3/13/23

13.1/13.2 Trigonometric Ratios- Tangent, Sine, and Cosine

Measure the side opposite $\angle X$ $(\overline{YZ})$to the nearest tenth of cm.

Measure the side adjacent $\angle X$ $(\overline{XY})$to the nearest tenth of cm.

What is the ratio of the opposite leg length to the adjacent leg length rounded to the nearest thousandth?

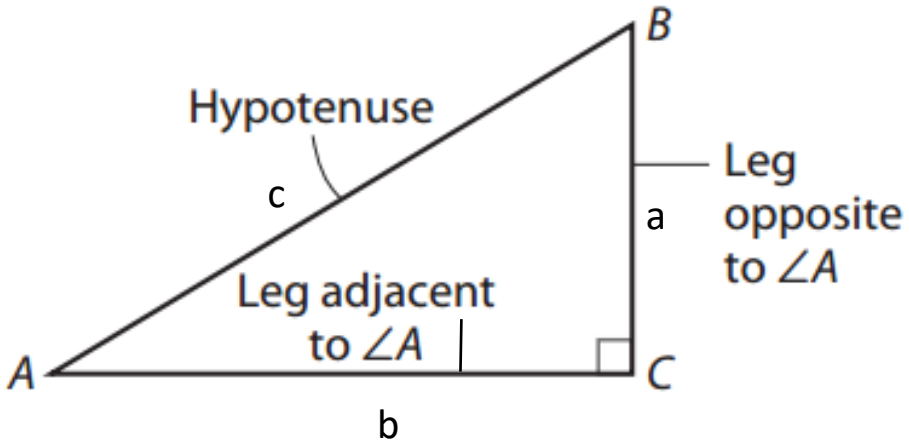
$$\frac{YZ}{XY} \approx$$

Compare your ratio to others in your group? What do you notice? Why?

On your calculator, find tan $40°$. (on my calculators, press tan then 40 then enter). What do you notice?

A **trigonometric ratio** is a ratio of the lengths of two sides of a right triangle. The three basic trigonometric ratios are **tangent**, **sine**, and **cosine** which are abbreviated *tan*, *sin*, and *cos*.

In a given right triangle, ΔABC, with a right angle at vertex C, there are 3 sides. The side **adjacent** to $\angle A$ is the leg that forms one side of $\angle A$. The side **opposite** $\angle A$ is the leg that does not form a side of $\angle A$. The side that connects the adjacent and opposite legs is the **hypotenuse.**


B
Hypotenuse
c
a
Leg
opposite
to ∠A
Leg adjacent
to ∠A
A
C
b

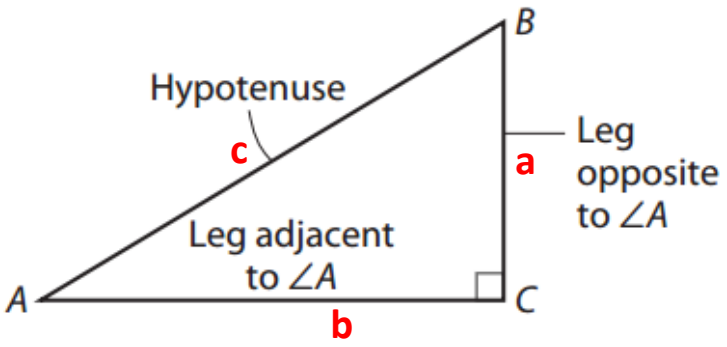
TRIGONOMETRIC RATIOS

Let $\triangle ABC$ be a right triangle. The sine, the cosine, and the tangent of acute $\angle A$ are defined as follows.

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

$$\cos A = \frac{\text{leg adjacent to } \angle A}{\text{hypotenuse}} =$$

$$\tan A = \frac{\text{leg opposite } \angle A}{\text{leg adjacent to } \angle A} =$$

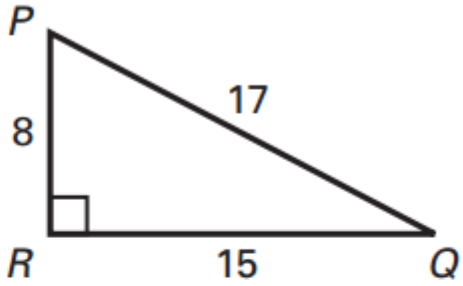


SOH-CAH-TOA

$$\text{Sine} = \frac{\text{Opposite}}{\text{Hypotenuse}} \quad \text{Cosine} = \frac{\text{Adjacent}}{\text{Hypotenuse}} \quad \text{Tangent} = \frac{\text{Opposite}}{\text{Adjacent}}$$

Example 1 ***Finding Trigonometric Ratios***

Find the sine, the cosine, and the tangent of $\angle P$.



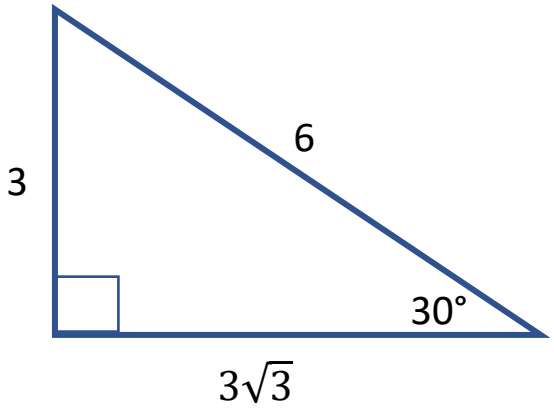
Solution

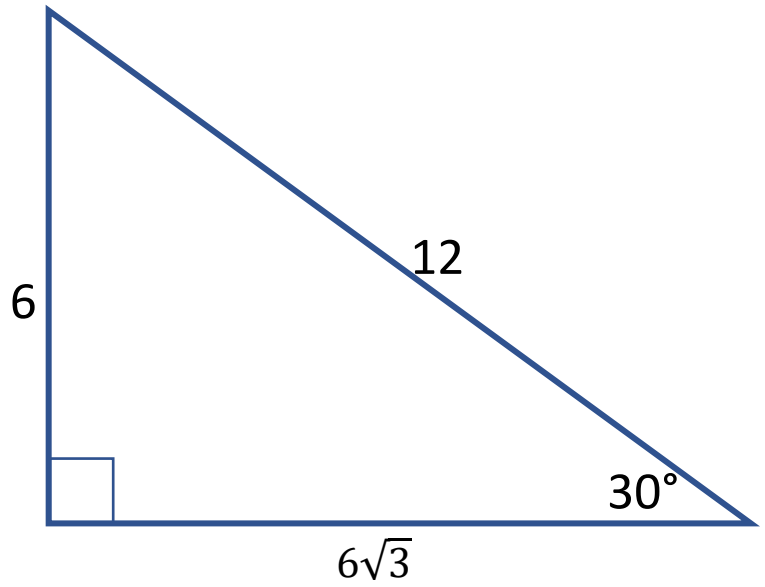
The length of the hypotenuse is ___. The length of the side opposite $\angle P$ is ___, and the length of the side adjacent to $\angle P$ is ___.

$$\sin P = \frac{\qquad}{\qquad} = \frac{\qquad}{\qquad} \approx \qquad$$

$$\cos P = \frac{\qquad}{\qquad} = \frac{\qquad}{\qquad} \approx \qquad$$

$$\tan P = \frac{\qquad}{\qquad} = \frac{\qquad}{\qquad} = \qquad$$





The sine function sin takes an angle and gives you the ratio $\frac{\text{opposite}}{\text{hypotonuse}}$

$\sin 30° = \frac{3}{6} = 0.5$ (press sin 30 or 30 sin on your calculator)

The inverse sine function $\sin^{-1}$ takes the ratio $\frac{\text{opposite}}{\text{hypotonuse}}$ and gives you the angle

$\sin^{-1} \frac{3}{6} = 0.5 = 30°$ (press 2nd sin 0.5 or 0.5 2nd sin on your calculator)