



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 triangles.

Complete these steps:

1. Read through the lesson portion of the package independently.
2. Complete any of the examples in the lesson.
3. Check your lesson answer with the lesson key your teacher has.
4. Seek assistance from the teacher as needed. If you have any questions about the examples.
5. Complete the 'Assessment and Evaluation' and hand-in for evaluation. Be sure to ask the teacher for any assistance when you are experiencing any difficulty.

Hand-in the following to your teacher:

1. The 'Student Handout'.
2. Assessment and Evaluation Sheet

Questions for the teacher:



We will be using our definitions from the last lesson.

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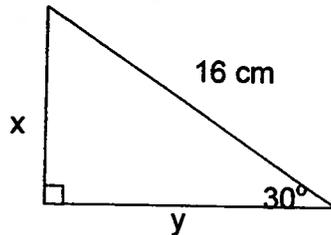
$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

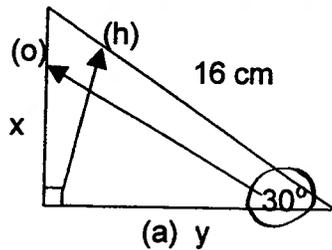
$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

We can use these equations, the Pythagorean Theorem (if we have three whole numbers which 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 triangle with sides a, b and hypotenuse h , we must have $h^2 = a^2 + b^2$.) and the fact that the angles in a triangle add up to 180° to solve any right triangle. If we are asked to solve a triangle we have to find the length of all three sides and the measure of all three angles.

Example 1. In this triangle we could 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 we know which ratio to use.



We placed the (h) across from the right angle – it is also the longest side of the triangle.
 We placed the (o) across from the given angle.
 We placed the (a) on the remaining side – it is also the side that with the hypotenuse makes the given angle

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

$$\cos 30^\circ = \frac{y}{16}$$

$$16(\cos 30^\circ) = y$$

$$y \approx 13.9$$

$$\sin 30^\circ = \frac{x}{16}$$

$$16(\sin 30^\circ) = x$$

$$x = 8$$

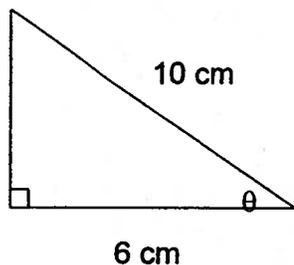
Do these calculations on your own calculator to make sure you get the same answers.

If you get a different value-check to make sure your calculator is in degrees.

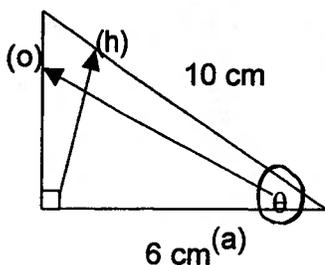
In this example we will not solve the whole triangle.



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 we know which ratio to use.



We placed the (h) across from the right angle – it is also the longest side of the triangle.
 We placed the (o) across from the given angle
 We placed 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.

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

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

$$\theta \doteq 53.130$$

$$\theta \doteq 53^\circ$$

\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 and he/she will help you with your calculator.

Practice:

1. Evaluate each of the following trig ratios to four decimal places.

a) $\sin 23^\circ$

b) $\cos 18^\circ$

c) $\tan 92^\circ$

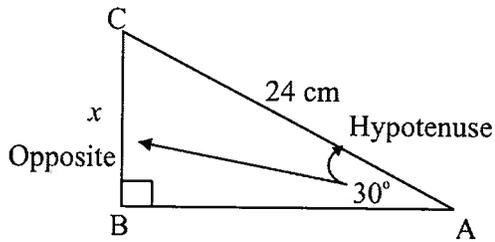
2. Evaluate to find the angle to the nearest degree.

a) $\sin A = 0.1625$

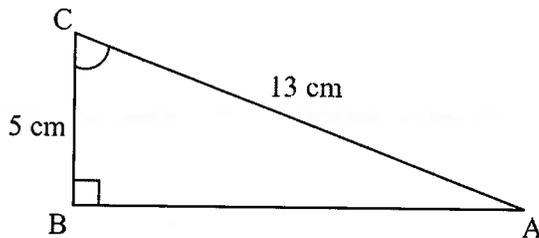
b) $\cos B = 0.4557$

c) $\tan C = 0.2243$

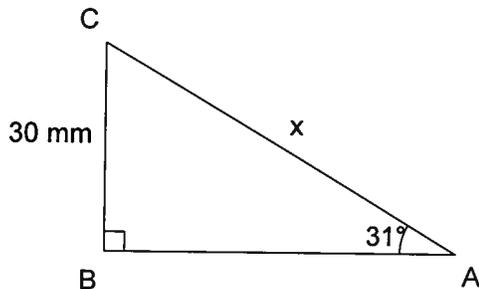
3. Solve for x .



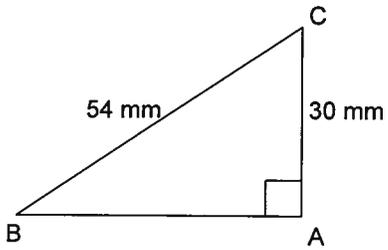
4. Solve for $\angle C$.



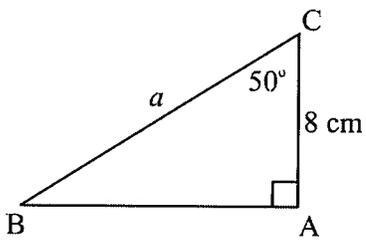
5. Solve for x .



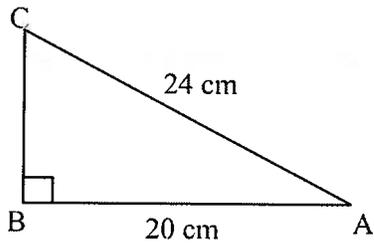
6. Solve for $\angle B$.



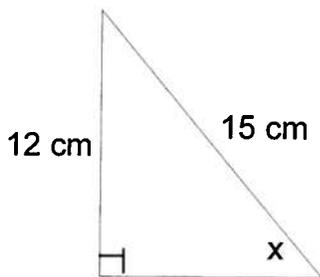
7. Solve for a .



8. Solve for $\angle C$.



9. Solve for x .



Student Assessment: Unit 4 Lesson 3

1. Evaluate each of the following trig ratios to four decimal places.

a) $\cos 23^\circ$

b) $\tan 18^\circ$

c) $\sin 32^\circ$

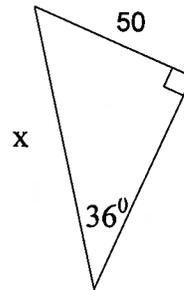
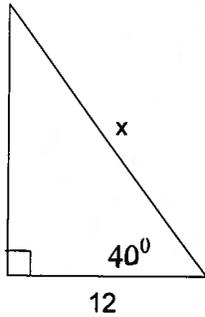
2. Evaluate to find the angle to the nearest degree.

a) $\tan A = 0.2235$

b) $\sin B = 0.7587$

c) $\cos C = \frac{3}{5}$

3. Find the side length to one decimal place.



4. Solve for x to the nearest degree.

