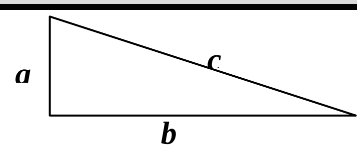
Section:	**7 – 2 Use the Converse of the Pythagorean Theorem**
Essential Question	How can you use the sides of a triangle to determine if it is a right triangle?

Warm Up:

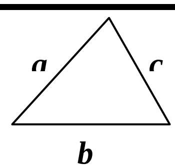
Theorems:

Converse of the Pythagorean Theorem



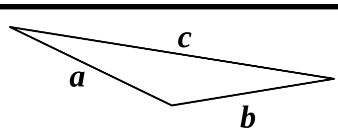
$c^2 = a^2 + b^2$

If the square of the length of the longest side of a triangle is equal to the sum of the squares of the lengths of the two shorter sides,	**then** the triangle is a right triangle.



$c^2 < a^2 + b^2$

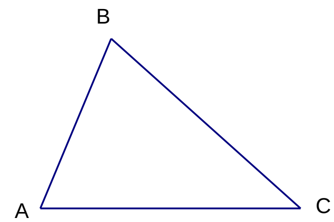
If the square of the length of the longest side of a triangle is less than the sum of the squares of the lengths of the two shorter sides,	**then** the triangle is an acute triangle.



$c^2 > a^2 + b^2$

If the square of the length of the longest side of a triangle is greater than to the sum of the squares of the length of the two shorter sides,	**then** the triangle is an obtuse triangle.

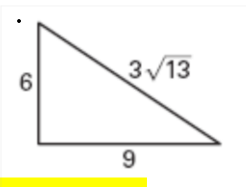
Review:

Triangle Inequality Theorem	
The sum of the lengths of any two sides of a triangle is greater than the length of the third side. If two sides of a triangle are x and y, then the third side must be between $x - y$ and $x + y$ where $x \ge y$.	

Show:

Ex 1: Tell if the given triangle is right, acute, or obtuse.

a. .



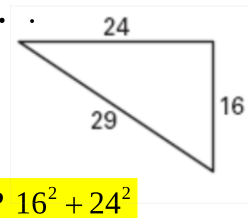
$(3\sqrt{13})^2 \ ? \ 6^2 + 9^2$

$117 = 117$

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

Right Triangle

b. .



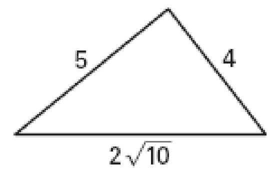
$29^2 \ ? \ 16^2 + 24^2$

$841 > 832$

$c^2 > a^2 + b^2$

Obtuse Triangle

c.



$(2\sqrt{10})^2 \ ? \ 6^2 + 9^2$

$40 = 41$

$c^2 < a^2 + b^2$

Acute Triangle

Ex 2: Can segments with lengths of 2.8 feet, 3.2 feet, and 4.2 feet form a triangle? If so, would the triangle be *acute*, *right*, or *obtuse*?

$4.2 > 2.8 + 3.2$, so by the Triangle Inequality Theorem, a triangle CAN be formed with these lengths

$4.2^2 \ ? \ 2.8^2 + 3.2^2$

$17.64 < 18.08$

$c^2 < a^2 + b^2$

Acute Triangle

Ex 3: Can segments with lengths of 6.1 inches, 9.4 inches, and 11.3 inches form a triangle? If so, would the triangle be *acute*, *right*, or *obtuse*?

$11.3 > 6.1 + 9.4$, so by the Triangle Inequality Theorem, a triangle CAN be formed with these lengths

$11.3^2 \ ? \ 6.1^2 + 9.4^2$

$127.69 > 125.57$

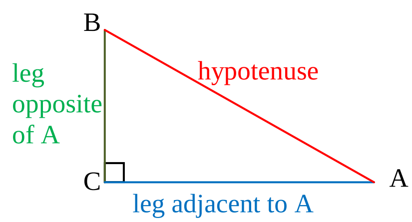
$c^2 > a^2 + b^2$

Obtuse Triangle

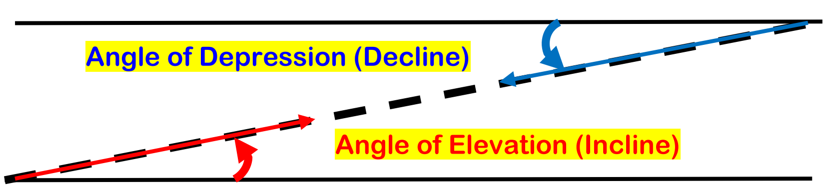
Section:	**7 – 5 Apply the Tangent Ratio**
Essential Question	How can you find a leg of a right triangle when you know the other leg and one acute angle?

Warm Up:

Key Vocab:

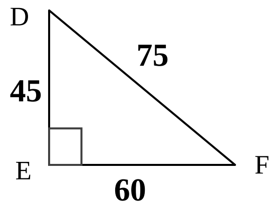
Trigonometric Ratio	The ratio of the lengths of two sides in a right triangle. Three common trigonometric ratios are sine, cosine, and tangent.	
Tangent Ratio	Let ΔABC, be a ________________ with acute angle $\angle A$, then	

Angle of Elevation (Incline)	The angle of sight when looking up at an object
Angle of Depression (Decline)	The angle of sight when looking down at an object



Show:

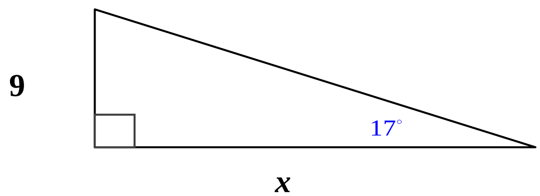
Ex 1: Find the $\tan D$ and the $\tan F$. Write each answer as a fraction and as a decimal rounded to four places.



$$\tan D = \frac{\text{opposite}}{\text{adjacent}} = \frac{60}{45} = \boxed{\frac{4}{3} \approx 1.3333}$$

$$\tan F = \frac{\text{opposite}}{\text{adjacent}} = \frac{45}{60} = \boxed{\frac{3}{4} \approx 0.7500}$$

Ex 2: Find the value of x.



$$\tan 17^\circ = \frac{\text{opposite}}{\text{adjacent}}$$

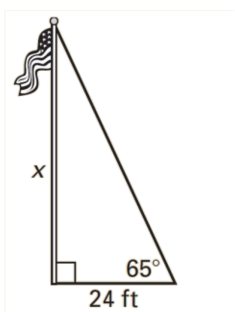
$$\tan 17^\circ = \frac{9}{x}.$$

$$x \tan 17^\circ = 9$$

$$x = \frac{9}{\tan 17^\circ}$$

$$\boxed{x \approx 29.438}$$

Ex 3: Find the height of the flagpole to the nearest foot.



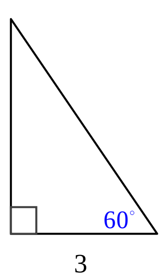
$$\tan 65^\circ = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan 65^\circ = \frac{x}{24}$$

$$x = 24 \tan 65^\circ$$

$$x = \boxed{51 \text{ ft}}$$

Ex 4: What is area of the triangle?



$$\tan(60°) = \frac{x}{3}$$

$$3\tan(60°) = x$$

$$5.2 \approx x$$

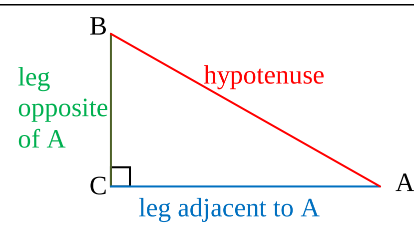
$$A = \tfrac{1}{2}bh$$

$$A = \tfrac{1}{2}(3)(5.2) \approx 7.8$$

Section:	**7 – 6 Apply the Sine and Cosine Ratios**
Essential Question	How can you find the lengths of the sides of a right triangle when you are given the length of the hypotenuse and one acute angle?

Warm Up:

Key Concepts:



Sine Ratio	Let ΔABC, be a right triangle with acute angle $\angle A$, then $\sin A = \dfrac{\text{length of leg opposite } \angle A}{\text{hypotenuse}} = \dfrac{\text{opposite}}{\text{hypotenuse}}$
Cosine Ratio	Let ΔABC, be a right triangle with acute angle $\angle A$, then $\cos A = \dfrac{\text{length of leg adjacent } \angle A}{\text{hypotenuse}} = \dfrac{\text{adjacent}}{\text{hypotenuse}}$

The great Chief of the Trigonometry Tribe SOH CAH TOA is a good memory device …

$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

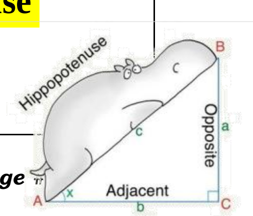
$$\tan A = \frac{\text{opposite}}{\text{adjacent}}$$

Another memory device … hippos

Orange Hippos → $\sin A = \dfrac{\textbf{opposite}}{\textbf{hypotenuse}}$

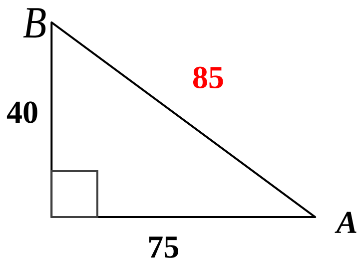
Always Have → $\cos A = \dfrac{\textbf{adjacent}}{\textbf{hypotenuse}}$

Orange Ankles → $\tan A = \dfrac{\textbf{opposite}}{\textbf{adjacent}}$



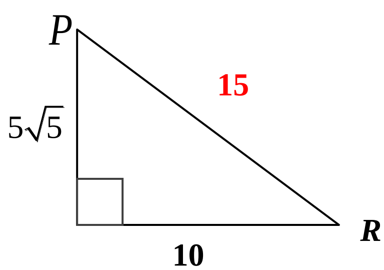
Show:

Ex 1: Find the $\sin A$ and $\sin B$. Write each answer as a fraction and decimal rounded to four places.



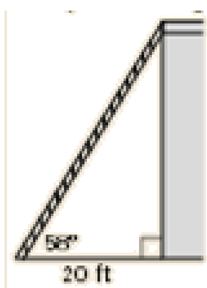
$$40^2 + 75^2 = c^2$$
$$85 = c$$
$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{40}{85} = \boxed{\frac{8}{17} \approx .4706}$$
$$\sin B = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{75}{85} = \boxed{\frac{15}{17} \approx .8824}$$

Ex 2: Find the $\cos P$ and $\cos R$. Write each answer as a fraction and decimal rounded to four places.



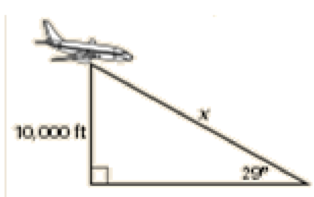
$$10^2 + \left(5\sqrt{5}\right)^2 = c^2$$
$$15 = c$$
$$\cos P = \frac{\text{adj}}{\text{hyp}} = \frac{5\sqrt{5}}{15} = \boxed{\frac{\sqrt{5}}{3} \approx .7454}$$
$$\cos R = \frac{\text{adj}}{\text{hyp}} = \frac{10}{15} = \boxed{\frac{2}{3} \approx .6667}$$

Ex 3: A rope, staked 20 feet from the base of a building, goes to the roof and forms an angle of elevation of 58°. To the nearest tenth of a foot, how long is the rope?



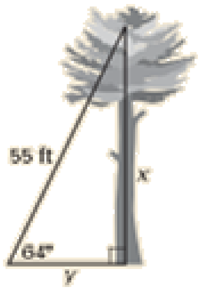
$$\cos 58^\circ = \frac{\text{adj}}{\text{hyp}}$$
$$x \cos 58^\circ = \frac{20}{x} \cdot x$$
$$\frac{x \cancel{\cos 58^\circ}}{\cancel{\cos 58^\circ}} = \frac{20}{\cos 58^\circ}$$
$$x = \frac{20}{\cos 58^\circ} \boxed{\approx 37.7 \text{ ft}}$$

Ex 4: A pilot is looking at an airport form her plane. The angle of depression is 29°. If the plane is at an altitude of 10,000 ft, approximately how far is the air distance to the runway?



$$\sin 29^\circ = \frac{\text{opp}}{\text{hyp}}$$
$$x \sin 29^\circ = \frac{10000}{x} \cdot x$$
$$\frac{x \cancel{\sin 29^\circ}}{\cancel{\sin 29^\circ}} = \frac{10000}{\sin 29^\circ}$$
$$x = \frac{10000}{\sin 29^\circ} \boxed{\approx 20626.7 \text{ ft}}$$

Ex 5: A dog is looking at a squirrel at the top of a tree. The distance between the two animals is 55 feet and the angle of elevation is 64°. How high is the squirrel and how far is the dog from the base if the tree?



$$\sin 64^\circ = \frac{\text{opp}}{\text{hyp}}$$

$$55\sin 64^\circ = \frac{x}{55}\cdot 55$$

$$x = 55\sin 64^\circ$$

$$\boxed{x \approx 49.4 \text{ ft high}}$$

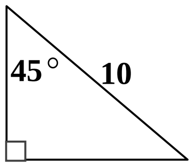
$$\cos 64^\circ = \frac{\text{adj}}{\text{hyp}}$$

$$55\cos 64^\circ = \frac{x}{55}\cdot 55$$

$$x = 55\cos 64^\circ$$

$$\boxed{x \approx 24.1 \text{ ft from the tree}}$$

Ex 6: What is the area of the triangle? (Round answers to the nearest tenth.)



$$\cos(45°) = \frac{h}{10}$$

$$10\cos(45°) = h$$

$$7.1 \approx h$$

$$\sin(45°) = \frac{b}{10}$$

$$10\sin(45°) = b$$

$$7.1 \approx h$$

$$A = \tfrac{1}{2}bh$$

$$A = \tfrac{1}{2}(7.1)(7.1) \approx 25.2$$