Unit 3, Lesson 8

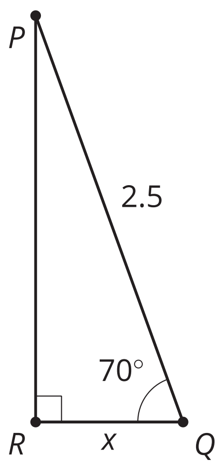
Sine and Cosine in the Same Right Triangle

Let's connect cosine and sine.

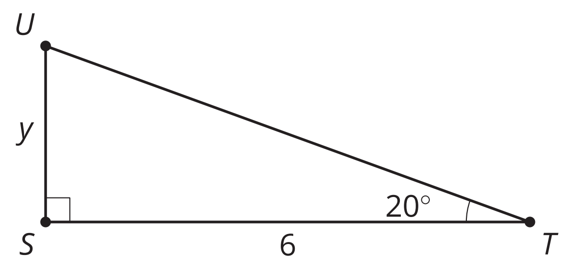
8.1 Which Three Go Together: Four Triangles

Which three go together? Why do they go together?

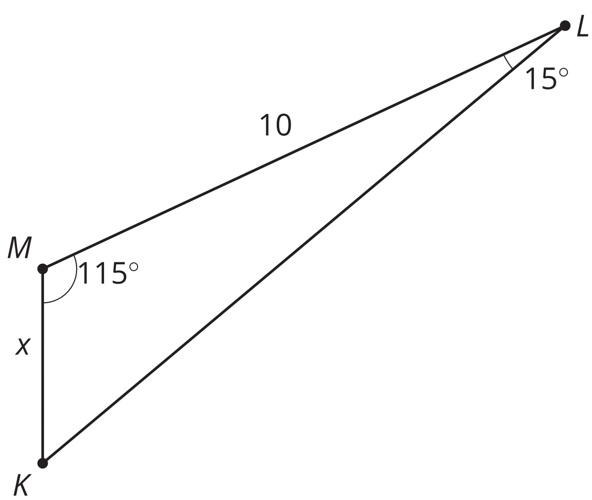
A



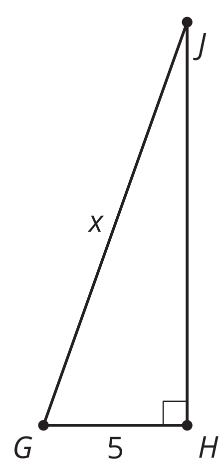
B



C



D

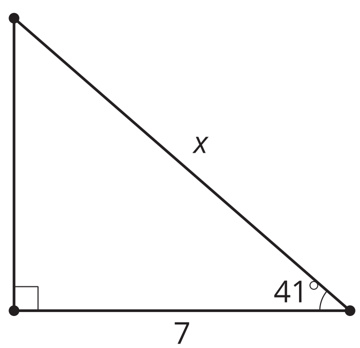


8.2 Twin Triangles

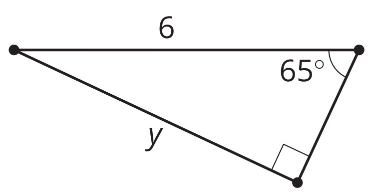
Your teacher will assign you either Column A or Column B. Find the values of the variables for the problems in your column.

Column A:

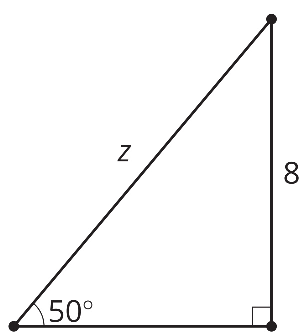
A1



A2

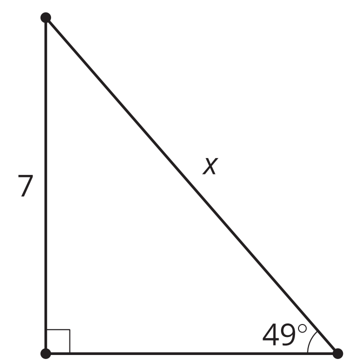


A3

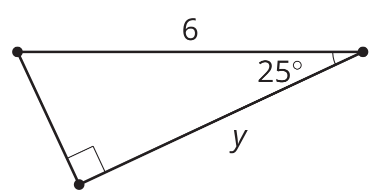


Column B:

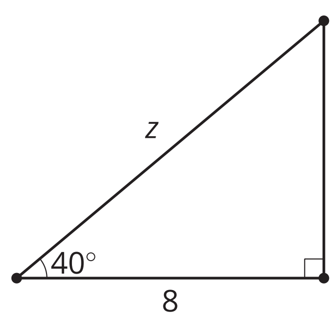
B1



B2



B3



Compare your solutions with your group's solutions. Why did you get the same answers to different problems?

8.3 Explain the Connection

1. Draw a diagram that will help you explain why $\sin(\theta) = \cos(90 - \theta)$.

2. Explain why $\sin(\theta) = \cos(90 - \theta)$.

Discuss your thinking with your group. If you disagree, work to reach an agreement.

Create a visual display that includes:

- A clearly labeled diagram.
- An explanation using precise language.

Are you ready for more?

1. Make a conjecture about the relationship between $\tan(\theta)$ and $\tan(90 - \theta)$.

2. Prove your conjecture.

8.4 Unequal Relationships

Describe the values of θ in which:

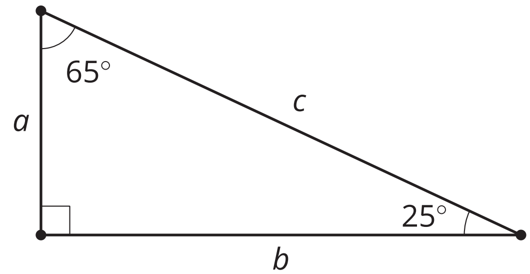
1. $\sin(\theta) < \cos(\theta)$

2. $\sin(\theta) = \cos(\theta)$

3. $\sin(\theta) > \cos(\theta)$

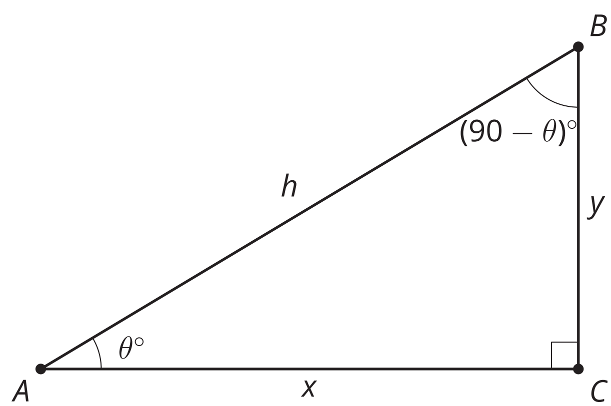
Lesson 8 Summary

In previous lessons, we recalled that any right triangle with acute angles of 25 and 65 degrees was similar to any other right triangle with these same acute angles. Revisiting these triangles, we notice that the sine of 25 degrees is equal to the cosine of 65 degrees, and the cosine of 25 degrees is equal to the sine of 65 degrees.



	cosine of angle	sine of angle
angle	adjacent leg ÷ hypotenuse	opposite leg ÷ hypotenuse
25°	0.906	0.423
65°	0.423	0.906

Mathematicians often use Greek letters to represent angles. For instance, θ is a Greek letter we use frequently in trigonometry. Looking at a general right triangle, the angles can be written as 90, θ, and $90 - \theta$. Using this general right triangle, we can fill out the table again. Notice that the same fraction, $\frac{x}{h}$, appears for both $\cos(\theta)$ and $\sin(90 - \theta)$. That's how we know $\cos(\theta) = \sin(90 - \theta)$ for any acute angle θ.



	cosine of angle	sine of angle
angle	adjacent leg ÷ hypotenuse	opposite leg ÷ hypotenuse
θ°	$\frac{x}{h}$	$\frac{y}{h}$
$(90 - \theta)^\circ$	$\frac{y}{h}$	$\frac{x}{h}$