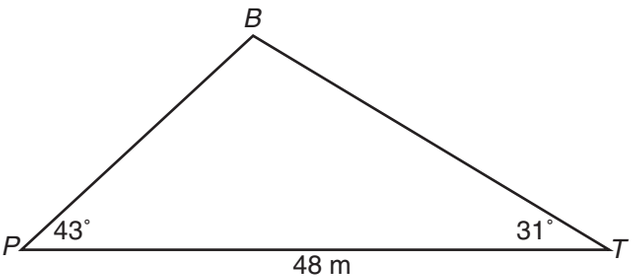
Unit 4: Geometry Lesson 4.4

Game On!

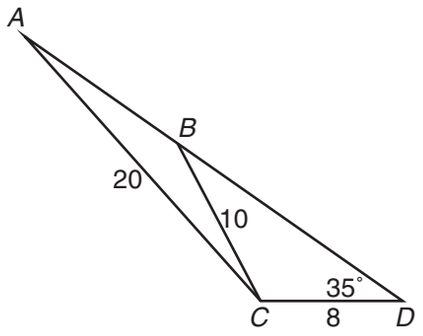
(4) 1. Phoebe and Tucker are 48 m apart. Phoebe looks up at an angle of 43° to see a hot air balloon hovering in the sky directly between her and Tucker. Tucker looks up at an angle of 31° to see the hot air balloon.

a. Explain how it could be determined who is closer to the balloon without doing any calculations.

b. Determine the distance between the balloon and the person nearest the balloon.



(2) 2. Determine the measure of angle A.



(4) 3. Refer to Example 1 in Section A of *Lesson 4.4*.

a. Prove that $\frac{\sin B}{b} = \frac{\sin C}{c}$.

b. Complete the sine law proof by explaining why your results in a. and those in Example 1 allow you to conclude $\frac{\sin A}{a} = \frac{\sin C}{c}$.

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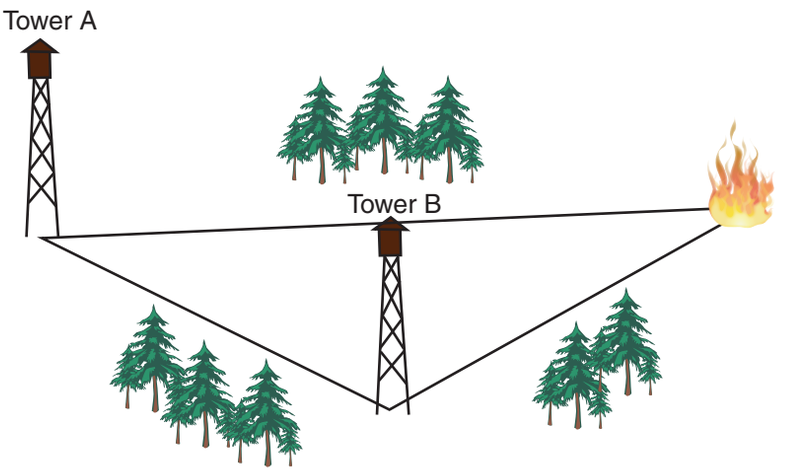
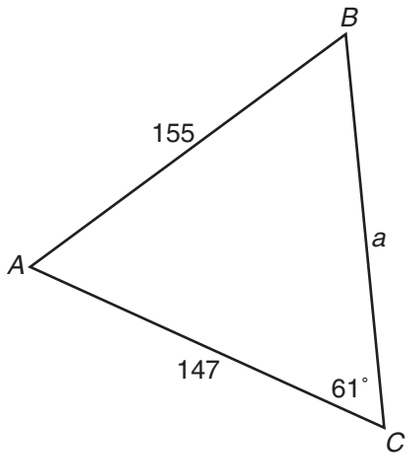
4. Fire lookout towers are used to locate fires so they can be put out as soon as possible. These towers often work in networks and if two towers can see a fire at the same time, they can determine the location of the fire very accurately.

Two forest rangers in towers see a fire as shown below. The angle at tower A between tower B and the fire is measured to be 41.5°. The angle at tower B between tower A and the fire is measured to be 87.3°. If the towers are known to be 34.32 km apart, how far is the fire from each tower?



(2) 5. Explain how the sine law could be used to solve for a. (Don't solve for a; just outline a strategy.)



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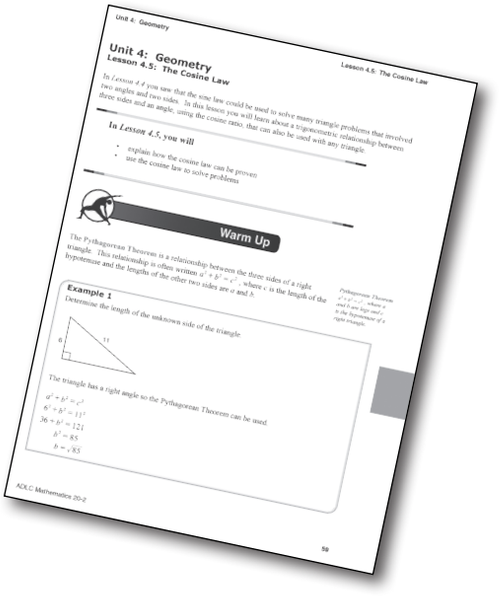
You have completed *Lesson 4.4 Game On!* Please return to the *Module* and continue your training with *Lesson 4.5*.


Unit 4: Geometry

Lesson 4.5: The Cosine Law

Unit 4: Geometry
Lesson 4.5: The Cosine Law

In *Lesson 4.4* you saw that the sine law could be used to solve many triangle problems that involved two angles and two sides. In this lesson you will learn about a trigonometric relationship between three sides and an angle, using the cosine ratio, that can also be used with any triangle.

In *Lesson 4.5*, you will

- explain how the cosine law can be proven
- use the cosine law to solve problems

Warm Up

The Pythagorean Theorem is a relationship between the three sides of a right triangle. This relationship is often written $a^2 + b^2 = c^2$, where c is the length of the hypotenuse and the lengths of the other two sides are a and b.

Pythagorean Theorem
$a^2 + b^2 = c^2$, where a and b are legs and c is the hypotenuse of a right triangle.

Example 1

Determine the length of the unknown side of the triangle.

6 11

The triangle has a right angle so the Pythagorean Theorem can be used.

$a^2 + b^2 = c^2$
$6^2 + b^2 = 11^2$
$36 + b^2 = 121$
$b^2 = 85$
$b = \sqrt{85}$

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