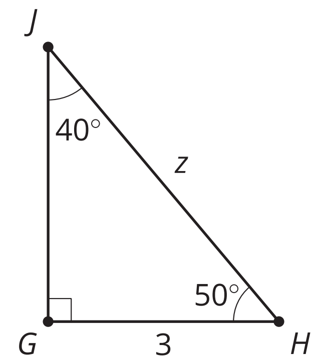
Working with Trigonometric Ratios

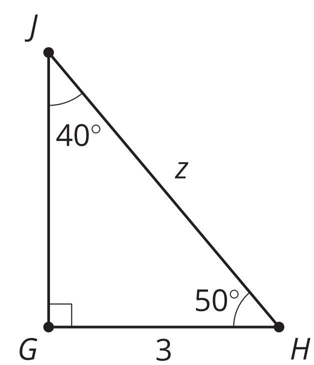
Let's solve problems using cosine, sine, and tangent.

6.1 This Time with Strategies

Estimate the value of z.



6.2 New Names, Same Ratios



1. Use your calculator to determine the values of $\cos(50)$, $\sin(50)$, and $\tan(50)$.

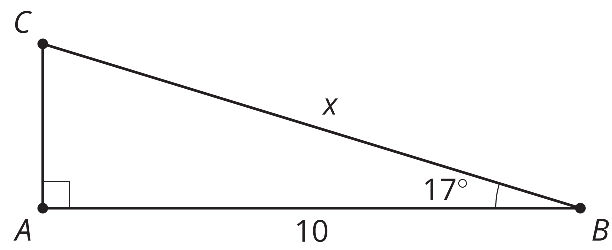
2. Use your calculator to determine the values of $\cos(40)$, $\sin(40)$, and $\tan(40)$.

3. How do these values compare to your Right Triangle Table?

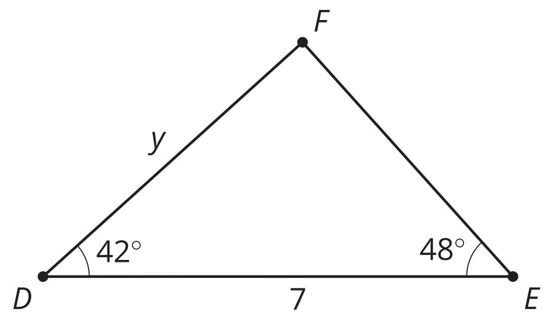
4. Find the value of z.

6.3 Unknown Triangle Measures

1. Find the value of x.



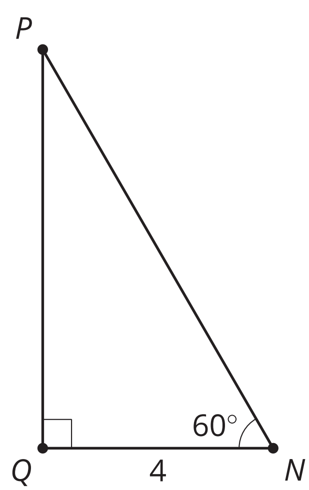
2. Find the value of y.



3. Find all the unknown sides and angle measures.

   a. In triangle XYZ, the measure of angle X is 90 degrees and angle Y is 12 degrees. Side XZ has length 2 cm.

   b.



c. In triangle KLM, the measure of angle K is 90 degrees and angle L is 71 degrees. Side LM has length 20 cm.

Are you ready for more?

Complete the table.

angle	cosine	sine	tangent
80°			
85°			
89°			

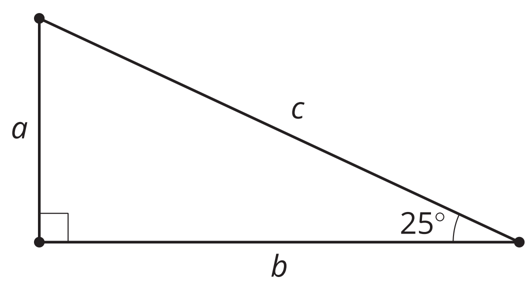
Based on this information, what do you think are the cosine, sine, and tangent of 90 degrees? Explain or show your reasoning.

Lesson 6 Summary

We have a column in the Right Triangle Table labeled "$\text{adjacent leg} \div \text{hypotenuse}$." We use this ratio so frequently that it has a name. It is called the **cosine** of the angle. We write "$\cos(25)$" to say "the cosine of 25 degrees." The other columns in our table also have names: **Sine** is the name for the ratio "$\text{opposite leg} \div \text{hypotenuse}$," and **tangent** is the name for the ratio "$\text{opposite leg} \div \text{adjacent leg}$."

A scientific calculator can display these ratios for any angle. This means we can more precisely calculate unknown side lengths rather than estimating using the table. The Right Triangle Table is sometimes called a "trigonometry table" since cosine, sine, and tangent are **trigonometric ratios**. Here is what the table looks like with the ratios labeled with their special names:

	cosine	sine	tangent
angle	adjacent leg ÷ hypotenuse	opposite leg ÷ hypotenuse	opposite leg ÷ adjacent leg
25°	$\cos(25) = 0.906$	$\sin(25) = 0.423$	$\tan(25) = 0.466$



If the length b is 7, we can find c by solving the equation $\cos(25) = \frac{7}{c}$. So c is about 7.7 units. To solve for a, we have three methods that we can use: the Pythagorean Theorem, sine, and tangent. Let's use tangent by solving the equation $\tan(25) = \frac{a}{7}$. So a is about 3.3 units. We can check our answers using the Pythagorean Theorem. It should be true that $3.3^2 + 7^2 = 7.7^2$. The two expressions are almost equal, which makes sense because we expect some error due to rounding.