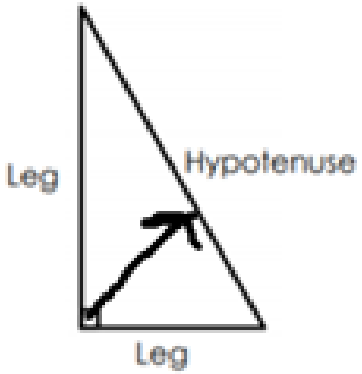
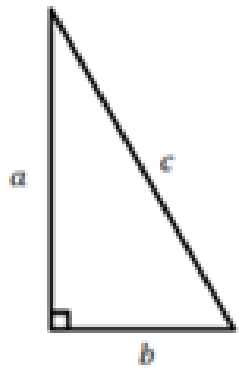
Pythagorean Theorem

In a Right triangle, the square of the hypotenuse (the side opposite to the right angle) is equal to the sum of the squares of the other two sides.



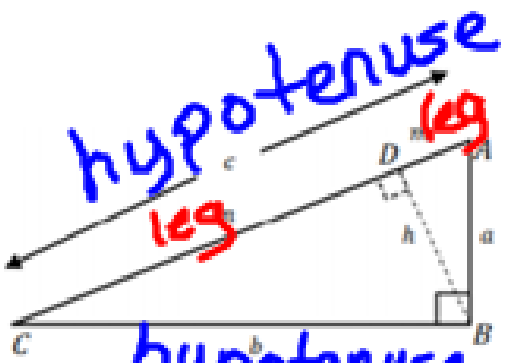


$a^2+b^2=c^2$

$6^2+8^2=10^2$

$36+64=100$

$100=100$ ✓



Given: $\triangle ABC \sim \triangle ADB \sim \triangle BDC$
Prove: $a^2 + b^2 = c^2$ using triangle similarity.

Statements	Reasons
1. $\triangle ABC \sim \triangle ADB \sim \triangle BDC$	1. Given
2. $\frac{a}{m} = \frac{c}{a}, \frac{b}{n} = \frac{c}{b}$	2. Corresponding sides of similar triangles are proportional
3. $a^2 = cm, b^2 = cn$	3. Multiplication Property Of Equality
4. $a^2 + b^2 = cm + cn$	4. Add. Prop
5. $a^2 + b^2 = c(m + n)$	5. Distributive Property
6. $AD + DC = AC$ or $m + n = c$	6. Seg Add Post.
7. $a^2 + b^2 = c^2$	7. Substitution

Let's Practice!

1. A business building has several office spaces for rent. Each office is in the shape of a right triangle. If one side of the office is 11 feet long and the longest side is 15 feet long, what is the length of the other side?

$11^2 + x^2 = 15^2$

$121 + x^2 = 225$

$-121 \qquad -121$

$\sqrt{x^2} = \sqrt{104}$

$\sqrt{104}$

$\sqrt{2}\ \sqrt{52}$

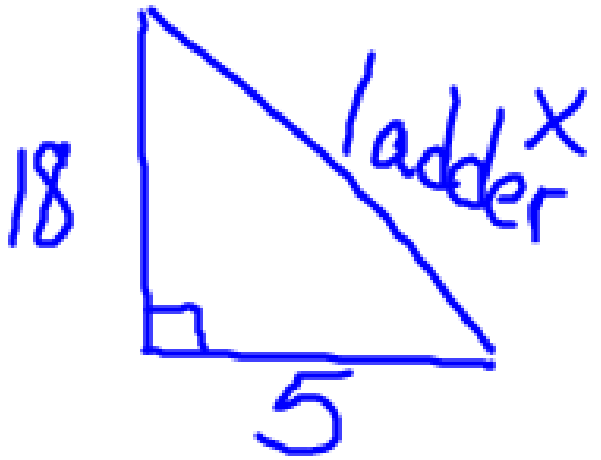
$\sqrt{2}\ \sqrt{26}$

$\sqrt{2}\ \sqrt{13}$

$2 \cdot \sqrt{26}$

$2\sqrt{26} = x$

2. Mr. Roosevelt is leaning a ladder against the side of his son's tree house to repair the roof. The top of the ladder reaches the roof, which is 18 feet from the ground. The base of the ladder is 5 feet away from the tree. How long is the ladder?



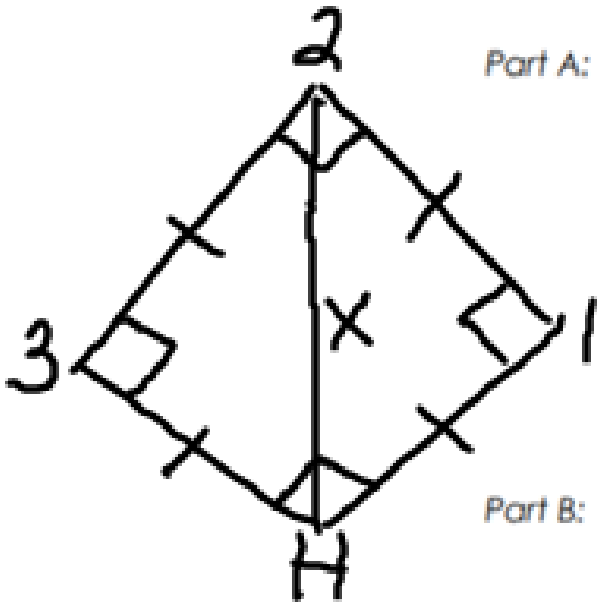
$5^2 + 18^2 = x^2$

$25 + 324 = x^2$

$\sqrt{349} = \sqrt{x^2}$

You try!

1. A baseball diamond is actually a square with sides of 90 feet.



Part A: If a runner tries to steal second base, how far must the catcher, who is at home plate, throw the ball to get the runner out?

$90^2 + 90^2 = c^2$

$8100 + 8100 = c^2$

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

$\sqrt{16200}$

$\sqrt{162}$ $\sqrt{100}$

$\sqrt{2}$ $\sqrt{81}$ $\sqrt{10}$ $\sqrt{10}$

$\sqrt{9}$ $\sqrt{9}$

$10 \cdot 9 \cdot \sqrt{2}$

$90\sqrt{2}$

Part B: Explain why runners try to steal second base more often than third base.

A Pythagorean Triple is a set of positive integers, a, b, and c that satisfy the Pythagorean Theorem.

The side lengths of a right triangle, 3, 4 and 5, form a Pythagorean triple. Prove that each set of numbers below is a Pythagorean triple.

- 5, 12, 13 $5^2+12^2 \stackrel{?}{=} 13^2$
  $25+144 \stackrel{?}{=} 169$
  $169=169$ ✓
- 8, 15, 17 $8^2+15^2 \stackrel{?}{=} 17^2$ $64+225 \stackrel{?}{=} 289$
  $289=289$ ✓
- 7, 24, 25 $7^2+24^2 \stackrel{?}{=} 25^2$
  $49+576 \stackrel{?}{=} 625$
  $625=625$