of the kite to the ground is 11.20 m.

3. Ms. Navarette standing 3m in front of the flagpole observes that the angle of depression 30^0 from the base of the flagpole and 65^0 angle of elevation to the top of the flagpole. How high is the flagpole?



A. Distance from the line of sight to the base of the flagpole

$\tan 30^0 = \frac{x}{3}$

X = 3 tan 30^0

X = *1.73 m*

B. Distance from the line of sight to the top of the flagpole

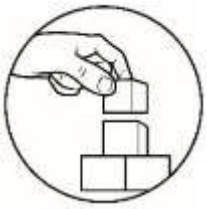
$\tan 65^0 = \frac{x}{3}$

X = 3 tan 65^0

X = 6.*43 m*

6.43m + 1.73m = 8.16 m is the height of the flagpole.

Now that you have learned on how to solve word problems involving right triangle, so you can proceed to the next activities



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 5: Let's SOLVE it!

Directions: Solve the problems accurately.

1. Carlo of 1.5m tall is on top of the building. He observes a car on the road at an angle 75^0. If the building is 30m high, how far is the car from the building.

2. A four - meter ladder leans against a wall. If the foot of the ladder makes an angle of 80^0 with the ground, how high up the wall does the ladder reach?

3. An airplane took off from an airport and traveled at a constant rate and angle of elevation. When the airplane reached an altitude of 500m, its horizontal distance from the airport was found to be 235m. What was the angle when the airplane rose from the ground?

Did you answer correctly the activity? I know you did it! So, let us proceed to the next activity.

Activity 6: Check Me if I am Wrong!

Directions: Read carefully the problem given below. Analyze the suggested solutions and find out what is wrong with them. Write corrected solution on the next column

Problem 1: An airplane is flying at a constant altitude of 100 m above the ground. At that instant, it was recorded that the angle of depression of the airport is 40^0. Find the horizontal distance between the airplane and the airport.

Suggested Solution	Correct Solution
$\tan 40^0 = \frac{opposite}{adjacent}$ $\tan 40^0 = \frac{x}{1000}$ X = 1000 tan 40^0 X = 1000 (0.8391) X = 839.1 The horizontal distance between the airplane and the airport is 839.1 m	

Problem 2: PAG-ASA announces that a typhoon is going to enter the Philippine Area of Responsibility. Strong winds and heavy rains are expected over Bulacan and nearby provinces in Central Luzon.

Alvin lives in Bulacan. He noticed that one of the lampposts installed in their garden is about to collapse. As a precautionary measure, he attached 2 m wire to the lamppost to support it. One end of the wire attached is attached one meter from the base of the lamppost and the other end is attached to the base of nearby tree. Determine the angle of the wire makes with the ground?

Suggested Solution	Correct Solution
$\sin P = \frac{adjacent}{hypotenuse}$ $\sin P = \frac{1}{2}$ P = $\sin^{-1}$ (0.8) P = 50^0 The angle form by the two wires is 30^0.	

Questions:

1. What did you noticed from the values given in the problem?
2. How did you solve the problem?

Great job! You have understood the lesson. Are you now ready to summarize?

Reflect on the activities you have done in this lesson by completing the following sentences. Write your answers on your journal notebook

I learned that I _____
I was surprised that I _____
I noticed that I _____
I discovered that I _____
I was pleased that I _____

Deepen

Activity 7: Problem Solved?

Directions: Read each of the following problems carefully and solve.

1. The angle of depression of a sun is 37^0 at the same time that flagpole cast a shadow of 12 m long. How high is the flagpole?

2. From a top of a light house 29.5 m high, the angle of depression of an observer to a boat is 29^0. How far is the boat from the light house?

Gauge

Assessment: Choose the letter of the correct answer. Write your answer on a separate sheet of paper.

1. What is the ratio of the hypotenuse to the opposite side with respect to the given angle?
   A. cosecant B. cosine C. secant D. sine
2. Which statement is NOT CORRECT about tangent?
   A. opposite side over hypotenuse B. opposite side over adjacent side
   C. tangent is the reciprocal of cotangent D. all of the above
3. What is the measure of AC of the right triangle ABC where C is the hypotenuse, AB = 10, BC = 8?
   A. 6 B. 7 C. 8 D. 9
4. In an isosceles right triangle if the measure of one side is 9, what is the measure of the hypotenuse?
   A. $9\sqrt{2}$ B. $9\sqrt{3}$ C. $10\sqrt{2}$ D. $10\sqrt{3}$