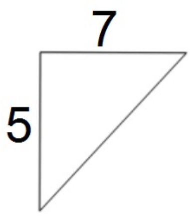
Bellwork

Using Pythagorean Theorem, find the missing side of the given triangles.

1.



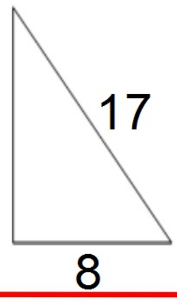
$5^2 + 7^2 = c^2$

$25 + 49 = c^2$

$74 = c^2$

$\sqrt{74} = c$

2.



$8^2 + b^2 = 17^2$

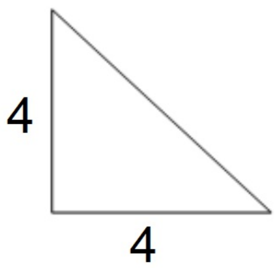
$64 + b^2 = 289$

$\underline{-64 \qquad -64}$

$b^2 = 225$

$b = 15$

3.



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

$16 + 16 = c^2$

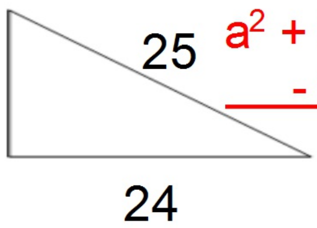
$32 = c^2$

$c = \sqrt{32}$

$c = \sqrt{16(2)}$

$c = 4\sqrt{2}$

4.



$a^2 + 24^2 = 25^2$

$a^2 + 576 = 625$

$\underline{\quad - 576 \quad - 576}$

$a^2 = 49$

$a = 7$

Pythagorean Theorem

Recall the Pythagorean Theorem:

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

Where:

1. a = the length of the smallest leg
2. b = the length of the largest leg
3. c = the length of the hypotenuse

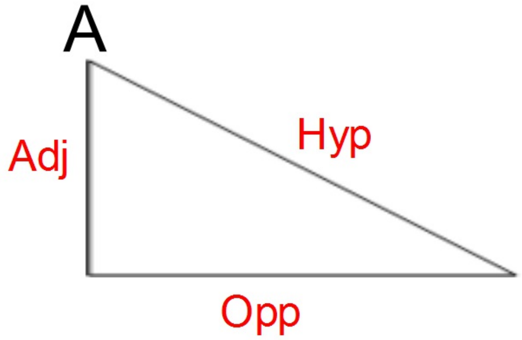
When to use it:

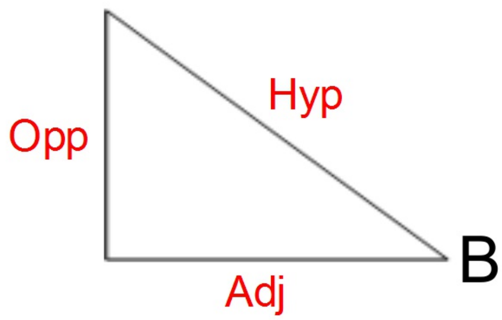
Any time that you are missing one length of any given right triangle.

The Sides of a Triangle

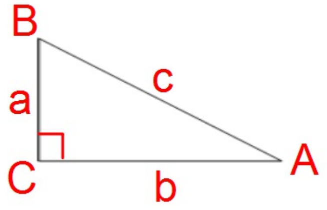
Throughout this lesson and the chapter we will need to focus on the sides of a triangle and how they relate to a particular angle. Of particular interest are:

1. The opposite side
2. The adjacent side
3. The hypotenuse





Parts of a Triangle



The 3 angles of a triangle:

1. $\angle A$
2. $\angle B$
3. $\angle C$ - the right angle in a right triangle.

The 3 sides of a triangle:

1. Side a - the side opposite angle A
   (Typically the shortest side)
2. Side b - the side opposite angle B
   (Typically the longest side)
3. Side c - the side opposite angle C
   (The Hypotenuse)

The Basic Six Trigonometric Functions

The 3 original Trigonometric Functions:

1. Sine
2. Cosine
3. Tangent

The 3 reciprocal Trigonometric Functions:

1. Cosecant
2. Secant
3. Cotangent

The Originals

Remember the phrase:

SOH - CAH - TOA

Why?

1. $\text{Sin } A = \dfrac{\text{Opp}}{\text{Hyp}}$
2. $\text{Cos } A = \dfrac{\text{Adj}}{\text{Hyp}}$
3. $\text{Tan } A = \dfrac{\text{Opp}}{\text{Adj}}$

The Reciprocal Trig Functions

Given that they are RECIPROCAL functions,
What do you think they would be given...

1. Sine is connected with Cosecant
2. Cosine is connected with Secant
3. Tangent is connected with Cotangent

$\text{Csc } A = \frac{\text{hyp}}{\text{opp}}$ $\quad$ $\text{Sec } A = \frac{\text{hyp}}{\text{adj}}$ $\quad$ $\text{Cot } A = \frac{\text{adj}}{\text{opp}}$

Rationalizing the Denominator

Recall what it means to Rationalize the Denominator of an expression:

1. If there is a radical term in the bottom of a fraction, then you will have to multiply the top and the bottom of the fraction by the same square root that is on the bottom of the fraction and simplify.

Examples

Evaluate the 6 trigonometric functions for each of the following triangles using Angle A:

1. a = 4 & b = 6

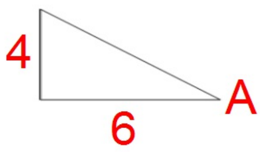
$4^2 + 6^2 = c^2$

$16 + 36 = c^2$

$52 = c^2$

$c = \sqrt{4(13)}$

$c = 2\sqrt{13}$



$\sin A = \frac{4}{2\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{4\sqrt{13}}{2(13)} = \frac{2\sqrt{13}}{13}$

$\cos A = \frac{6}{2\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{6\sqrt{13}}{2(13)} = \frac{3\sqrt{13}}{13}$

$\tan A = \frac{4}{6} = \frac{2}{3}$

$\csc A = \frac{2\sqrt{13}}{4} = \frac{\sqrt{13}}{2}$

$\cot A = \frac{3}{2}$

$\sec A = \frac{2\sqrt{13}}{6} = \frac{\sqrt{13}}{3}$

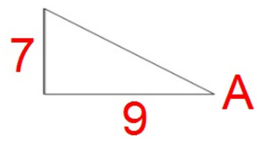
2. a = 7 & b = 9

$7^2 + 9^2 = c^2$

$49 + 81 = c^2$

$130 = c^2$

$\sqrt{130} = c$



$\sin A = \frac{7}{\sqrt{130}} \cdot \frac{\sqrt{130}}{\sqrt{130}} = \frac{7\sqrt{130}}{130}$

$\cos A = \frac{9}{\sqrt{130}} \cdot \frac{\sqrt{130}}{\sqrt{130}} = \frac{9\sqrt{130}}{130}$

$\tan A = \frac{7}{9}$

$\csc A = \frac{\sqrt{130}}{7}$

$\cot A = \frac{9}{7}$

$\sec A = \frac{\sqrt{130}}{9}$