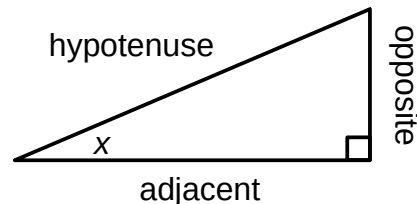


Applications of Trigonometric Ratios

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

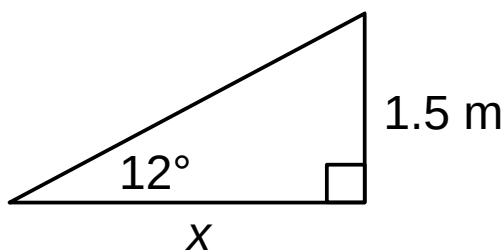
$$\sin x = \frac{\text{opp}}{\text{hyp}} \quad \cos x = \frac{\text{adj}}{\text{hyp}} \quad \tan x = \frac{\text{opp}}{\text{adj}}$$

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



2. Many word problems involve trigonometric ratios. It is a good idea to draw a diagram first, and determine whether the solution involves finding a side or an angle. Use an appropriate ratio for the given information.
3. Examples

- A. A ramp makes an angle of 12° with the ground. If the ramp rises up to a platform 1.5 metres above the ground, how far out does that ramp extend (i.e. how far is the base of the ramp from the base of the platform)?

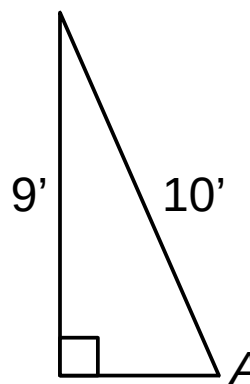


Since we know the length of the opposite side, and we want to determine the length of the adjacent side, we can use the tangent ratio.

$$\begin{aligned} \tan x &= \frac{\text{opp}}{\text{adj}} \\ \tan 12^\circ &= \frac{1.5}{x} \\ 0.212557 &= \frac{1.5}{x} \\ x &= \frac{1.5}{0.212557} \\ x &\approx 7.0569 \end{aligned}$$

Therefore, the ramp extends approximately 7.1 metres.

- B. A 10 ft support beam attaches to a vertical pole at a height of 9 ft above the ground. What angle does the pole make with the ground?



Since we know the measures of the hypotenuse and the side opposite to angle A , we can use the sine ratio to find the measure of angle A .

$$\begin{aligned} \sin A &= \frac{\text{opp}}{\text{hyp}} \\ \sin A &= \frac{9}{10} \\ \sin A &= 0.9 \\ A &= \sin^{-1}(0.9) \\ A &\approx 64^\circ \end{aligned}$$

Therefore, the beam makes an angle of approximately 64° with the ground.