Student Instruction Sheet: Unit 4, Lesson 3

Primary Trigonometric Ratios

Suggested Time: 75 minutes

What's important in this lesson:

In this lesson, you will use trigonometry (sin, cos, tan) to measure sides and angles of right-angle triangles.

Complete the following steps:

1. Read through the lesson portion of the package on your own.
2. Complete all of the exercises in the lesson.
3. Check your answers with the Answer Key that your teacher has.
4. Seek assistance from the teacher as needed.
5. Complete the Assessment and Evaluation and hand it in. Be sure to ask the teacher for assistance if you are having difficulty.

Hand in the following:

1. Student Handout
2. Assessment and Evaluation sheet

Questions for the teacher:

Topic 1: Solving a Triangle for Side Lengths – Trig Ratios

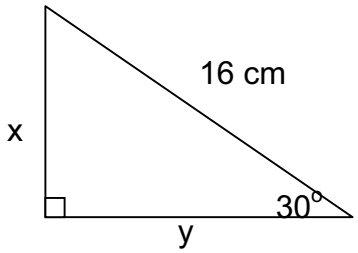
$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

We can use these equations, the Pythagorean Theorem, and the fact that the angles in a triangle add up to $180°$ to **solve** any right triangle.

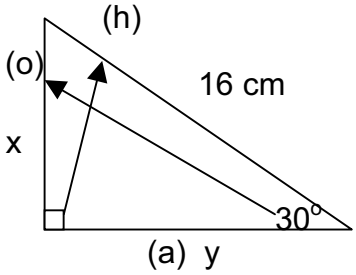
If we have three whole numbers that **exactly** give the side lengths of a right-angle triangle, we call these numbers a Pythagorean Triple. Remember that the Pythagorean Theorem says that in a right-angle triangle with sides a, b, and hypotenuse, h, we must have $h^2 = a^2 + b^2$.

If we are asked to **solve** a triangle, we must find the lengths of all three sides and the measures of all three angles.

Example 1: In this triangle, we can quickly find the third angle, which is $60°$, based on the angle sum of a triangle. We will use trig ratios to solve for the remaining two side lengths.



The first step is to label the triangle with opposite (o), adjacent (a), and hypotenuse (h), so that we know which ratio to use.



> We place the (h) across from the right angle. It is also the longest side of the triangle.
> We place the (o) across from the given angle.
> We place the (a) on the remaining side.

Now we set up a "trig" equation for each unknown side.

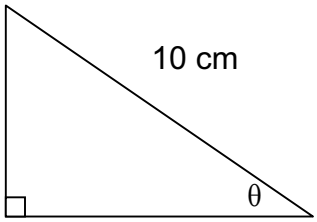
$$\cos 30° = \frac{y}{16}$$
$$16(\cos 30°) = x$$
$$x = 13.9$$

$$\sin 30° = \frac{x}{16}$$
$$16(\sin 30°) = x$$
$$x = 8$$

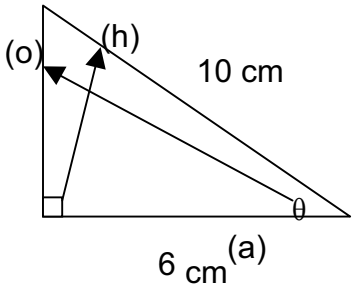
> Do these calculations on your calculator to make sure that you get the same answers.

Topic 2: Solving a Triangle for Angle Measures- Inverse Trig Ratios

Find the measure of the unknown angle to the nearest degree.



The first step is to label the triangle with opposite (o), adjacent (a) and hypotenuse (h), so that we know which ratio to use.



We place the (h) across from the right angle. It is also the longest side of the triangle.
We place the (o) across from the given angle.
We place the (a) on the remaining side.

This time, we are given no information about the opposite side, so we are going to solve using the COSINE ratio.

$$\cos\theta = \frac{6 \text{ cm}}{10 \text{ cm}}$$

$$\theta = \cos^{-1}\left(\frac{6}{10}\right)$$

$$\theta = 53.130$$

$$\theta = 53^{\circ}$$

$\cos^{-1}$ means the inverse cosine (or the opposite operation to cos). We always use the inverse to find the angle.

$\sin^{-1}$ is the inverse of sin.

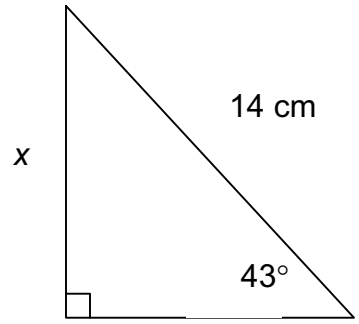
$\tan^{-1}$ is the inverse of tan.

Note: If you are unable to get the above answer, please see your teacher for help.

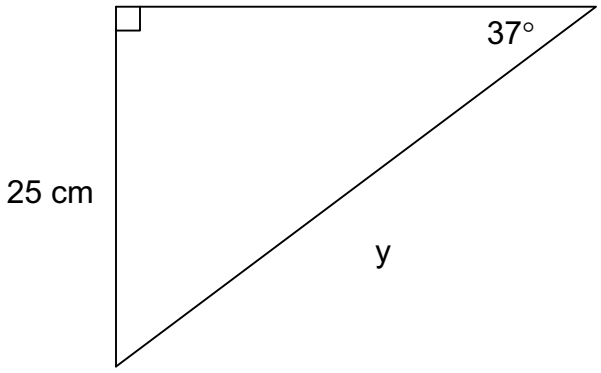
Student Handout: Unit 4, Lesson 3

Try these:

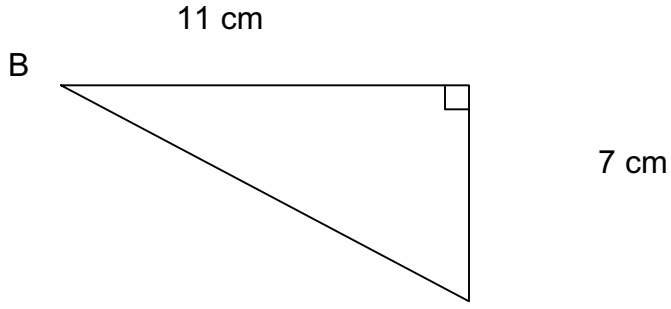
1. Find the length of the side marked *x*.



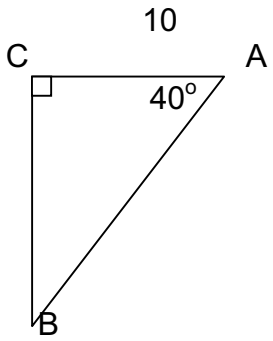
2. Find the length of the side marked y.

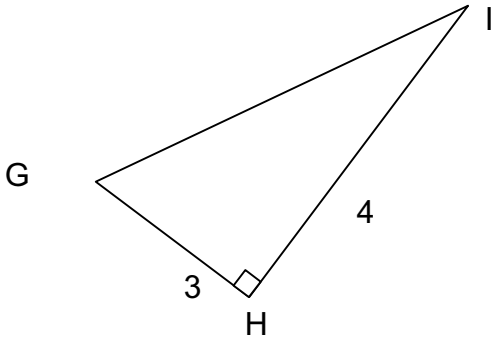


3. Find the measure of the angle at B.



4. **Solve** the following triangles. Round sides to one decimal place and angles to the nearest degree.





Answers to Question 4: $\angle$ B = 50°, a =8.4, c =13.1, h = 5, $\angle$ G=53°, $\angle$ I =37°

Assessment and Evaluation: Unit 4, Lesson 3

If you are told the measurement of the angle and are asked to solve for the length of a side, you will always use the sin, cos, or tan button on your calculator.

If you are asked to find the measure of an angle, you must use the inverse function. To get this, you will press the second function or SHIFT key before you hit the TRIG button.

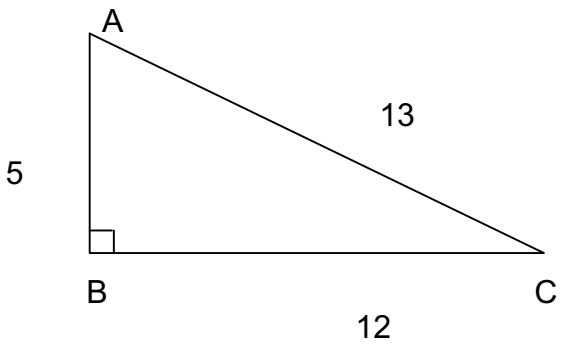
1. The memory word we use to help us remember the primary trig ratios is _____.

2. Fill in the blanks, based on the triangle below.

[a] _____$\angle A = \frac{12}{13}$

[b] tan $\angle C$ = _____

[c] sin $\angle$_____ = $\frac{5}{13}$



3. Use your calculator to evaluate. Round your answer to 3 decimal places.

a) sin 22° =_____ b) tan 85° =_____

4. Evaluate to the nearest degree.

a) cos $\angle A = 0.437$

$\angle A$ =

$\angle A$ =

b) tan $\angle A = \frac{15}{7}$

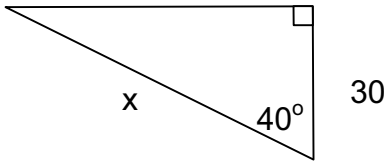
$\angle A$ =

$\angle A$ =

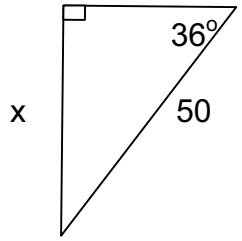
Assessment and Evaluation: Unit 4, Lesson 3

5. Find the indicated side length. Round to one decimal place.

a)

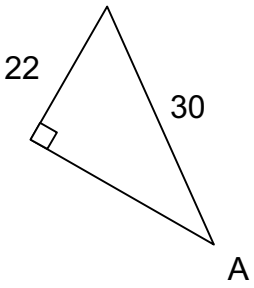


b)



6. Solve for $\angle$A to the nearest degree.

a)



b)