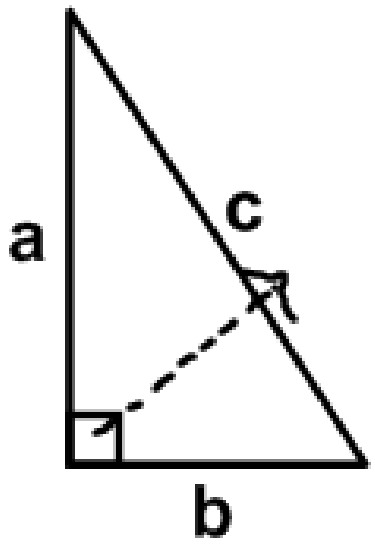
7 - 2
The Pythagorean Theorem and Its Converse

Theorem 7.4: (Pythagorean Thm)

In a right triangle, the sum of the squares of the measures of the legs equals the square of the measure of the hypotenuse.

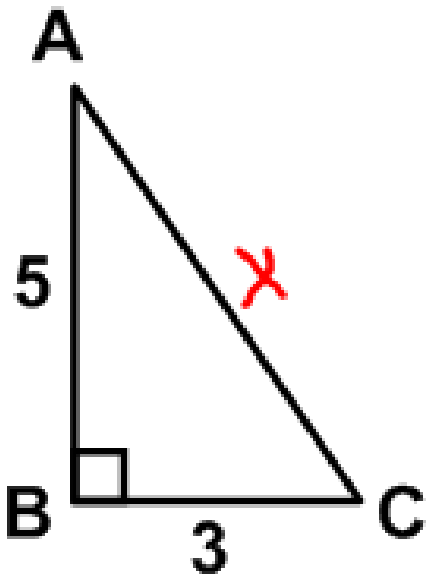


$$a^2 + b^2 = c^2$$

a, b: legs

c: hypotenuse

Ex: Find AC.



$5^2+3^2=x^2$

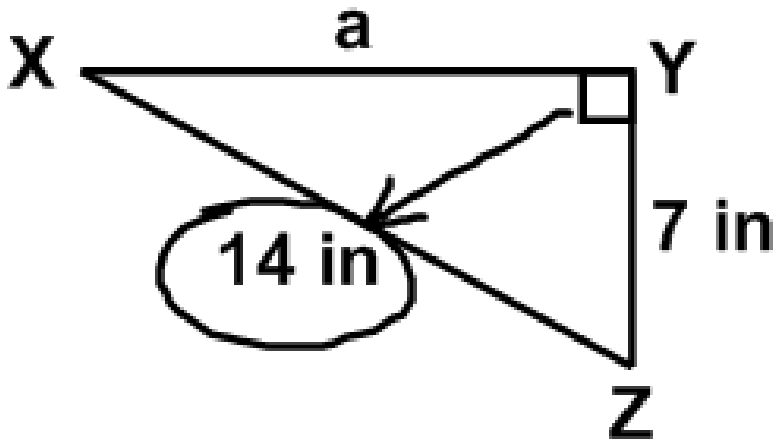
$25+9=x^2$

$\sqrt{34}=\sqrt{x^2}$

$\sqrt{34}=x$

≈ 5.8

Ex: Find XY.



$a^2 + 7^2 = 14^2$

$a^2 + 49 = 196$

$-49 \quad -49$

$\sqrt{a^2} = \sqrt{147}$

$a = \sqrt{147}$

≈ 12.1

Theorem 7.5: (Converse of the PT)

If the sum of the squares of the measures of two sides of a triangle equals the square of the measure of the longest side, then the triangle is a right triangle.

Pythagorean triple: three whole numbers that satisfy $a^2+b^2=c^2$

Determine whether each set of measures are the sides of a right triangle. Then state whether they form a Pythagorean triple.

$4\sqrt{3} \cdot 4\sqrt{3}$ $16 \cdot 3$

Ex: 9, 12, 15

$9^2 + 12^2 \stackrel{?}{=} 15^2$

$81 + 144 = 225$

$225 = 225$ ✓

Yes, yes

1
144
81
225

Ex: $4\sqrt{3}$, 4, 8

$(4\sqrt{3})^2 + 4^2 = 8^2$

$48 + 16 = 64$

$64 = 64$ ✓

Yes, no

Ex: Is $\triangle PQR$ a right triangle?

P(3, 2) Q(- 3, 6) R(5, 5)

$PQ: \sqrt{(3+3)^2+(2-6)^2} = \sqrt{36+16} = \sqrt{52}$

$QR: \sqrt{(-3-5)^2+(6-5)^2} = \sqrt{64+1} = \sqrt{65}$

$PR: \sqrt{(3-5)^2+(2-5)^2} = \sqrt{4+9} = \sqrt{13}$

$$(\sqrt{13})^2 + (\sqrt{52})^2 = (\sqrt{65})^2$$

$13 + 52 = 65$ ✓

Yes

Homework:

7 - 2 WS