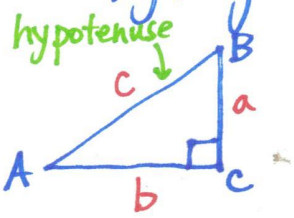
Pythagorean Theorem & Its Converse (Section 11-1)

* Pythagorean Theorem: If a triangle is a right triangle, then the sum of the lengths squared is equal to the hypotenuse squared.



(across from the right angle)

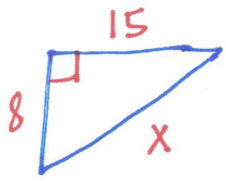
$a^2+b^2=c^2$

* Pythagorean Triple: nonzero whole #s that satisfy $a^2+b^2=c^2$.

most common: 3,4,5
5,12,13
8,15,17
7,24,25

} any of these can be multiplied by a whole # & still be a Pyth. Triple.
ex: 6,8,10 is 2(3,4,5)

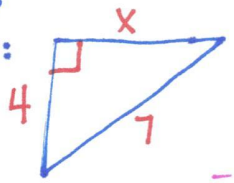
#1
ex:



$8^2+15^2=x^2$
$64+225=x^2$
$\sqrt{289}=\sqrt{x^2}$
$x=17$

* should have known this because of Pyth. Triples!

#3
ex:

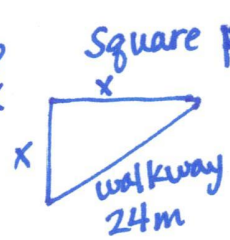


$4^2+x^2=7^2$
$16+x^2=49$
$-16 \quad -16$
$x^2=33$
$x=\sqrt{33}$

#5
ex: 15-ft ladder against a house. Base is 5ft from the house. How high does it reach?

$5^2+y^2=15^2$
$25+y^2=225$
$y^2=200$
$y=14.1$ ft

#6
ex



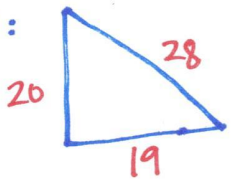
$x^2+x^2=24^2$
$\frac{2x^2}{2}=\frac{576}{2}$
$x^2=288$
$x=16.97 \approx 17$m

* The converse of the Pythagorean Theorem: If the sum of the square lengths of the sides of a triangle are equal to the square of the hypotenuse, then the triangle is a right triangle.

ex: If $a^2+b^2=c^2$, then $\triangle ABC$ is rt. triangle.

#7

ex:



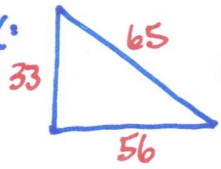
$20^2+19^2=28^2$

$400+361=784$

$761 \neq 784$

∴ Not a right triangle.

#8 ex:



$33^2+56^2=65^2$

$1089+3136=4225$

$4225=4225$

∴ yes, it is a rt. triangle.

* Theorems: If $c^2 > a^2+b^2$, then $\triangle ABC$ is obtuse.

If $c^2 < a^2+b^2$, then $\triangle ABC$ is acute.

So... example #7 (c^2)

$761 < 784$

then the triangle is obtuse!

#10

ex: $\sqrt{11}, \sqrt{7}, 4$ $\quad (\sqrt{11})^2+(\sqrt{7})^2 \stackrel{?}{=} 4^2$

$11+7 > 16$

$18 > 16$

∴ the triangle is acute!