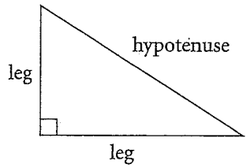
1.5 The Pythagorean Theorem

Quick Review

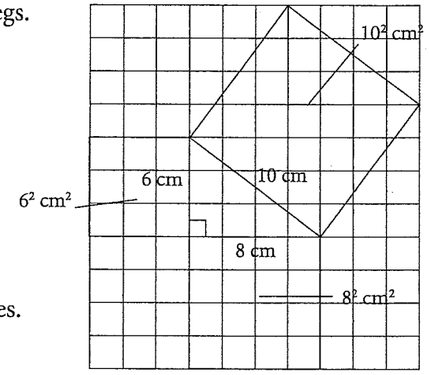


- A right triangle has two **legs** that form the right angle. The side opposite the right angle is called the **hypotenuse**.

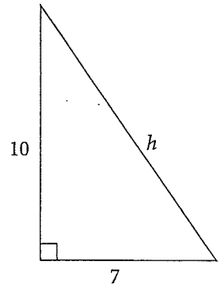
- The three sides of a right triangle form a relationship known as the **Pythagorean Theorem**.

  Pythagorean Theorem: The area of the square on the hypotenuse is equal to the sum of the areas of the squares on the legs.

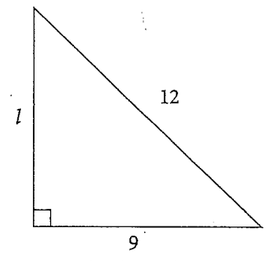
- In the diagram:
  Area of square on hypotenuse:
  $10^2\ cm^2 = 100\ cm^2$
  Areas of squares on legs:
  $6^2\ cm^2 + 8^2\ cm^2 = 36\ cm^2 + 64\ cm^2$
  $= 100\ cm^2$
  Notice that $10^2 = 6^2 + 8^2$.
  This theorem is true for all right triangles.



- You can use the Pythagorean Theorem to find the length of any side of a right triangle when you know the lengths of the other two sides.



To calculate the hypotenuse h, solve for h in this equation:
$h^2 = 7^2 + 10^2$
$h^2 = 49 + 100$
$h^2 = 149$
$h = \sqrt{149}$
Use a calculator: $h \doteq 12.2$



To calculate the leg with length l, solve for l in this equation:
$12^2 = l^2 + 9^2$
$144 = l^2 + 81$
$144 - 81 = l^2 + 81 - 81$
$63 = l^2$
$\sqrt{63} = l$
Use a calculator: $l \doteq 7.9$ cm

1.5 The Pythagorean Theorem

Review

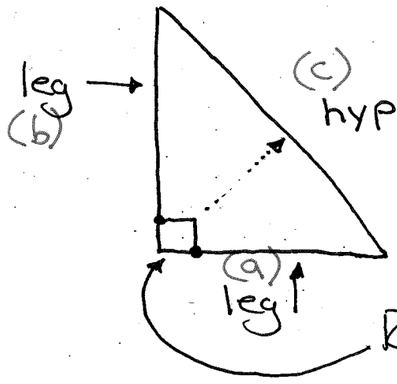
Name First Last

Blk _____

Right Angle Triangles

→ any triangle where 1 of the 3 angles (∠) is = 90°

→ All triangles have interior angles that total 180° ∠ A + B + C = 180°



hypotenuse: the longest side of a right angle triangle

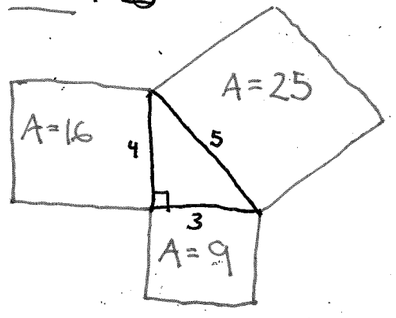
Right Angle Indicator
↳ touches the legs
↳ points to the hypotenuse

Pythagorean Theorem: $A^2 + B^2 = C^2$ learn it know it live it!

- used to calculate the side lengths of a right angle triangle

legs, hypotenuse

Proof [just for interest]

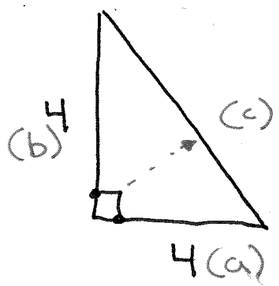


$a = 3$ $a^2 = 3 \cdot 3 = 9$
$b = 4$ $b^2 = 4 \cdot 4 = 16$
$c = 5$ $c^2 = 5 \cdot 5 = 25$

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

$9 + 16 = 25$

Ex 1 : Find the length of the hypotenuse (c)



1) label a, b, c

2) $a = 4$ $b = 4$

$a^2 = 4^2$ $b^2 = 4^2 = 4 \cdot 4$

$= 16$ $= 16$

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

$16 + 16 = c^2$

$32 = c^2$

BE CAREFUL YOU NEED c NOT c^2!! Must take $\sqrt{c^2}$ to get c!!

4) $\sqrt{c^2} = c$

$\sqrt{32} = c$

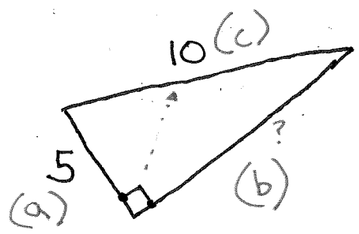
use a calculator

$\sqrt{\ }\ 32$ or $32\ \sqrt{\ }$ $\doteq 5.66$

$c = \sqrt{32}$

$c \simeq 5.66$

Ex 2: Find the unknown Length to one decimal place. (b)



$A^2 + B^2 = C^2$

$C^2 - A^2 = B^2$

$C^2 - B^2 = A^2$

1) label a, b, c

2) $a = 5$ $c = 10$

$a^2 = 25$ $c^2 = 100$

* Review Algebra and Rounding

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

$25 + b^2 = 100$

-25 -25

$b^2 = 75$

4) $b^2 = 75$

$\sqrt{b^2} = \sqrt{75}$ $b = 8.7$

$b = 8.6602$