

Chapter 12
Section 5

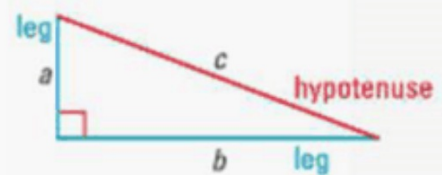
Pythagorean
Theorem

Pythagorean Theorem

THE PYTHAGOREAN THEOREM

If a triangle is a right triangle, then the sum of the squares of the lengths of the legs a and b equals the square of the length of the hypotenuse c .

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



Examples:

- 1. $a = 3, b = 4, c =$

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

$$3^2 + 4^2 = c^2$$

$$9 + 16 = c^2$$

$$\sqrt{25} = \sqrt{c^2}$$

$$5 = c$$

- 2. $a = 5, b = 10, c =$

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

$$5^2 + 10^2 = c^2$$

- $25 + 100 = c^2$

$$\sqrt{125} = \sqrt{c^2}$$

$$c = 11.18$$

Examples

3. $a = 4, c = 12, b =$

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

$$4^2 + b^2 = 12^2$$

$$\begin{array}{r} \sqrt{16 + b^2 = 144} \\ -16 \quad -16 \end{array}$$

$$\sqrt{b^2} = \sqrt{128}$$

$$b = 11.31$$

4. $b = 5, c = 7, a =$

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

$$a^2 + 5^2 = 7^2$$

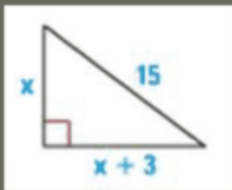
$$a^2 + 25 = 49$$

$$\sqrt{a^2} = \sqrt{24}$$

$$a = 4.90$$

Examples:

5. A right triangle has one leg that is 3 inches longer than the other leg. The hypotenuse is 15 inches. Find the missing lengths.



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

$$x^2 + (x+3)^2 = 15^2$$

$$(x+3)(x+3)$$

$$x^2 + x^2 + 3x + 3x + 9 = 225$$

$$2x^2 + 6x + 9 = 225$$

$$2x^2 + 6x - 216 = 0$$

$$x^2 + 6x - 432 = 0$$

$$(x + \frac{24}{2})(x - \frac{18}{2})$$

$$(x + 12)(x - 9)$$

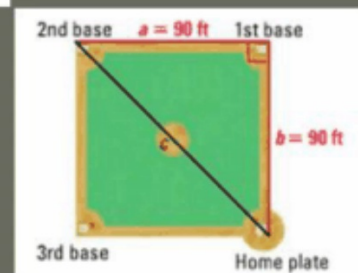
$$x = \cancel{12}, 9$$

$$\boxed{x = 9}$$

Examples

6. The length of each side of a baseball diamond is 90 feet. What is the distance from home plate to second base?

$$\begin{aligned}a^2 + b^2 &= c^2 \\90^2 + 90^2 &= c^2 \\8100 + 8100 &= c^2 \\\sqrt{16,200} &= \sqrt{c^2} \\c &= 127.28 \text{ ft}\end{aligned}$$



Converse to the PT

CONVERSE OF THE PYTHAGOREAN THEOREM

If a triangle has side lengths a , b , and c such that $a^2 + b^2 = c^2$, then the triangle is a right triangle.

- Used to determine if the 3 given sides form a right triangle

Examples

1.) 5, 12, 13

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

$$5^2 + 12^2 = 13^2$$

$$25 + 144 = 169$$

$$169 = 169$$

Right \triangle

2.) 6, 7, 8

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

$$6^2 + 7^2 = 8^2$$

$$36 + 49 = 64$$

$$85 = 64$$

No

CLASSWORK

● Pg 741 # 4-12, 25-27

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

$$x^2 + x^2 + 2x + 2x + 4 = 100$$

$$2x^2 + 4x + 4 = 100$$

$$2x^2 + 4x - 96 = 0 \quad \rightarrow x = 6$$

$$2(x^2 + 2x - 48) = 0$$

$$2(x+8)(x-6) = 0$$

6, 8, 10

Homework

- Page 741-742 # 13-23 odd, 28-30, 41-43