5.3: SOHCAHTOA

Learning Goal: We are learning to use SOHCAHTOA to solve problems involving right triangles.

SOHCAHTOA is a handy acronym to help us remember the relationships between an angle and two side lengths.

S = Sin
O = opposite
H = hypotenuse
C = cos
A = adjacent
H = hypotenuse
T = tan
O = opposite
A = adjacent

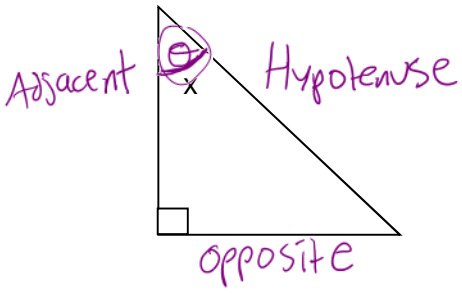
$\sin\theta = \frac{O}{H}$ $\cos\theta = \frac{A}{H}$ $\tan\theta = \frac{O}{A}$

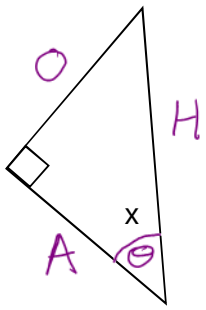
$S\overset{O}{}_{H}C\overset{A}{}_{H}T\overset{O}{}_{A}$

yesterday we saw

$\sin 30 = 0.5 = \frac{1}{2}$ ← opposite ← Hypotenuse

Label The sides of the following triangles for angle X
Adjacent, Opposite, Hypotenuse. You may use A, O and H to stand for the full word.



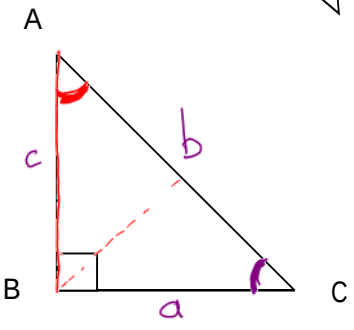


Fill in the blanks:

a) In △ABC, the hypotenuse is AC, or b

the opposite to C is AB, or c

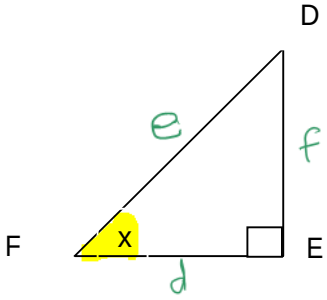
the adjacent to A is AB, or c



b) In △EDF, e is the hypotenuse or DF

d is the adjacent,

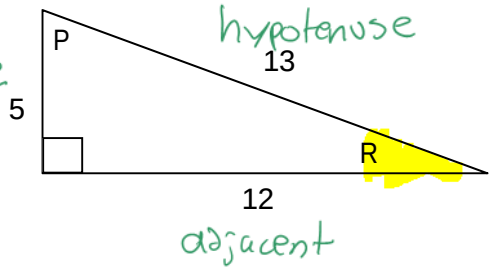
and f is the opposite.



Sin R= $\frac{O}{H} = \frac{5}{13} = 0.3846$

Cos R= $\frac{A}{H} = \frac{12}{13} = 0.9231$ opposite

Tan R= $\frac{O}{A} = \frac{5}{12} = 0.4167$



Finding the ratios is useful, but what if we want to know the size of angle R? Well, once we know our trig ratios (*sin, cos, tan*) we can use ANY of them to find out the size of R! Just use the inverse operation technique we learnt yesterday!

What is the size of angle R? Calculate it using all three ratios.

Sin R = 0.3846
$R = \sin^{-1}(0.3846)$
$R = 23°$

Cos R = 0.9231
$R = \cos^{-1} 0.9231$
$R = 23°$

tan R = 0.4167
$R = \tan^{-1}(0.4167)$
$R = 23°$

Bonus: What is the size of angle P – without using trig ratios....

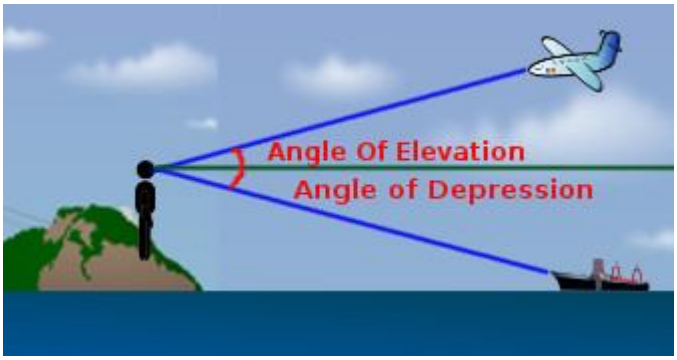
Angles in any Δ add to 180°

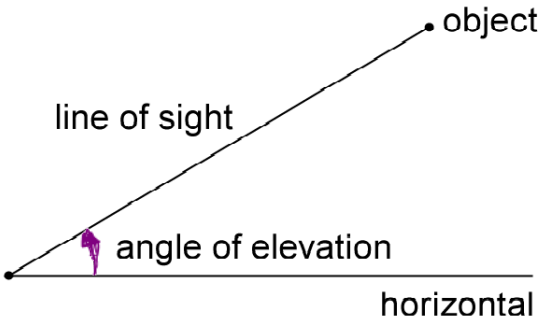
$180 - 90 - 23 = 67°$

Angle Of Elevation

When you see an object above you there is an angle of elevation

between the horizontal and your line of sight.



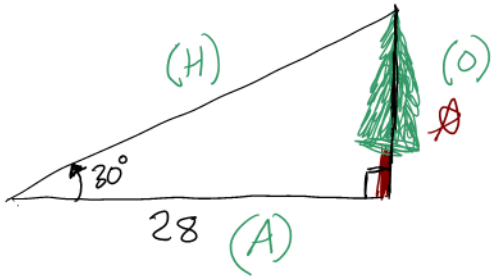


Let's Practise

The angle of elevation of the top of a tree is 30° from a point 28 ft away from the foot of the tree. Find the height of the tree rounded to the nearest foot.

Start w/ a Picture

SOHCAH|TOA use tan!



$\tan\theta = \frac{O}{A}$

$\tan 30 = \frac{O}{28}$

$\times 28 \quad 0.5774 = \frac{O}{28} \times 28$

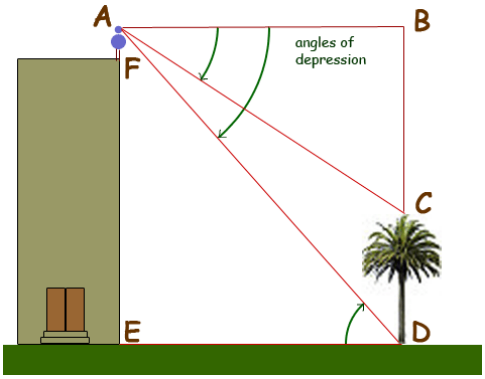
$O = 16.16$ ft

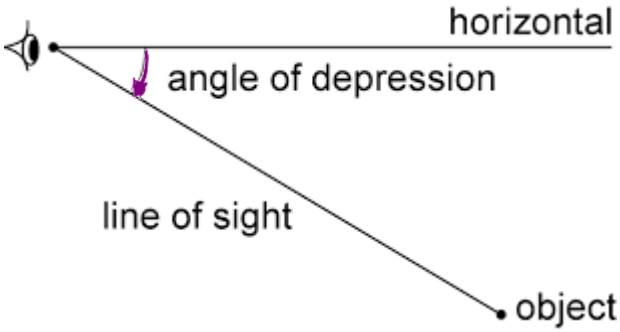
16 ft

Angle Of Depression

When you see an object below you there is an angle of depression

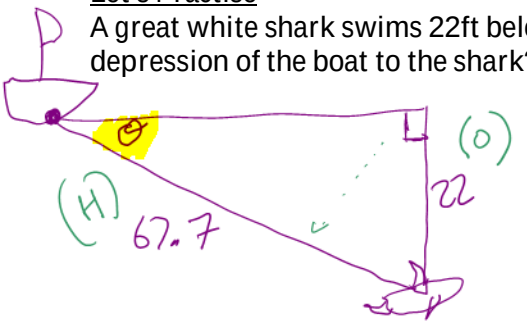
between the horizontal and your line of sight.





Let's Practise

A great white shark swims 22ft below sea level. If the shark is 67.7 feet from the sailboat, what is the angle of depression of the boat to the shark?



SOH CAH TOA

$\sin\theta = \frac{O}{H}$

$\sin\theta = \frac{22}{67.7}$

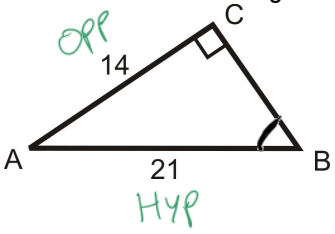
$\sin\theta = 0.3249$

$\theta = \sin^{-1}(0.3249)$

$\theta = 19^\circ$

Other Examples

What is the size of angle B?



SOHCAHTOA

$\sin B = \frac{O}{H}$

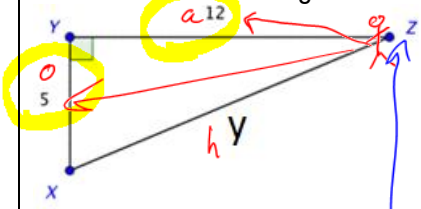
$\sin B = \frac{14}{21}$

$\sin B = 0.6667$

$B = \sin^{-1}(0.6667)$

$B = 42^\circ$

What is the size of angle Z?



$\tan Z = \frac{Opp}{adj}$

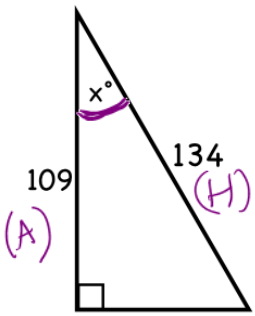
$\tan Z = \frac{5}{12}$

$\tan Z = 0.4167$

$Z = \tan^{-1}(0.4167)$

$Z = 23^\circ$

What is the size of angle x?



$\cos x = \frac{A}{H}$

$\cos x = \frac{109}{134}$

$\cos x = 0.8134$

$x = \cos^{-1}(0.8134)$

$x = 36^\circ$

What is the length of side y. *Hint – don't use trig ratios!*

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

$5^2 + 12^2 = c^2$

$25 + 144 = c^2$

$\sqrt{169} = \sqrt{c^2}$

$13 = c$

Success Criteria

- I can use SOHCAHTOA to solve for a missing side length or angle in a right angle triangle