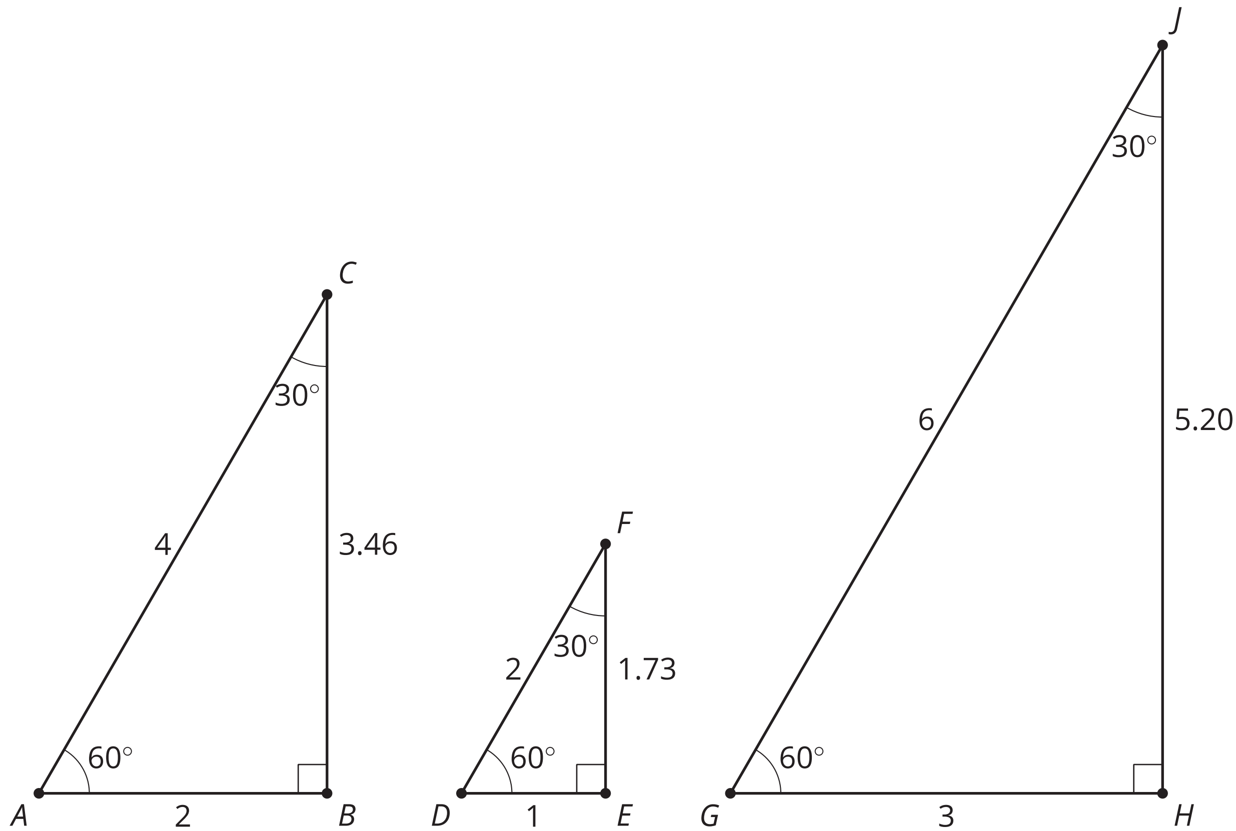
Unit 4 Family Support Materials

Right Triangle Trigonometry

In this unit, your student will be learning about right triangle trigonometry. Trigonometry is the study of triangle measure. In a previous unit students studied similar triangles. Now they can apply what they learned about similar triangles to right triangles in this unit. Right triangles turn out to be useful enough that there is a whole unit of study on them.

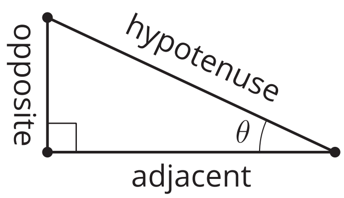


What do you notice about these triangles? What do you wonder about them?

You may notice that the hypotenuse (the longest side) is always twice as long as the shortest side. This ratio of $1:2$ for $\text{short side} : \text{hypotenuse}$ applies to any triangle with angles measuring $30^\circ, 60^\circ$, and 90°. That's because all of these triangles are similar triangles, and corresponding sides or similar triangles are proportional. The shortest side is opposite the 30-degree angle, so we call this ratio $\sin(30) = \frac{1}{2}$. We say the sine of a 30-degree angle is equal to $\frac{1}{2}$. The definition of **sine** is the ratio of the side opposite the given angle to the hypotenuse (in a right triangle).

Mathematicians recorded the ratios for right triangles with a variety of acute angles in tables. Then as calculators became more powerful, the information in the table was programmed into scientific calculators. So instead of having to draw and measure the sides of a triangle, we can look up the ratio for any right triangle. This allows us to calculate triangle measures without making precise diagrams.

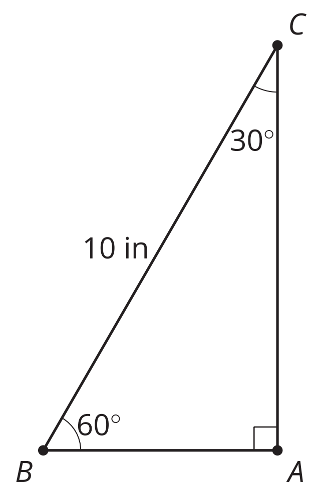
In this unit students learn the names of 3 **trigonometric ratios**. θ is a Greek letter used to represent an angle measure, such as 30 degrees in the previous example.



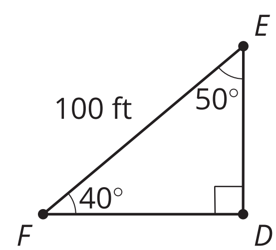
$$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$$
$$\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$$
$$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$$

Here is a task to try with your student:

angle	adjacent leg ÷ hypotenuse	opposite leg ÷ hypotenuse	opposite leg ÷ adjacent leg
30°	0.866	0.500	0.577
40°	0.766	0.643	0.839
50°	0.643	0.766	1.192
60°	0.500	0.866	1.732



1. How long is side AB? Show or explain your reasoning.
2. How long is side AC? Show or explain your reasoning.
3. How long is side DE? Show or explain your reasoning.
4. How long is side FD? Show or explain your reasoning.



Solution:

1. $AB = 5$ inches.
   It's half of 10 inches.
   $\sin(30) = \frac{AB}{10}$, so $0.5 = \frac{AB}{10}$.
2. $AC = \sqrt{75}$, or about 8.66, inches.
   $5^2 + (AC)^2 = 10^2$, so $AC = \sqrt{75}$.
   $\cos(30) = \frac{AC}{10}$, so $0.866 = \frac{AC}{10}$.
3. $DE = 64.3$ feet.
   $\sin(40) = \frac{DE}{100}$, so $0.643 = \frac{DE}{100}$.
4. $FD = 76.6$ feet.
   $64.3^2 + (FD)^2 = 100^2$
   $\cos(40) = \frac{FD}{100}$, so $0.766 = \frac{FD}{100}$.