ALG I – §10-1 NOTES

Algebra I Notes

10.1 The Pythagorean Theorem

Objectives:	To solve problems using the Pythagorean Theorem To identify right triangles

Warm-Up

1. Solve for x using factoring.
   $2x^2 - 5x = 3$

$2x^2 - 5x - 3 = 0$

$(2x + 1)(x - 3) = 0$

$2x + 1 = 0$ or $x - 3 = 0$

$2x = -1$ $\quad x = 3$

$x = -\frac{1}{2}$

2. Solve using the quadratic formula.
   $x^2 + 8x = -11$

$a = 1$, $b = 8$, $c = 11$

$x^2 + 8x + 11 = 0$

$$x = \frac{-8 \pm \sqrt{(8)^2 - 4(1)(11)}}{2(1)}$$

$$x = \frac{-8 \pm \sqrt{64 - 44}}{2}$$

$$x = \frac{-8 \pm \sqrt{20}}{2}$$

$$x = \frac{-8 \pm 2\sqrt{5}}{2}$$

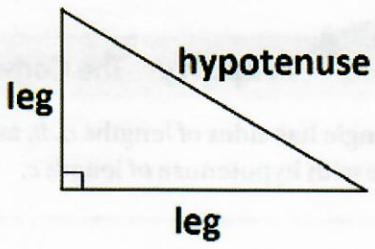
$$x = -4 \pm \sqrt{5}$$

DEFINITIONS

In a **right triangle**,

legs - sides that form the right angle

hypotenuse - the side opposite the right angle

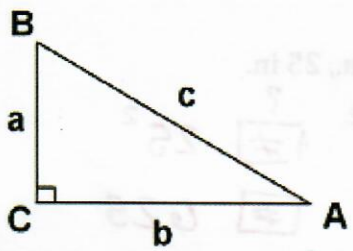


THE PYTHAGOREAN THEOREM

In a right triangle,

$(\boldsymbol{leg})^2 + (\boldsymbol{leg})^2 = (\boldsymbol{hypotenuse})^2$

$(\boldsymbol{a})^2 + (\boldsymbol{b})^2 = (\boldsymbol{c})^2$



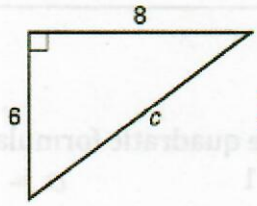
List the perfect squares from 1^2 to 12^2:

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144

In each problem, solve for the missing side using the Pythagorean Theorem.

Example 1

a.



$leg^2 + leg^2 = hyp^2$

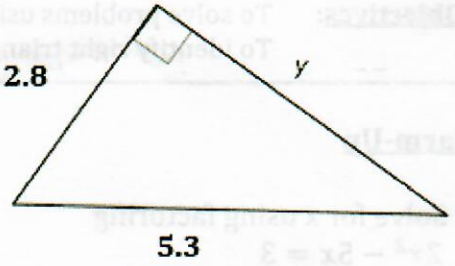
$6^2 + 8^2 = c^2$

$36 + 64 = c^2$

$\sqrt{100} = \sqrt{c^2}$

$10 = c$

b.



$(2.8)^2 + y^2 = 5.3^2$

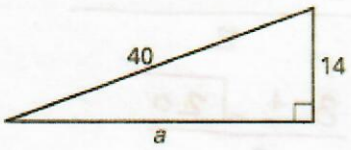
$7.84 + y^2 = 28.09$

$y^2 = 20.25$

$y = 4.5$

Example 2

a.



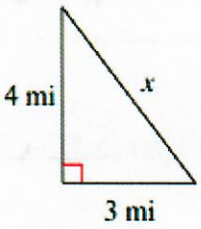
$a^2 + 14^2 = 40^2$

$a^2 + 196 = 1600$

$\sqrt{a^2} = \sqrt{1404}$

$a \approx 37.5$

b.



$4^2 + 3^2 = x^2$

$16 + 9 = x^2$

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

$5\text{ mi} = x$

take note

Property The Converse of the Pythagorean Theorem

If a triangle has sides of lengths a, b, and c, and $a^2 + b^2 = c^2$, then the triangle is a right triangle with hypotenuse of length c.

Determine whether the given lengths can be side lengths of a right triangle.

Example 3

a. 6 in., 24 in., 25 in.

$6^2 + 24^2 \overset{?}{\neq} 25^2$

$36 + 576 \neq 625$

$612 \neq 625$

Not a right Δ.

b. 11 m, 60 m, 61 m

$11^2 + 60^2 = 61^2$

$121 + 3600 = 3721$

$3721 = 3721$

Right Δ