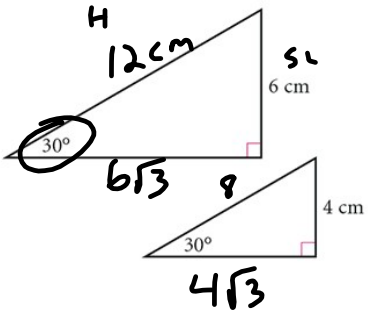
Warm-Up

Find the missing sides. Describe your method.

Are these triangles similar? Explain how you know.



LESSON 12.1

Trigonometric Ratios

sin
cos
tan

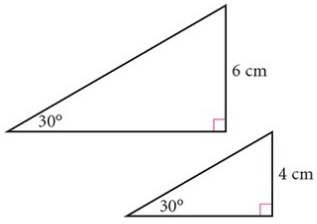
Warm-Up

Find the missing sides. Describe your method.

12 cm, $6\sqrt{3}$ cm, 8 cm, $4\sqrt{3}$ cm, Using the side ratios of a 30°-60°-90° triangle.

Are these triangles similar? Explain how you know.

Yes, they are similar because of the AA Triangle Similarity conjecture.



12.1 Trigonometric Ratios Day 1

Purpose:

To find the missing sides and angles of right triangles.

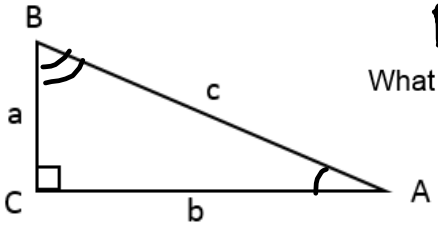
Learning Target:

a. Given a right triangle, I can define the sine, cosine, and tangent ratios from an unknown angle.

b. I can use Trigonometric Ratios to solve for unknown sides and angles in a right triangle.

Opposite/Adjacent/Hypotenuse

To understand sine, cosine, and tangent, you must be able to label sides as adjacent or opposite of an angle and hypotenuse.



What side is the hypotenuse?

$\overline{AB}$

What side is opposite of $\angle A$?

$\overline{BC}$

What side is adjacent to $\angle A$? (next to)

$\overline{AC}$

What side is opposite of $\angle B$?

$\overline{AC}$

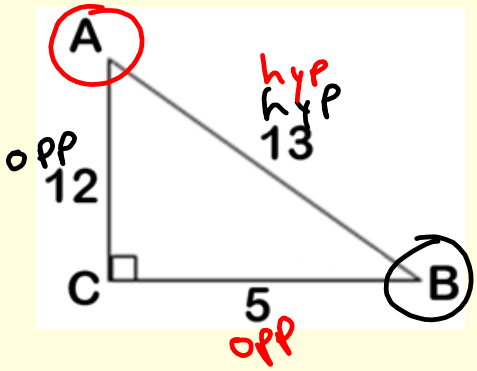
What side is adjacent to $\angle B$?

$\overline{BC}$

Sine (sin)

The sine (or shorthand sin) is simply a ratio in a right triangle comparing the side opposite an angle to the hypotenuse.

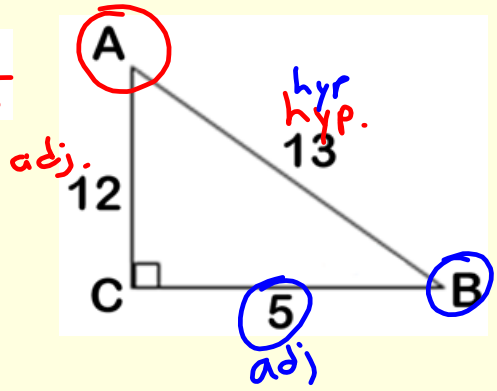
For example, $\sin B = \frac{12}{13}$ and $\sin A = \frac{5}{13}$



Cosine (cos)

The cosine (or shorthand cos) is simply a ratio in a right triangle comparing the side adjacent an angle to the hypotenuse.

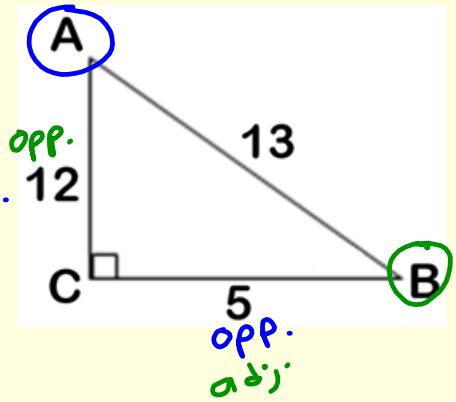
For example, $\cos A = \frac{12}{13}$ and $\cos B = \frac{5}{13}$



Tangent (tan)

The tangent (or shorthand tan) is simply a ratio in a right triangle comparing the side opposite an angle to the side adjacent.

For example, $\tan A = \frac{5}{12}$ and $\tan B = \frac{12}{5}$



Sine (sin) / Cosine(cos) / Tangent(tan)

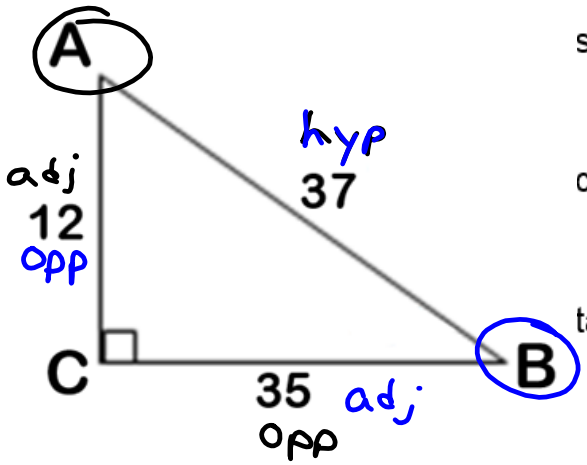
To remember the trigonometric ratio we can use the following saying:

SOH-CAH-TOA

Sin = $\frac{\text{opposite}}{\text{hypotenuse}}$ Cos = $\frac{\text{adjacent}}{\text{hypotenuse}}$ Tan = $\frac{\text{opposite}}{\text{adjacent}}$

S $\frac{O}{H}$ C $\frac{A}{H}$ T $\frac{O}{A}$

Using the triangle below express sine-cosine-tangent.



$\sin A = \frac{35}{37}$ $\quad \sin B = \frac{12}{37}$

$\cos A = \frac{12}{37}$ $\quad \cos B = \frac{35}{37}$

$\tan A = \frac{35}{12}$ ← reciprocals → $\tan B = \frac{12}{35}$

Examples: Use the triangle below to find sin, cos, tan. NO DECIMALS!

1. $\sin A = \frac{\sqrt{8}}{2\sqrt{8}} = \frac{1}{2}$

2. $\sin B = \frac{\sqrt{3}}{2}$

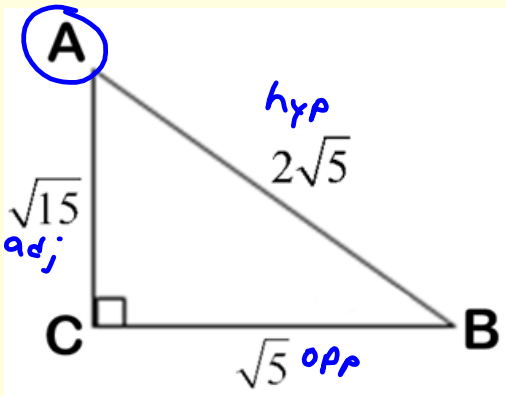
3. $\cos A = \frac{\sqrt{15}}{2\sqrt{5}} = \frac{\sqrt{3}}{2}$

4. $\cos B = \frac{\sqrt{5}}{2\sqrt{5}} = \frac{1}{2}$

5. $\tan A = \frac{\sqrt{8}}{\sqrt{15}\sqrt{3}} = \frac{1}{\sqrt{3}}$

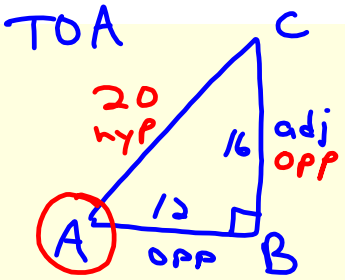
$\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{\sqrt{3}}{3}}$

6. $\tan B = \frac{\sqrt{15}\sqrt{3}}{\sqrt{5}} = \sqrt{3}$



7. In ΔABC, $\angle B$ is the right angle. Suppose $\tan C = \frac{12}{16} = \frac{3}{4}$. Find $\sin A$.

TOA



$\tan C = \frac{opp}{adj}$

$\sin A = \frac{opp}{hyp}$

SOH

$\sin A = \frac{16}{20}$

$\sin A = \frac{4}{5}$

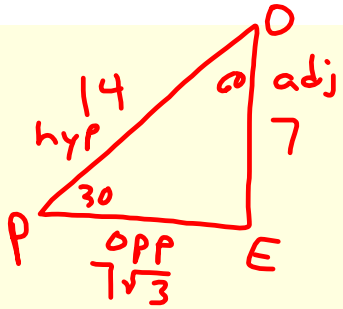
$12^2 + 16^2 = x^2$

$144 + 256 = x^2$

$400 = x^2$

$20 = x$

8. In ΔPOE, $\angle E$ is the right angle. Suppose $\cos O = \frac{7}{14} = \frac{1}{2}$. Find $\tan O$.



$\cos O = \frac{adj}{hyp}$

$\tan O = \frac{opp}{adj}$

$\tan O = \frac{7\sqrt{3}}{7} = \sqrt{3}$

Assignment: 12.1 Day 1 Practice