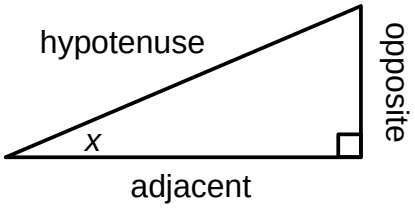
Name: _____ Date: _____

MFM2P: Foundations of Mathematics 10 Similarity and Trigonometry

Finding Side Lengths Using Trigonometry

1. Recall the three **primary trigonometric ratios**:

$$\sin x = \frac{\text{opp}}{\text{hyp}} \qquad \cos x = \frac{\text{adj}}{\text{hyp}} \qquad \tan x = \frac{\text{opp}}{\text{adj}}$$

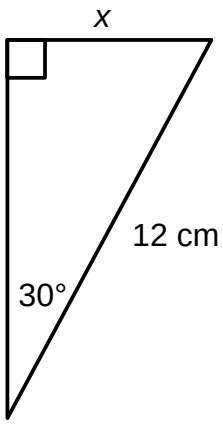


A mnemonic to remember these three ratios is **SOH-CAH-TOA**.

2. If we know the measure of an angle, x, and the length of one of the sides (e.g. the hypotenuse), we can use a trigonometric ratio to find the length of one of the other sides (opposite or adjacent).

3. Examples

A. Determine the length of the side marked x.

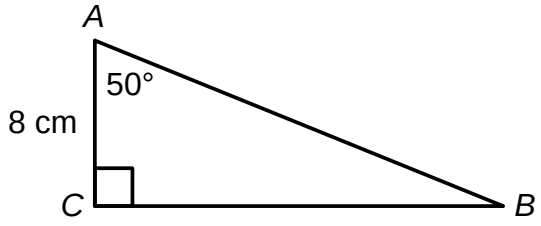


Since x is opposite the 30° angle, and we know the length of the hypotenuse, we can use the sine ratio to calculate x.

$$\begin{aligned} \sin x &= \frac{\text{opp}}{\text{hyp}} \\ \sin 30^\circ &= \frac{x}{12} \\ 12 \times \sin 30^\circ &= x \\ 12 \times 0.5 &= x \\ 6 &= x \end{aligned}$$

Therefore, the side length is 6 cm.

B. Determine the length of side AB.



Since AB is is the hypotenuse of the triangle, and we know the measure of the side adjacent to the 50° angle, we can use the cosine ratio.

$$\begin{aligned} \cos A &= \frac{\text{adj}}{\text{hyp}} \\ \cos 50^\circ &= \frac{8}{AB} \\ AB \times \cos 50^\circ &= \frac{8\,AB}{AB} \\ AB \times \cos 50^\circ &= 8 \\ \frac{AB \times \cos 50^\circ}{\cos 50^\circ} &= \frac{8}{\cos 50^\circ} \\ AB &= \frac{8}{\cos 50^\circ} \\ AB &\approx \frac{8}{0.642788} \\ AB &\approx 12.4 \end{aligned}$$

Therefore, AB is approximately 12.4 cm long.