

Chapter 2-Trigonometry: Skills Summary

1. Skill: Calculate a trigonometric ratio.

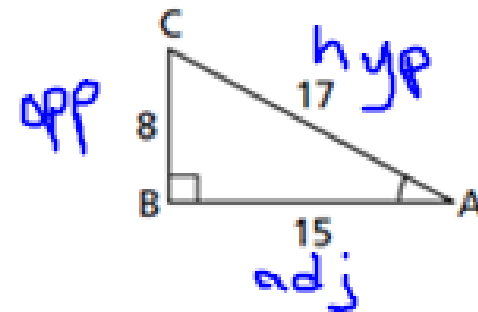
Strategy:

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

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

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

Example:



$$\tan A = \frac{\text{opp}}{\text{adj}}$$

$$\tan A = \frac{8}{15}$$

A ratio is just
a comparison

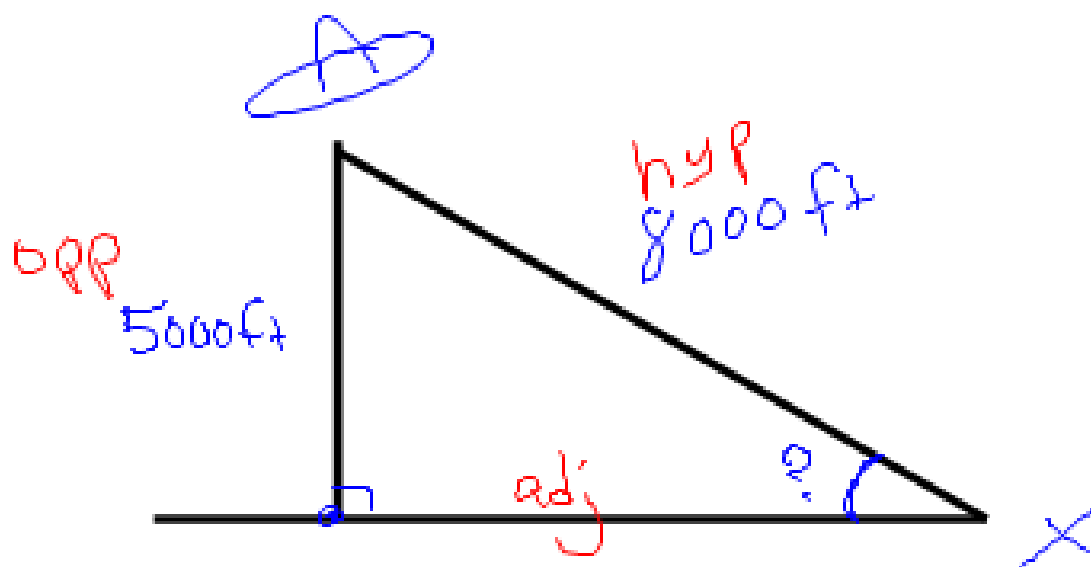
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2. Skill: Determine the measure of an angle

Strategy: To determine the measure of an acute angle when given two sides of a right angle triangle:

1. Label the sides of the triangle in relation to the unknown angle as opposite, adjacent or hypotenuse
2. Select the appropriate trig ratio depending on which side lengths are known.
3. Determine the value of the trig ratio using the given lengths.
4. Use $\sin/\cos/\tan^{-1}$ to determine the measure of the angle.

Example: A water bomber is flying at an altitude of 5000 ft. The plane's radar shows that it is 8000 ft. from the target site. What is the angle of elevation of the plane measured from the target site, to the nearest degree?



$$\sin x = \frac{\text{opp}}{\text{hyp}}$$

$$\sin x = \frac{5000}{8000}$$

$$x = \sin^{-1}\left(\frac{5000}{8000}\right)$$

$$x = 38.6822^\circ$$

$$x = 39^\circ$$

3. Skill: Determine the length of a side

Strategy:

To determine the length of a side when given one length and one angle of a right angle triangle:

1. Label the sides of the triangle in relation to the given angle
2. Select the appropriate trig ratio
3. Substitute the known values and solve the equation for the unknown length.

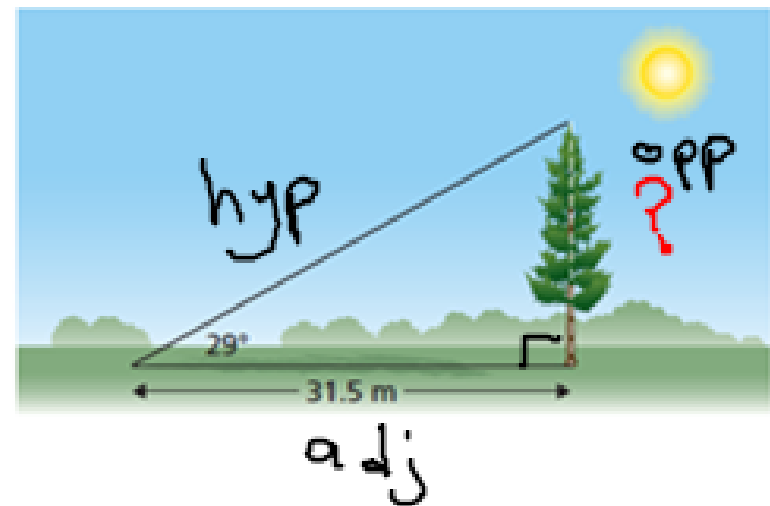
Example: A tree casts a shadow that is 31.5 m long when the angle between the sun's rays and the ground is 29° . What is the height of the tree to the nearest tenth of a metre?

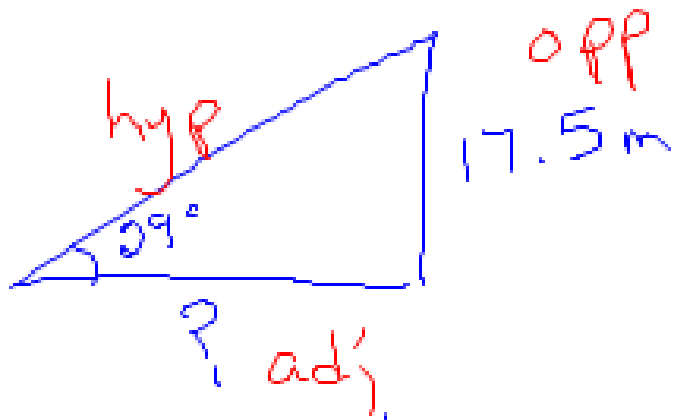
$$\tan T = \frac{\text{opp}}{\text{adj}}$$
$$\tan 29^\circ = \frac{\text{opp}}{31.5}$$

$$31.5 \tan 29^\circ = \text{opp}$$

$$17.4607 \text{ m} = \text{opp}$$

$$17.5 \text{ m} \rightarrow \text{tree height}$$





$$5 = \frac{16}{6}$$

$$\tan 29^\circ = \frac{\overset{\text{adj}}{17.5}}{\underset{\text{adj}}{\quad}}$$

$$\text{adj} = 31.6 \text{ m}$$

$$\frac{\text{adj} \tan 29^\circ}{\tan 29^\circ} = \frac{17.5}{\tan 29^\circ}$$

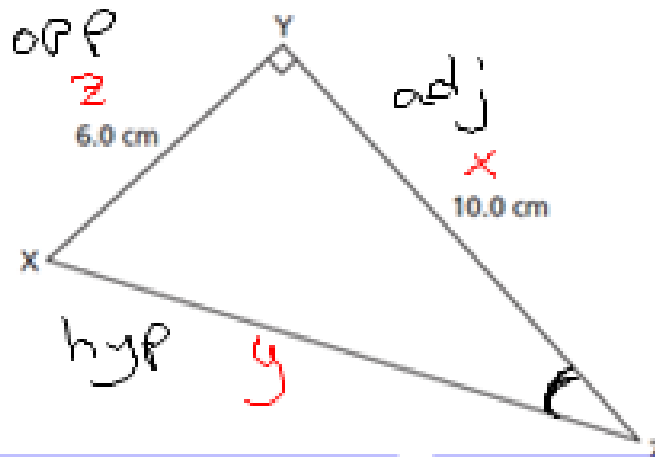
4. Skill: Solving a right triangle.

Strategy: 'Solving a triangle' means to determine the measures of all the angles and the lengths.

To do this you can use the following:

1. Trig ratios (sin/cos/tan)
2. Pythagorean theorem
3. sum of angles in a triangle = 180°

Solve $\triangle XYZ$. Give the measures to the nearest tenth.



	side
$Y = 90^\circ$	$y = 11.7 \text{ cm}$
$X = 59.0^\circ$	$x = 10.0 \text{ cm}$
$Z = 31.0^\circ$	$z = 6.0 \text{ cm}$

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

$$6^2 + 10^2 = c^2$$

$$\sqrt{6^2 + 10^2} = c$$

$$11.6019 = c$$

$$\tan Z = \frac{\text{opp}}{\text{adj}}$$

$$\tan Z = \frac{6}{10}$$

$$Z = \tan^{-1}\left(\frac{6}{10}\right)$$

$$Z = 30.9638^\circ$$

$$X$$

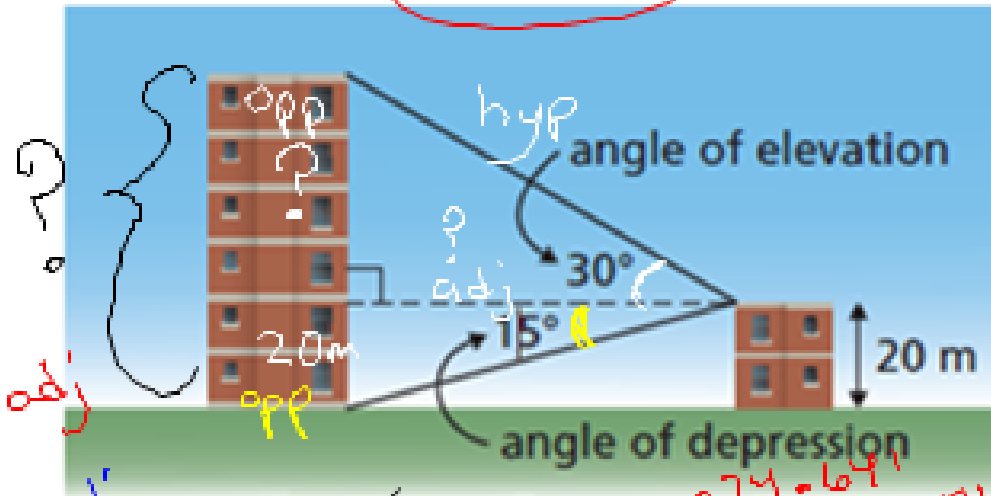
$$180^\circ - 90^\circ - 30.9638^\circ$$

$$= 59.0362^\circ$$

5. Skill: Solving problems involving more than one triangle

Strategy: Use the information from one triangle to solve for missing values in the adjacent triangle.

Example 1: From the top of a 20-m high building, a surveyor measured the angle of elevation of the top of another building and the angle of depression of the base of that building. The surveyor sketched this plan of her measurements. Determine the height of the taller building to the nearest tenth of a metre.



$$\tan 15^\circ = \frac{\text{opp}}{\text{adj}} = \frac{20}{\text{adj}}$$

$$\frac{\text{adj} \tan 15^\circ}{\tan 15^\circ} = \frac{20}{\tan 15^\circ}$$

$$\text{adj} = \frac{20}{\tan 15^\circ}$$

$$\text{adj} = 74.6410 \text{ m}$$

$$\tan 30^\circ = \frac{\text{opp}}{74.6410}$$

$$74.6410 \tan 30^\circ = \text{opp}$$

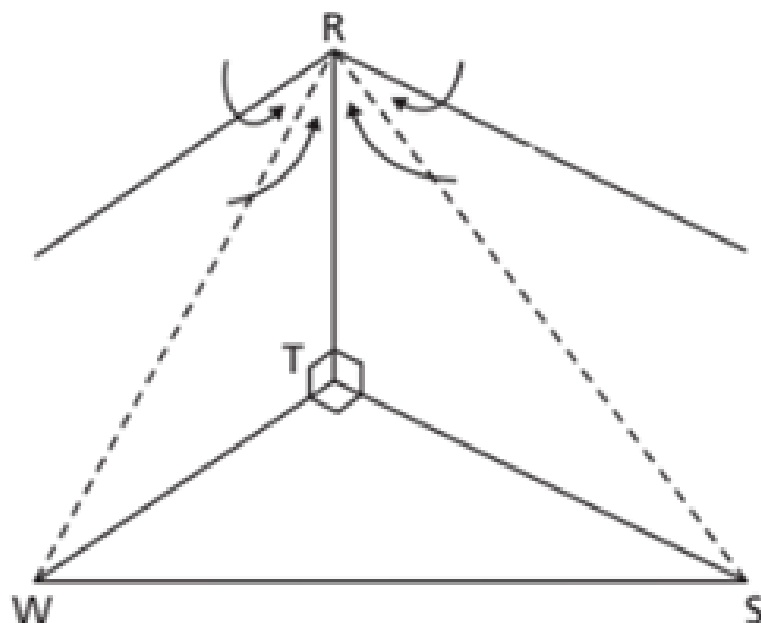
$$43.0940 \text{ m} = \text{opp}$$

$$\text{Total } 20 + 43.0940 = 63.1 \text{ m}$$

"Level C" questions:

- you HAVE the skills to solve them
- not one-step/plug+chug problems
- multiple steps OR think (a little!) outside the box!

From the top of a 90-ft. observation tower, a fire ranger observes one fire due west of the tower at an angle of depression of 5° , and another fire due south of the tower at an angle of depression of 2° . How far apart are the fires to the nearest foot? The diagram is *not* drawn to scale.



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