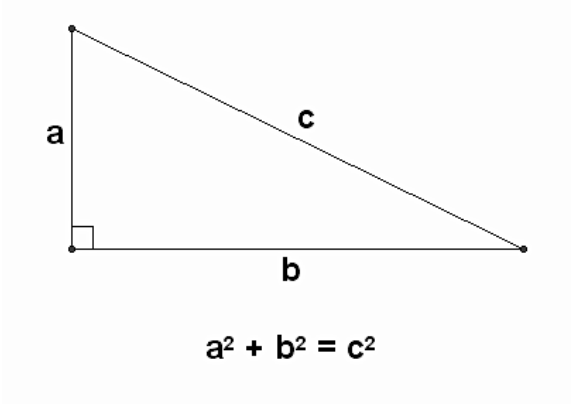
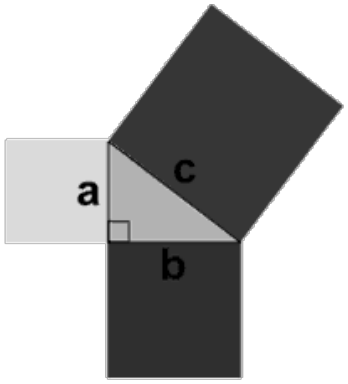
Pythagorean Theorem {9.1}

Secondary Math II Notes

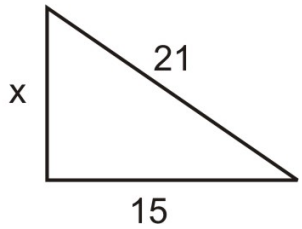
OBJECTIVE: Prove the Pythagorean Theorem and use it to find side lengths of triangles.

Pythagorean Theorem: In a right triangle, one leg squared plus the other leg squared equals the hypotenuse squared, $a^2 + b^2 = c^2$.





Using the Pythagorean Theorem

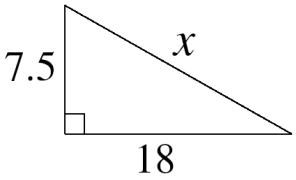


$x^2 + 15^2 = 21^2$

$21^2 - 15^2 = x^2$

$216 = x^2$

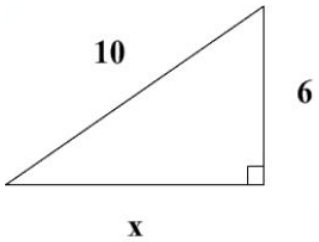
$6\sqrt{6} = x$



$7.5^2 + 18^2 = x^2$

$380.25 = x^2$

$19.5 = x$



$x^2 + 6^2 = 10^2$

$10^2 - 6^2 = x^2$

$64 = x^2$

$8 = x$

A right triangle has side lengths a, b, and c, where c is the hypotenuse. Solve for the missing side.

$a = \sqrt{3}$

$b = 7$

$c =$

$\left(\sqrt{3}\right)^2 + 7^2 = c^2$

$52 = c^2$

$2\sqrt{13} = c$

A right triangle has side lengths a, b, and c, where c is the hypotenuse. Solve for the missing side.

$a = \sqrt{5}$

$b =$

$c = \sqrt{21}$

$\left(\sqrt{21}\right)^2 - \left(\sqrt{5}\right)^2 = b^2$

$21 - 5 = b^2$

$16 = b^2$

$4 = b$

A right triangle has side lengths a, b, and c, where c is the hypotenuse. Solve for the missing side.

$a =$

$b = 16$

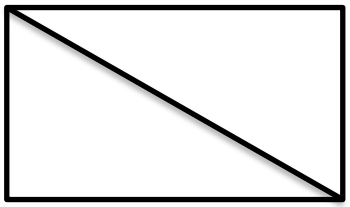
$c = 20$

$20^2 - 16^2 = a^2$

$144 = a^2$

$12 = a$

Find the length of the diagonal of a rectangle with a length of 10 cm and a width of 7 cm.

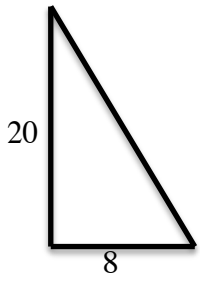


$10^2 + 7^2 = c^2$

$100 + 49 = c^2$

$\sqrt{149} = c$

How long must a guywire be to run from the top of a 20 ft pole to a point on the ground 8 ft from the base of the pole?

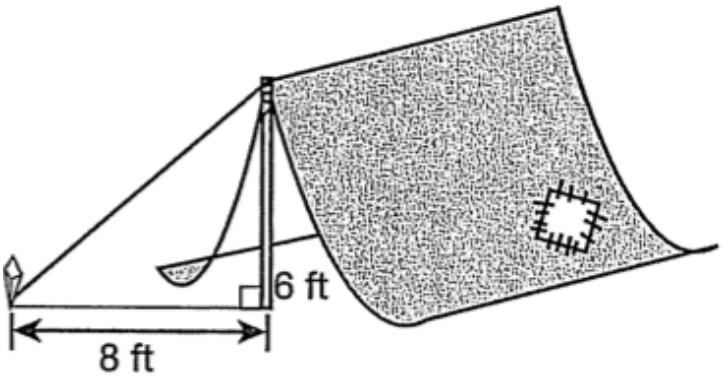


$20^2 + 8^2 = c^2$

$400 + 64 = c^2$

$4\sqrt{29} = c$

Challenge: A tent is supported by a guy rope tied to a stake, as shown in the diagram. What is the length of the rope?



$8^2 + 6^2 = c^2$

$64 + 36 = c^2$

$100 = c^2$

$10 = c$

Classifying Triangles

If $a^2 + b^2 > c^2$, then the triangle is _____ Acute _____.

If $a^2 + b^2 < c^2$, then the triangle is _____ Obtuse _____.

If $a^2 + b^2 = c^2$, then the triangle is _____ Right _____.

Determine whether the given side lengths would be create an acute, obtuse, or right triangle

Side Lengths: 12, 15, 9

$9^2 + 12^2 \_\_ 15^2$

$81 + 144 \_\_ 225$

$225 = 225$

Right

Side Lengths: 5, 7, 11

$5^2 + 7^2 \_\_ 11^2$

$25 + 49 \_\_ 121$

$74 < 121$

Obtuse

Side Lengths: $\sqrt{5}, 5, \sqrt{21}$

$\left(\sqrt{5}\right)^2 + \left(\sqrt{21}\right)^2 \_\_ 5^2$

$5 + 21 \_\_ 25$

$26 > 25$

Acute