Geometry

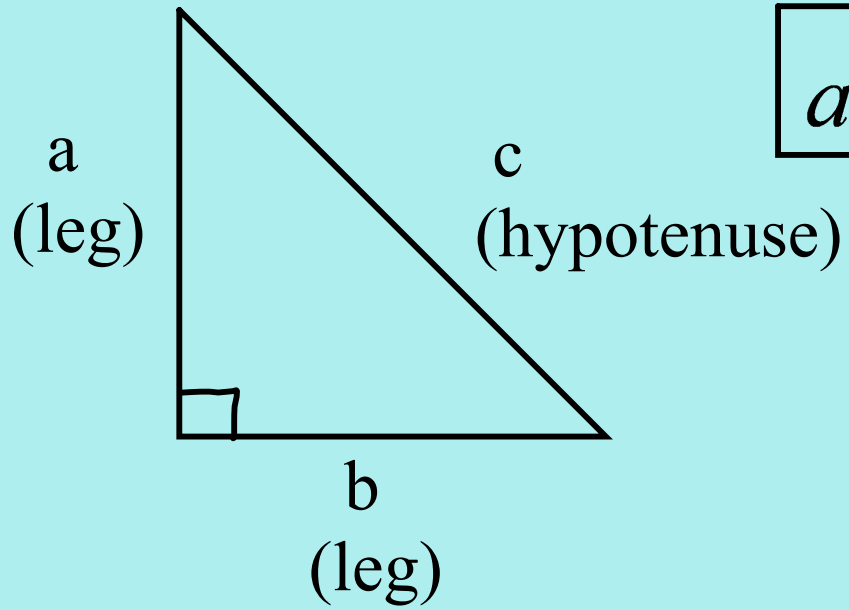
Ch. 8 Handout 8.1
The Pythagorean Theorem and its Converse

Pythagorean Theorem

1. Works only on right triangles.

Use when you know 2 out of 3 sides & you are trying to find length of third side.

2. In a right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.



$$a^2 + b^2 = c^2$$

A **Pythagorean Triple** is a set of nonzero whole numbers a, b, and c that satisfy the equation $a^2 + b^2 = c^2$. Here are some common Pythagorean triples:

3, 4, 5	5, 12, 13
8, 15, 17	7, 24, 25

If you multiply each number in a Pythagorean triple by the same whole number, the three numbers that results also form a Pythagorean triple.

1. Find the length of the hypotenuse of ΔABC.

$(\text{leg})^2 + (\text{leg})^2 = (\text{hyp})^2$

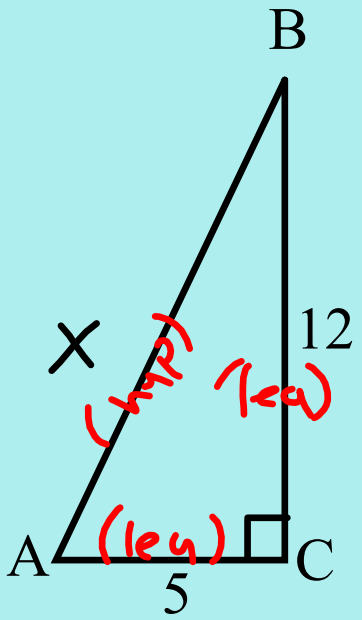
$a^2 + b^2 = c^2$

$(5)^2 + (12)^2 = x^2$

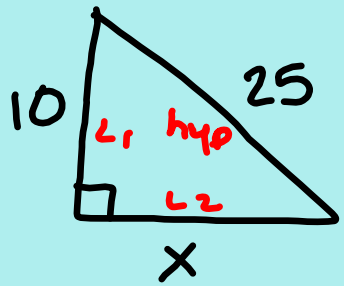
$25 + 144 = x^2$

$\sqrt{169} = x$

$x = 13$



2. A right triangle has a hypotenuse of length 25 and a leg of length 10. Find the length of the other leg.



$$(x)^2 + (10)^2 = (25)^2$$

$$x^2 + 100 = 625$$

$$-100 \quad -100$$

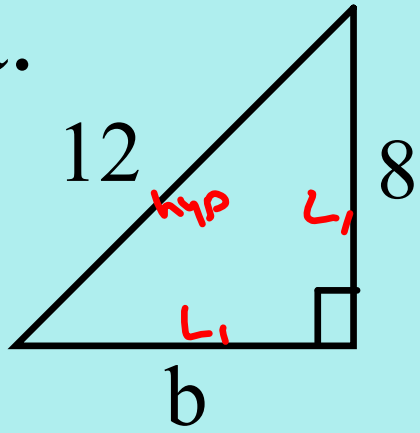
$$\sqrt{x^2} = \sqrt{525}$$

$$\sqrt{25 \cdot 21}$$

$$x = 5\sqrt{21}$$

3. Find the value of b. Leave you answer in simplest radical form.

a.



$(b)^2 + (8)^2 = (12)^2$

$b^2 + 64 = 144$

$-64 \quad -64$

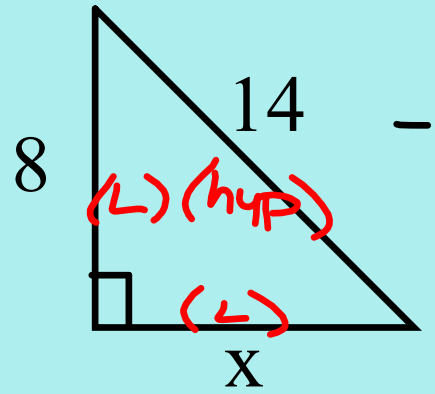
$\sqrt{b^2} = \sqrt{80}$

$\sqrt{16 \cdot 5}$

$b = 4\sqrt{5}$

3. Find the value of b. Leave you answer in simplest radical form.

b.



$(8)^2 + (x)^2 = (14)^2$

$64 + x^2 = 196$

$-64 \quad -64$

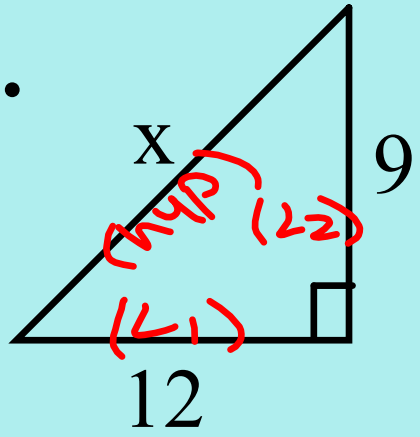
$\sqrt{x^2} = \sqrt{132}$

$\sqrt{4 \cdot 33}$

$x = 2\sqrt{33}$

3. Find the value of b. Leave you answer in simplest radical form.

c.



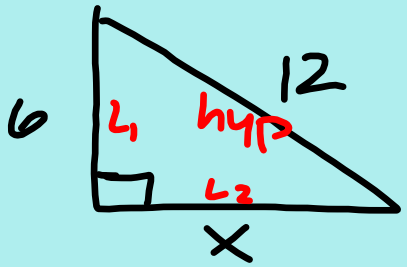
$(12)^2 + (9)^2 = (x)^2$

$144 + 81 = x^2$

$\sqrt{225} = \sqrt{x^2}$

$x = 15$

4. The hypotenuse of a right triangle has length 12. One leg has length 6. Find the length of the other leg. Leave your answer in simplest radical form.



$6^2 + x^2 = 12^2$

$36 + x^2 = 144$

$-36 \quad -36$

$\sqrt{x^2} = \sqrt{108}$

$\sqrt{36 \cdot 3}$

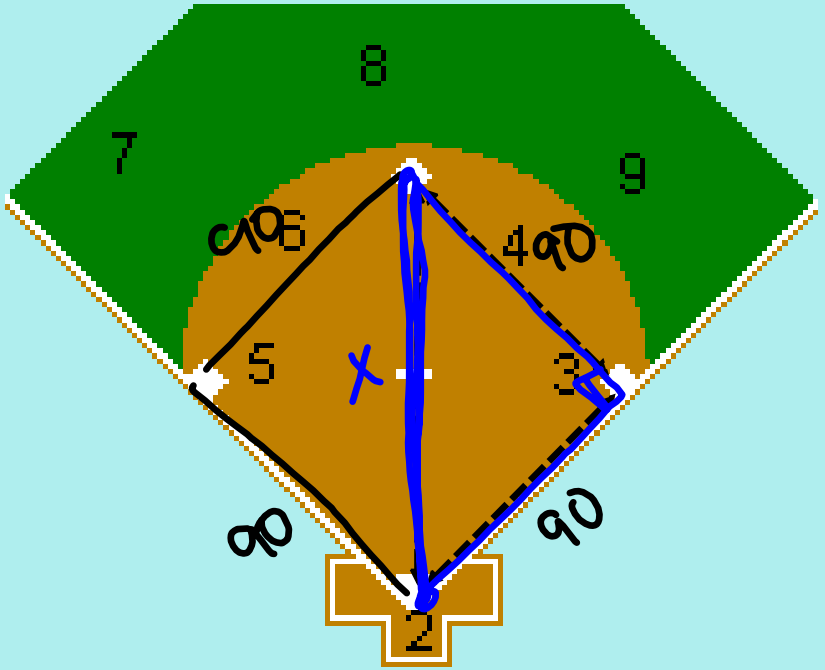
$x = 6\sqrt{3}$

5. A baseball diamond is a square with 90-ft sides. Home plate and second base are at opposite vertices of the square. About how far is home plate from second base?

$90^2 + 90^2 = x^2$

$\sqrt{x^2} = \sqrt{16,200}$

$x \approx 127$ ft



Theorem 8-2: Converse of Pythagorean Theorem

If the square of the length of one side of a triangle is equal to the sum of the squares of the lengths of the other two sides, then the triangle is a right triangle.

$$c^2 = a^2 + b^2$$

Theorem 8-3

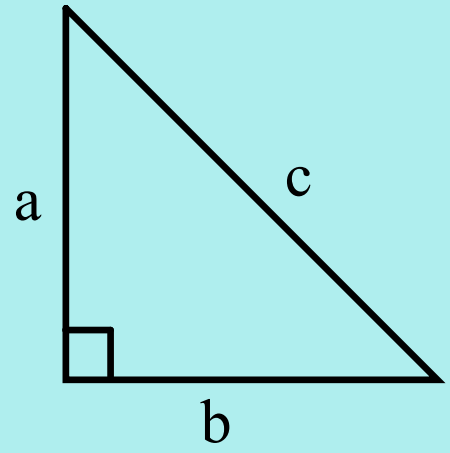
If the square of the length of the longest side of a triangle is greater tha the sum of the squares of the lengths of the other two sides, the triangle is obtuse.

$$c^2 > a^2 + b^2$$

Theorem 8-4

If the square of the length of the longest side of a triangle is less than the sum of the squares of the lengths of the other two sides, the triangle is acute.

$$c^2 < a^2 + b^2$$

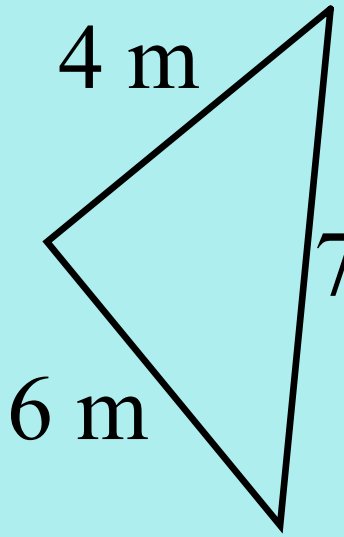


$c^2 = a^2 + b^2$ is a right triangle

$c^2 > a^2 + b^2$ is an obtuse triangle

$c^2 < a^2 + b^2$ is an acute triangle

Classify each triangle as Acute, Obtuse, or Right Triangle.



$(c)^2$ $(a)^2+(b)^2$

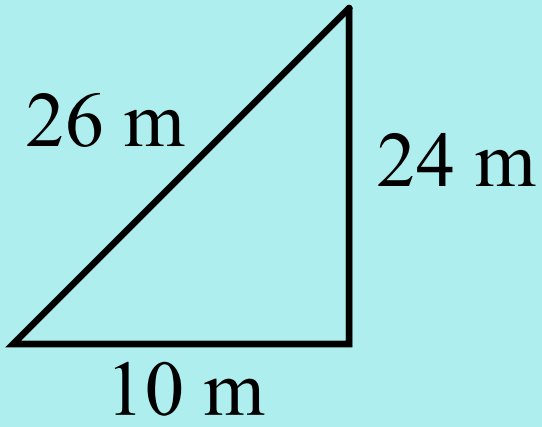
$(hyp)^2$ $(leg)^2+(leg)^2$

$(7)^2$ $(4)^2+(6)^2$

49 $16+36$

$49 < 52$

Acute Δ



$(26)^2$ $(10)^2+(24)^2$

100 576

$676 = 676$

Right Δ

Classify each triangle as Acute, Obtuse, or Right Triangle.

1) 10, 15, and 20

$(20)^2 \_\_\_ (10)^2 + (15)^2$

$400 \_\_\_ 100 + 225$

$400 > 325$ Obtuse Δ

2) 16, 48, and 50

$(50)^2 \_\_\_ (16)^2 + (48)^2$

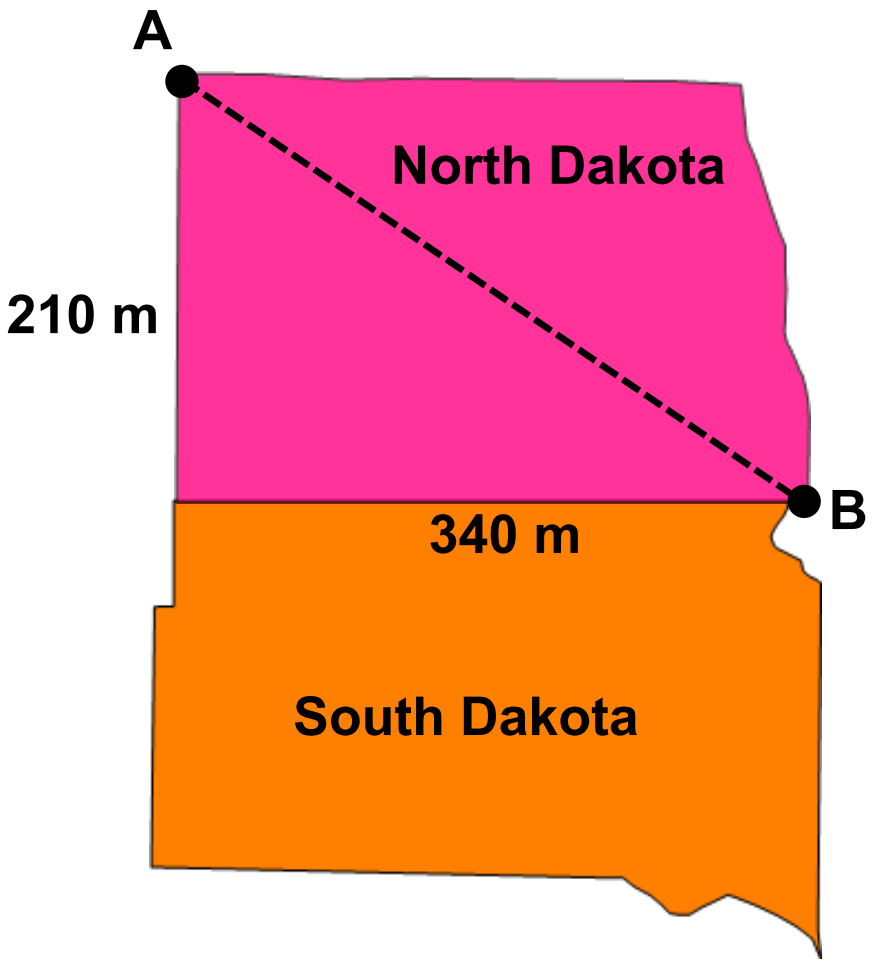
$2500 < 2560$

Acute Δ

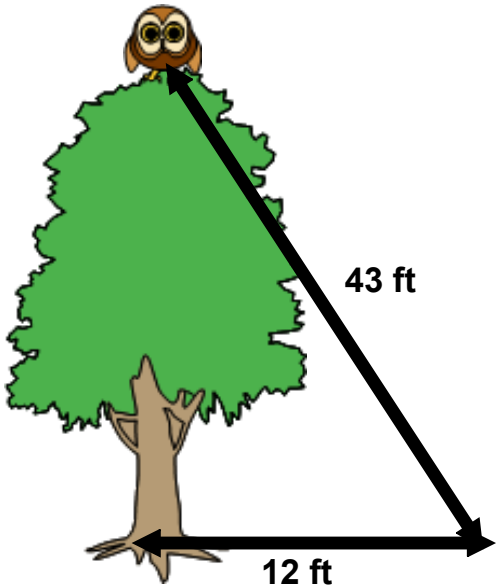
3) 7, 8, and 9

6. The town of Elena is 24 mi north and 8 mi west of Holberg A train runs on a straight track between the two towns. How many miles does it cover? Round your answer to the nearest whole number.

What is the distance from A to B? (to the nearest mile)



How high off the ground is Ollie the owl?



Assignment:

Day 1: pgs 420-421 1-15 odds, 17, 27, 29