Geometry: *Hutschenreuter*
Chapter 7 Note Packet

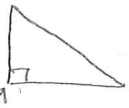
Name KEY

Section 7.1: Apply the Pythagorean Theorem

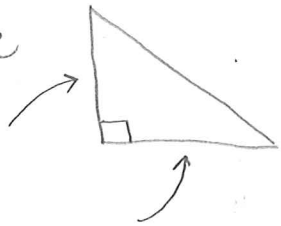
Essential Question:
If you know the lengths of two sides of a right triangle, how do you find the length of the third side?

VOCABULARY:

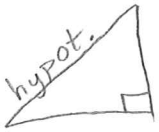
Right triangle
A triangle with one 90° angle



Leg of a right triangle
sides of a right triangle that are adjacent to the right angle



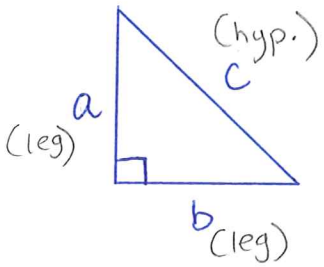
Hypotenuse
The side of a right △ that is opposite of the right angle



Pythagorean Triple
Integers a, b, c that satisfy $a^2+b^2=c^2$

Theorem 7.1: Pythagorean Theorem

In a right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.



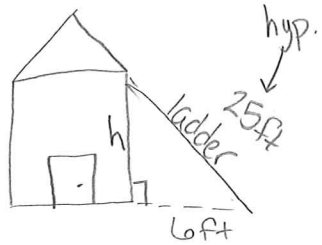
$a^2+b^2=c^2$
$(leg_1)^2+(leg_2)^2=(hyp.)^2$

EXAMPLES:

A1. Find the length of the hypotenuse of a right triangle with legs of 12 inches and 9 inches.

$a^2+b^2=c^2$
$12^2+9^2=c^2$
$144+81=c^2$
$225=c^2$
$\sqrt{c^2}=\sqrt{225}$
$c=$ 15 inches

A2. A 25-foot ladder must be set 6 feet from the base of the house. How far up the side of the house will the ladder reach?



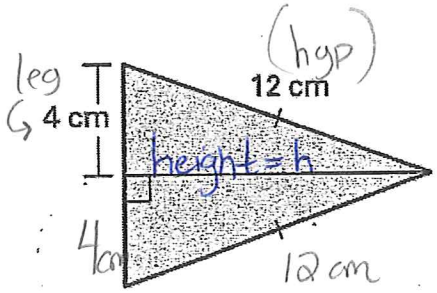
$h^2+6^2=25^2$
$h^2+36=625$
$-36\quad -36$
$h^2=589$
$\sqrt{h^2}=\sqrt{589}\approx$ 24.27ft

A3. Find the area of the pictured triangle.

Area of △ $=\frac{1}{2}$(base)(height)

$A=\frac{1}{2}(8)(h)$
$\frac{1}{2}(8)(11.31)$
$A=45.25\ cm^2$

$h^2+4^2=12^2$
$h^2+16=144$
$\sqrt{h^2}=\sqrt{128}$
$h\approx 11.31$



List the 5 most common primitive Pythagorean Triples, then give three Pythagorean Triple multiples for each.

$3^2+4^2=5^2$
$9+16=25$

Primitives	Multiples (by 2)	Multiples (by 3)	Multiples (by 10)
3, 4, 5	6, 8, 10	9, 12, 15	30, 40, 50
5, 12, 13	10, 24, 26	15, 36, 39	50, 120, 130
8, 15, 17	16, 30, 34	24, 45, 51	80, 150, 170
7, 24, 25	14, 48, 50	21, 72, 75	70, 240, 250
9, 40, 41	18, 80, 82	27, 120, 123	90, 400, 410

$3(2)=6$
$4(2)=8$
$5(2)=10$

A4. Find the missing right triangle length using Pythagorean triples.

a. Leg: $300 \div 10 = 30$
Leg: $160 \div 10 = 16$

Triple $\Rightarrow$ 16, 30, 34

$34(10) = \boxed{340}$

OR $300^2+160^2=c^2 \rightarrow \sqrt{115{,}600}=\sqrt{c^2} \rightarrow c=340$

b. Leg: $(3.5)(2)=7$
Hypotenuse: $(12.5)(2)=25$

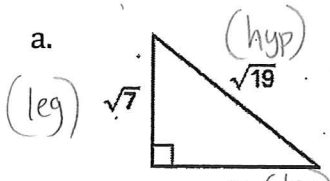
Triple $\Rightarrow$ 7, 24, 25

$24 \div 2 = \boxed{12}$

OR $3.5^2+b^2=12.5^2$
$-3.5^2 \quad -3.5^2$
$b^2=144 \rightarrow b=12$

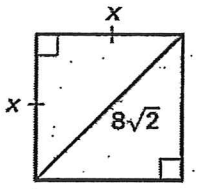
A5. Find the value of the variable. Properly simplify radicals.

a.



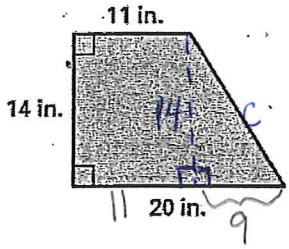
$x^2+\sqrt{7}^2=\sqrt{19}^2$
$x^2+7=19$
$-7 \quad -7$
$x^2=12$
$x=\sqrt{12}=\sqrt{4}\sqrt{3}$
$x \approx 3.464$ OR $2\sqrt{3}$

b.



$x^2+x^2=(8\sqrt{2})^2$
$2x^2=8\cdot\sqrt{2}\cdot8\cdot\sqrt{2}$
$64\cdot2$
$\frac{2x^2}{2}=\frac{128}{2} \rightarrow x^2=64$
$x=\sqrt{64}=\boxed{8}$

A6. Find the area of the figure.



Area of rectangle $=(L)(W)$
$A=(14)(11)$
$A=154$

Area $\Delta = \frac{1}{2} b \cdot h$
$= \frac{1}{2}(9)(14)$
$A=63$

$154 + 63 = \boxed{217\ in^2}$

Section 7.1 Summary:

A right triangle's side lengths a, b, c satisfy the equation $a^2+b^2=c^2$. If given two lengths, the 3rd side length may be found using the Pythagorean Theorem.