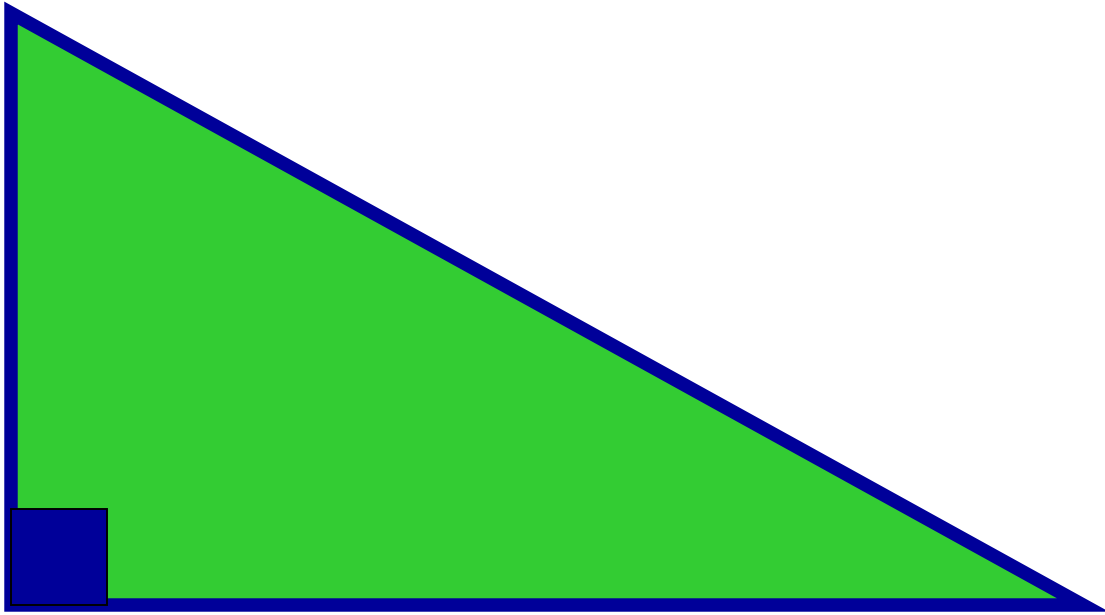


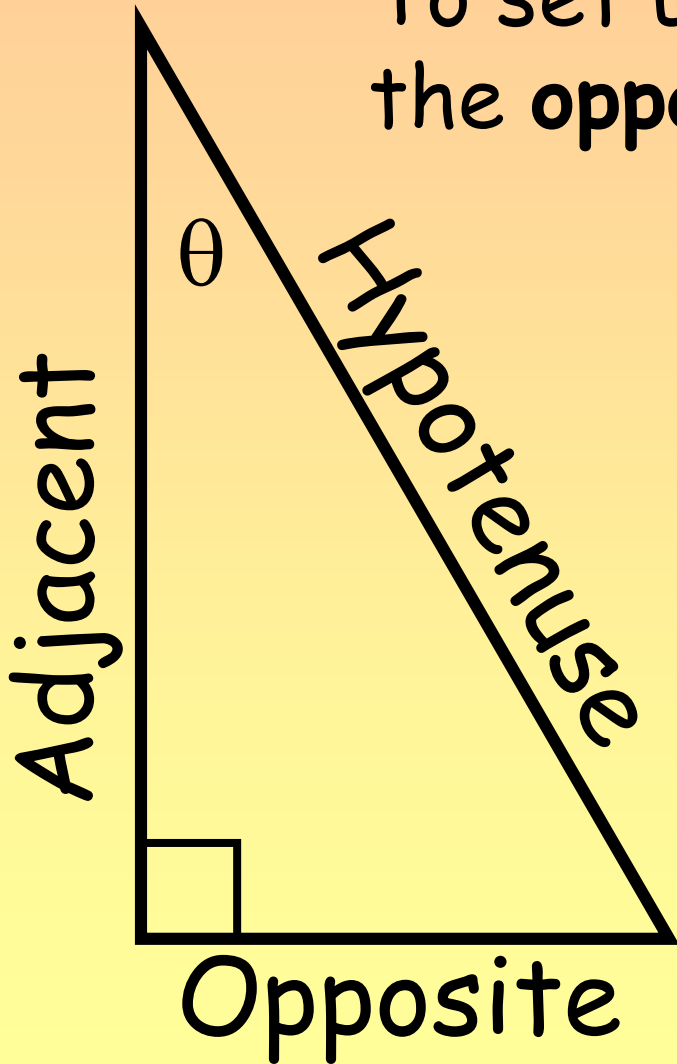
8.5 - 8.6 Trigonometry



SOHCAHTOA

SOHCAHTOA

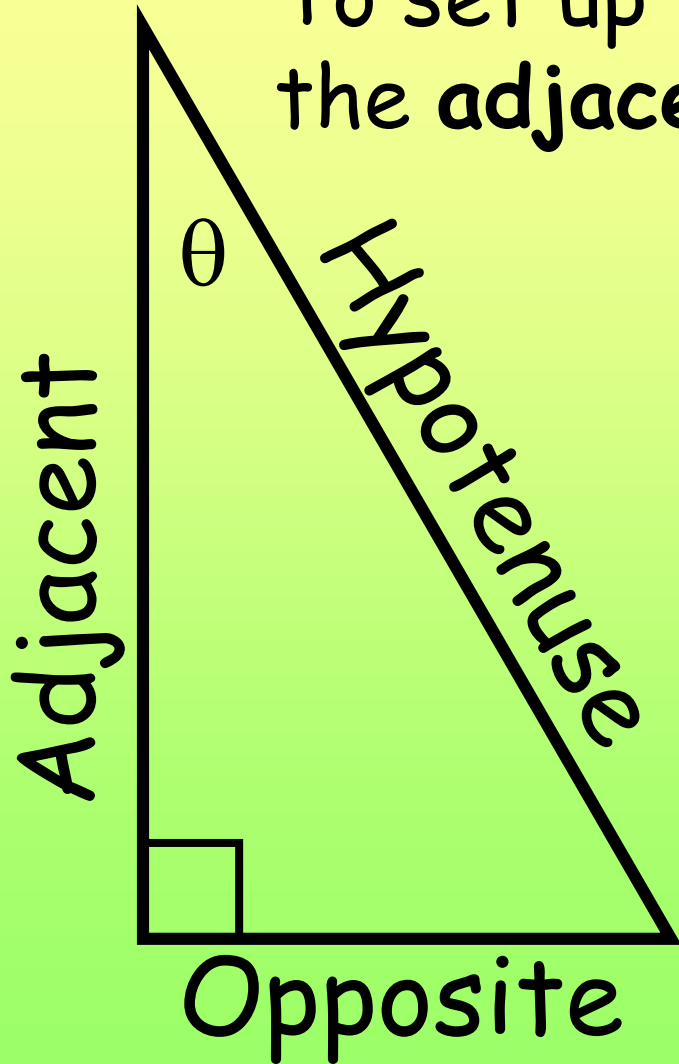
To set up the sine ratio, you compare the opposite side to the hypotenuse.



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

SOHCAHTOA

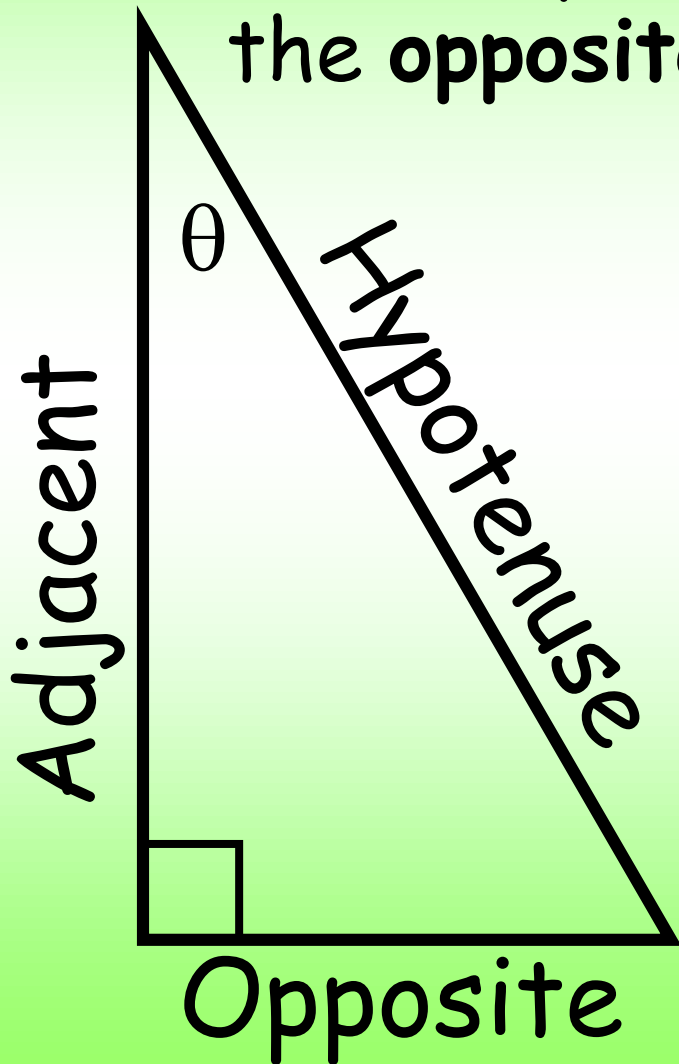
To set up the cosine ratio, you compare the adjacent side to the hypotenuse.



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

SOHCAHTOA

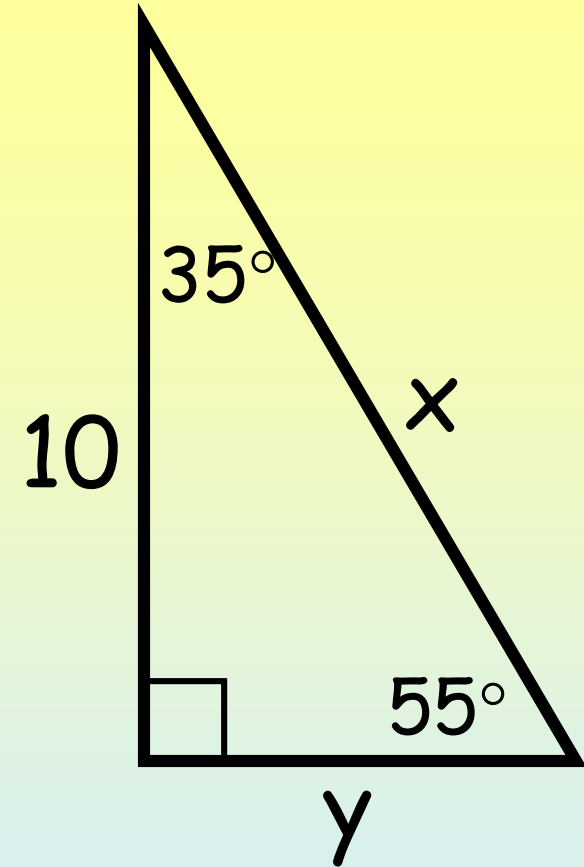
To set up the tangent ratio, you compare the opposite side to the adjacent side.



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

Example 1 - Find side lengths.

SOHCAHTOA



$$\sin 55 = \frac{10}{x}$$

$$x \sin 55 = 10$$

$$x = \frac{10}{\sin 55}$$

$$x = 12.2$$

$$\tan 55 = \frac{10}{y}$$

$$y \tan 55 = 10$$

$$y = \frac{10}{\tan 55}$$

$$y = 7.0$$

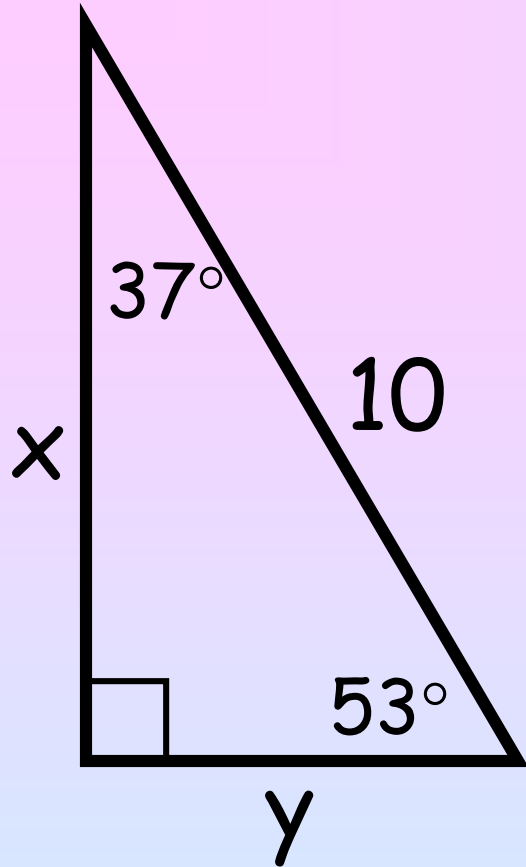
Use Pythagorean Theorem to check:

$$10^2 + 7^2 = 12.2^2$$

$$149 = 148.84$$

Example 2 - Find side lengths.

SOHCAHTOA



$$\sin 53 = \frac{x}{10}$$

$$10 \sin 53 = x$$

$$x = 7.99$$

$$\cos 53 = \frac{y}{10}$$

$$y = 10 \cos 53$$

$$y = 6.02$$

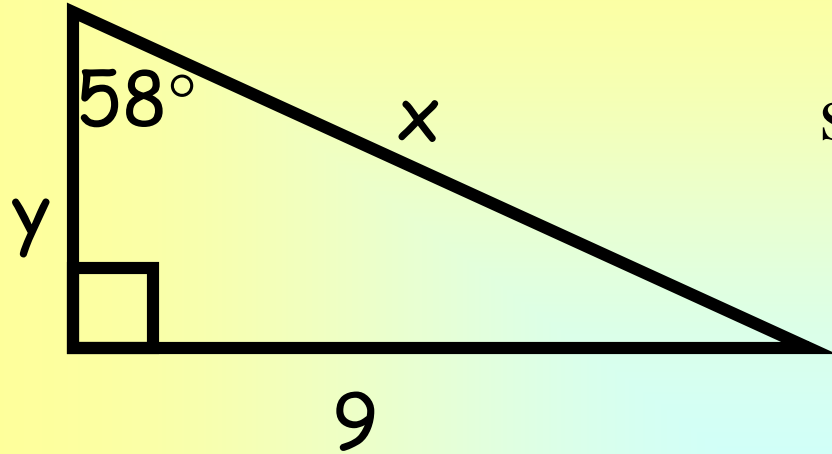
Use Pythagorean Theorem to check:

$$6.02^2 + 7.99^2 = 10^2$$

$$99.96 = 100$$

Example 3 - Find side lengths.

SOHCAHTOA



$$\sin 58 = \frac{9}{x}$$

$$x \sin 58 = 9$$

$$x = \frac{9}{\sin 58}$$

$$x = 10.61$$

$$\tan 58 = \frac{9}{y}$$

$$y \tan 58 = 9$$

$$y = \frac{9}{\tan 58}$$

$$y = 5.62$$

Use Pythagorean Theorem to check:

$$5.62^2 + 9^2 = 10.61^2$$

$$112.58 = 112.57$$

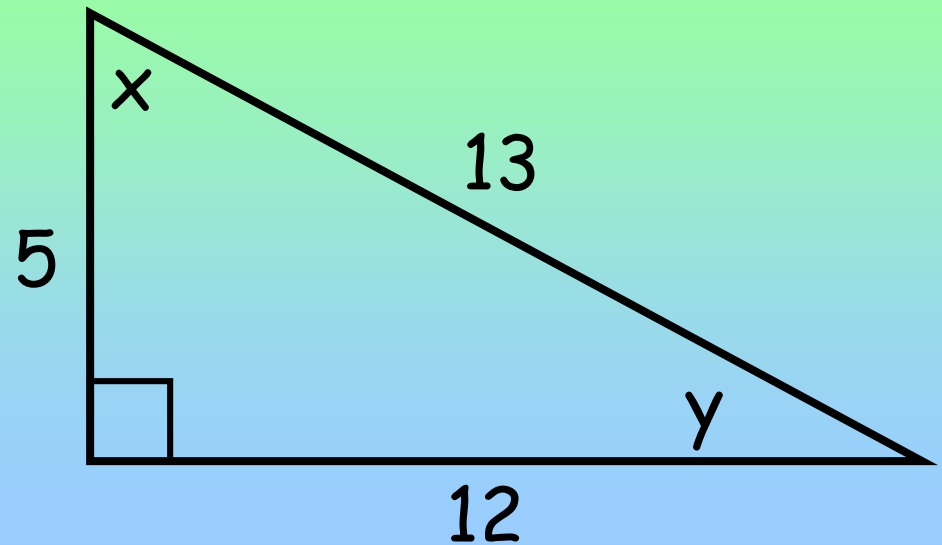
Example 4 - Find angle measures. SOHCAHTOA

Use Pythagorean Theorem to find the missing side length.

$$b^2 + 12^2 = 13^2$$

$$b^2 + 144 = 169$$

$$b^2 = 25 \quad b = 5$$



$$\sin(x) = \frac{12}{13}$$

$$\sin^{-1} \frac{12}{13} = x$$

$$x = 67.38$$

$$\cos(y) = \frac{12}{13}$$

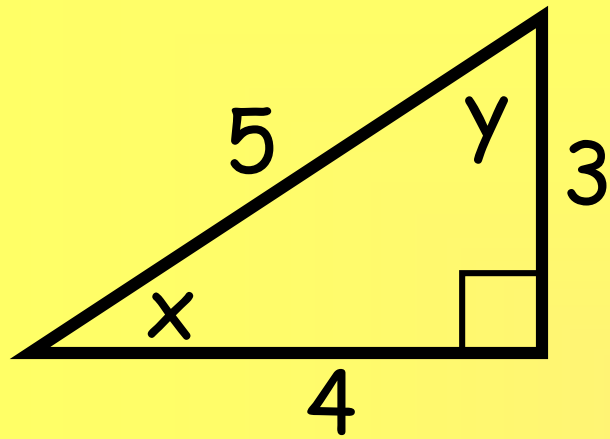
$$\cos^{-1} \frac{12}{13} = y$$

$$y = 22.62$$

Check:

$$67.38 + 22.62 + 90 = 180$$

Example 5 - Find angle measures. SOHCAHTOA



$$3^2 + 4^2 = c^2$$

$$9 + 16 = c^2$$

$$25 = c^2$$

$$c = 5$$

$$\tan(x) = \frac{3}{4}$$

$$\tan^{-1} \frac{3}{4} = x$$

$$x = 36.87$$

$$\tan(y) = \frac{4}{3}$$

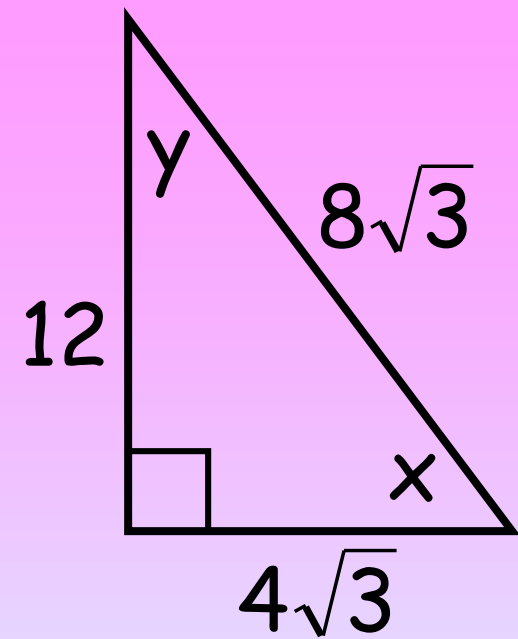
$$\tan^{-1} \frac{4}{3} = y$$

$$y = 53.13$$

Check:

$$36.87 + 53.13 + 90 = 180$$

Example 6 - Find angle measures. SOHCAHTOA



$$12^2 + (4\sqrt{3})^2 = c^2$$

$$144 + 48 = c^2$$

$$192 = c^2$$

$$8\sqrt{3} = c$$

$$\tan(x) = \frac{12}{4\sqrt{3}}$$

$$\tan^{-1} \frac{12}{4\sqrt{3}} = x$$

$$x = 60$$

$$\tan(y) = \frac{4\sqrt{3}}{12}$$

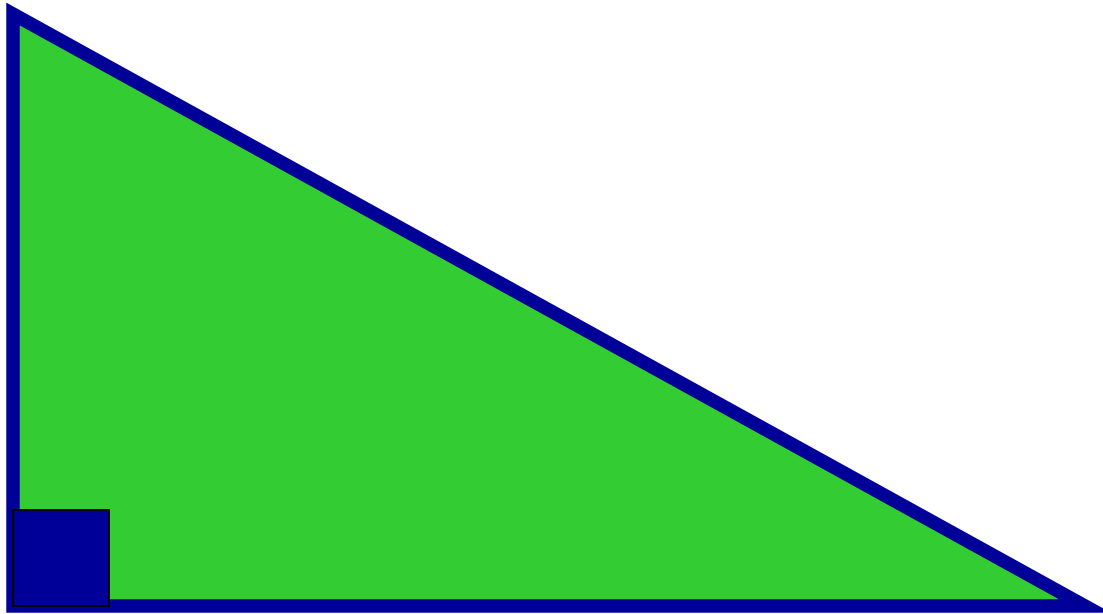
$$\tan^{-1} \frac{4\sqrt{3}}{12} = y$$

$$y = 30$$

Check:

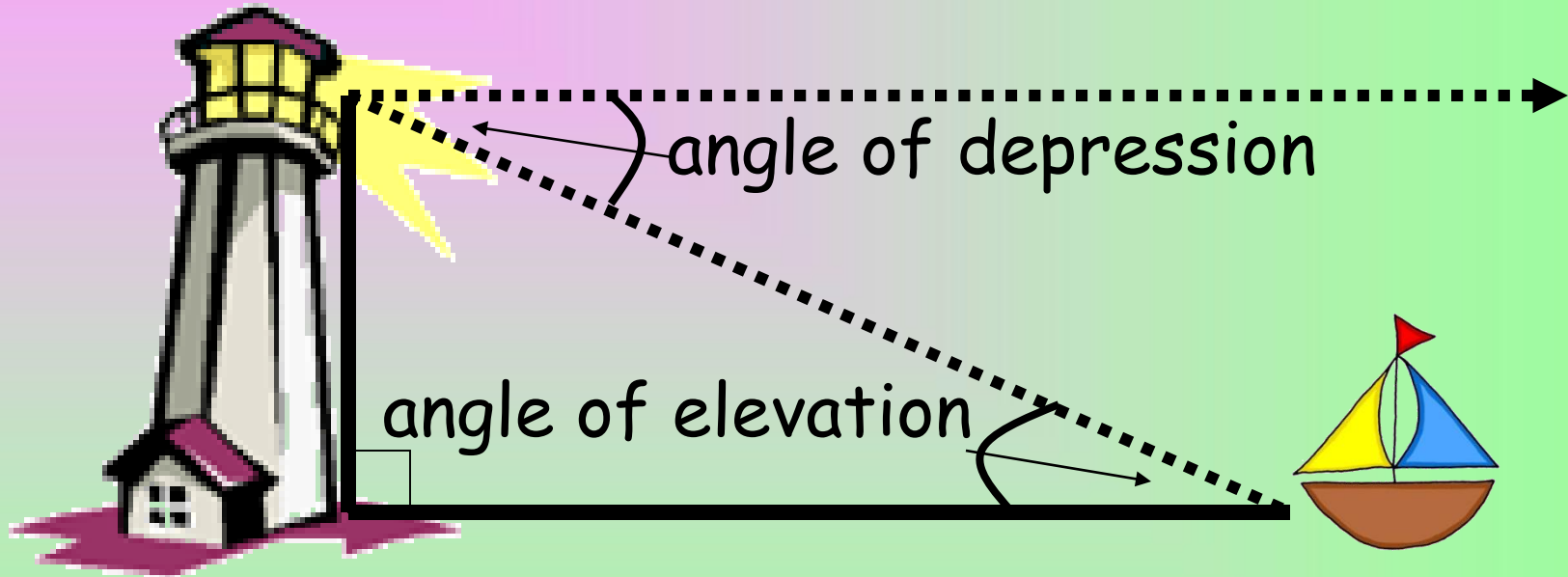
$$30 + 60 + 90 = 180$$

8.7 Trig Applications

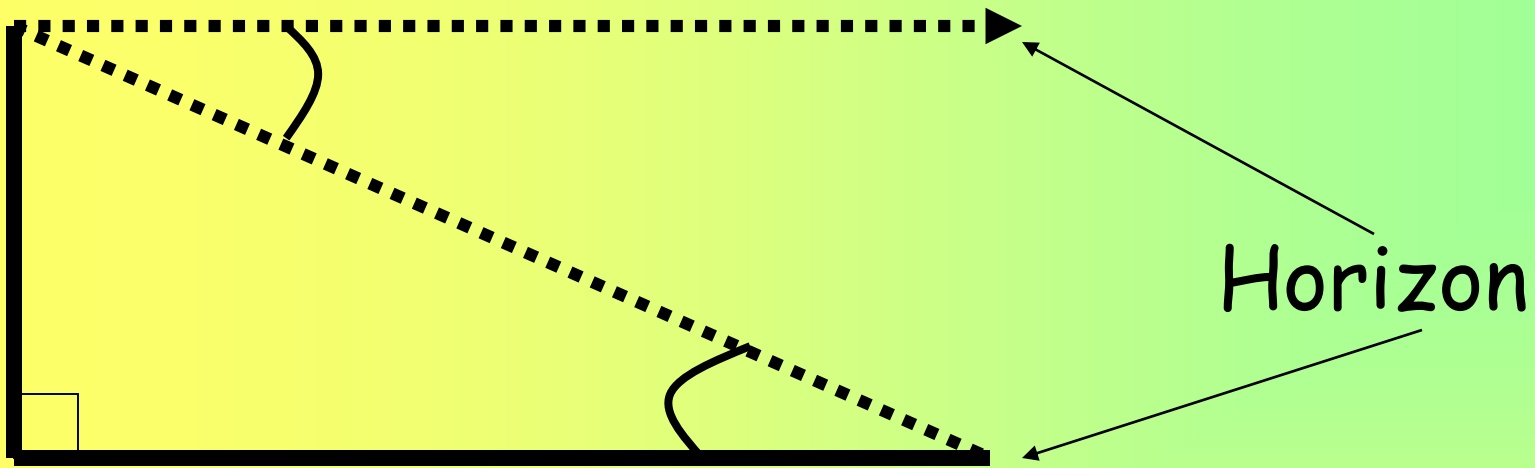


SOHCAHTOA

Imagine an operator at the top of a lighthouse sees a sailboat on a line that makes an angle of 15° with the horizon. The angle between the horizon and the object is the angle of depression.



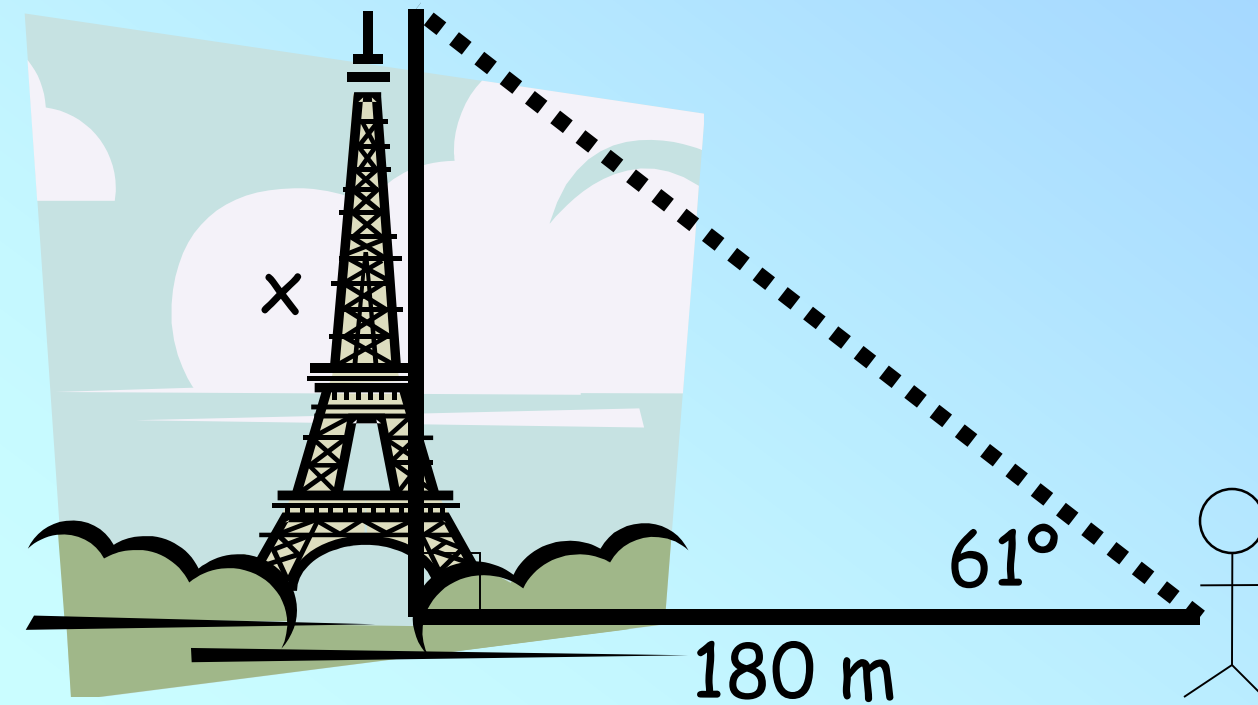
At the same time, a person on the boat looks up at the lighthouse. The angle made from the horizon up to the top of the light house is the angle of elevation.



The horizon lines are always
parallel

Therefore the angle of elevation
and the angle of depression are
congruent.

How tall is the Eiffel Tower? At a distance of 180m away from the tower, an observer notices that the angle of elevation to the top of the building is 61° .



$$\tan 61 = \frac{x}{180}$$

$$180 \tan 61 = x$$

$$x = 324.7 \text{ m}$$

What factors could influence your answer and lead to error?

An airplane is flying at a height of 2 miles above the ground. The distance along the ground from the airplane to the airport is 5 miles. What is the angle of depression from the airplane to the airport? 21.8°

$$\tan x = \frac{2}{5} \quad \tan^{-1} \frac{2}{5} = x \quad x = 21.8$$

