Name Key **Date** ____________

9.1 – 9.3:
Pythagorean Inequalities and Triples, Special Right Triangles, and Similar Triangles

9.1 Pythagorean Theorem can be used for more than just finding the lengths of a right triangle. It can also determine whether a triangle is *obtuse, right, or acute*.

A. Summarize the rule that determines if the triangle is obtuse, right or acute.

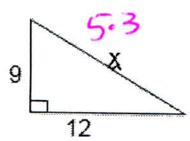
$a^2 + b^2 > c^2$ acute $\quad a^2 + b^2 = c^2$ Right $\quad a^2 + b^2 < c^2$ obtuse

B. Identify the triangles below.

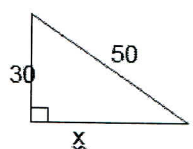
1. 4, 5, 5 acute $\quad 4^2 + 5^2 > 5^2$
2. 2, 10, 11 obtuse $\quad 2^2 + 10^2 < 11^2$
3. 3, 4, 5 Right $\quad 3^2 + 4^2 = 5^2$

* The numbers 3, 4, and 5 are called a **Pythagorean triple**. Not only do 3, 4 and 5 make a right triangle, so do any multiples of 3, 4 and 5. If you are given 2 sides of a triangle and notice that they are multiples of 3, 4, or 5, then all you have to do is find the **scale factor** and use it to find the missing side. You can just multiply by the scale factor or set up a proportion. This is quicker and easier than using Pythagorean Theorem all the time. There are other triples besides 3, 4, 5. The triples that we will be using are: **3,4,5; 5,12,13; 7,24,25; 8,15,17**

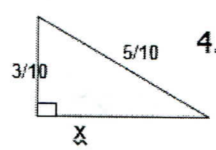
Find the missing sides below by using the triple 3, 4, 5.

1\. 

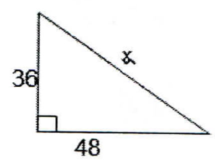
SF = 3, 5·3, X=15

2\. 

SF = 10, 4(10), X=40

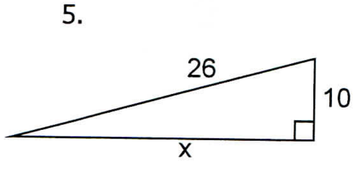
3\. 

SF = $\frac{1}{10}$, X = $\frac{4}{10}$

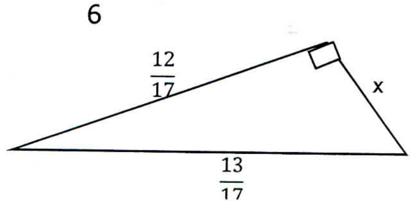
4\. 

SF = 12, 5·12 = 60, X=60

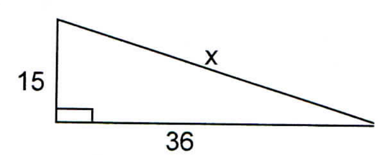
Now try to use the triple to find the missing side and scale factor: 5, 12, 13

5\. 

SF = 2, 12(2), X=24

6\. 

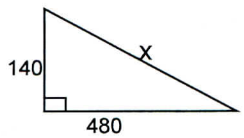
SF = $\frac{1}{17}$, X = $\frac{5}{17}$

7\. 

SF = 3, 13(3), X=39

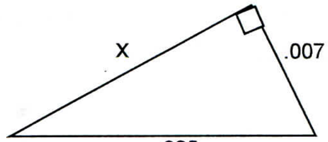
7, 24, 25

8.



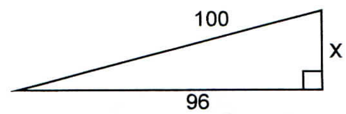
SF=20
25(20)
X=500

9.



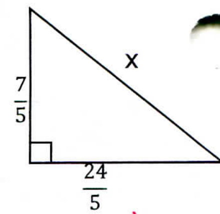
SF=.001
X=.024

10.



SF=4
X=28

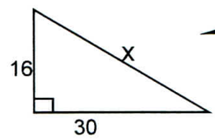
11.



SF=$\frac{1}{5}$
X=5

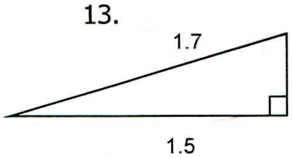
8, 15, 17

12.



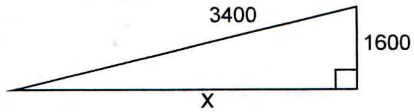
SF=2
17(2)
X=34

13.



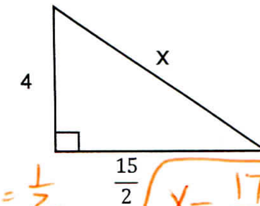
SF=.1
X=.8

14.



SF=200
X=3000

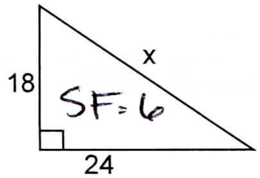
15.



SF=$\frac{1}{2}$
X=$\frac{17}{2}$

Now try these mixed up! You decide..... 3,4,5; 5,12,13; 7,24,25; or 8,15,17 !! Find x.

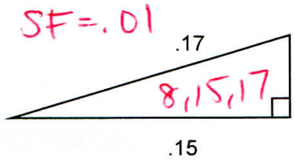
16. 30



SF=6
3 4 5

17. .08

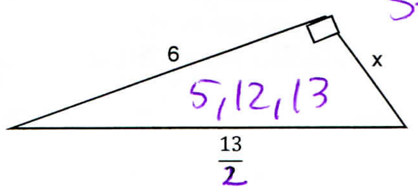
SF=.01



8,15,17

18. $\frac{5}{2}$

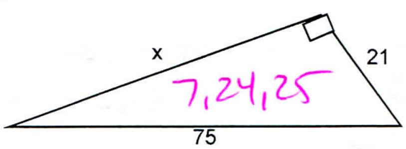
SF=$\frac{1}{2}$



5,12,13

19. 72

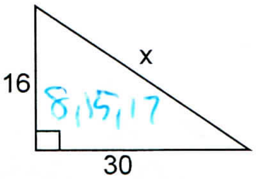
SF=3



7,24,25

20. 34

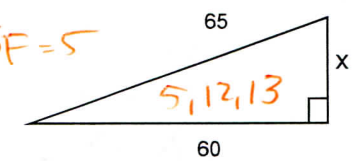
SF=2



8,15,17

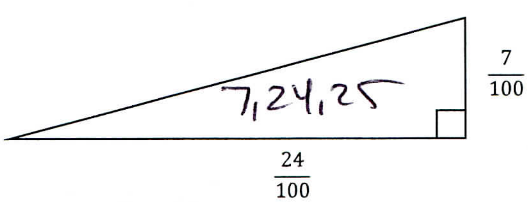
21. 25

SF=5



5,12,13

22. $\frac{1}{4}$

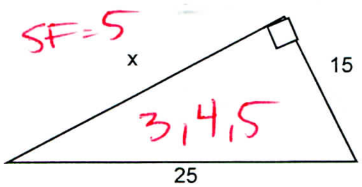


7,24,25

SF=$\frac{1}{100}$

23. 20

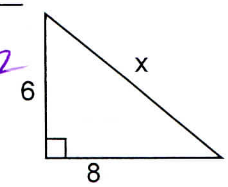
SF=5



3,4,5

24. 10

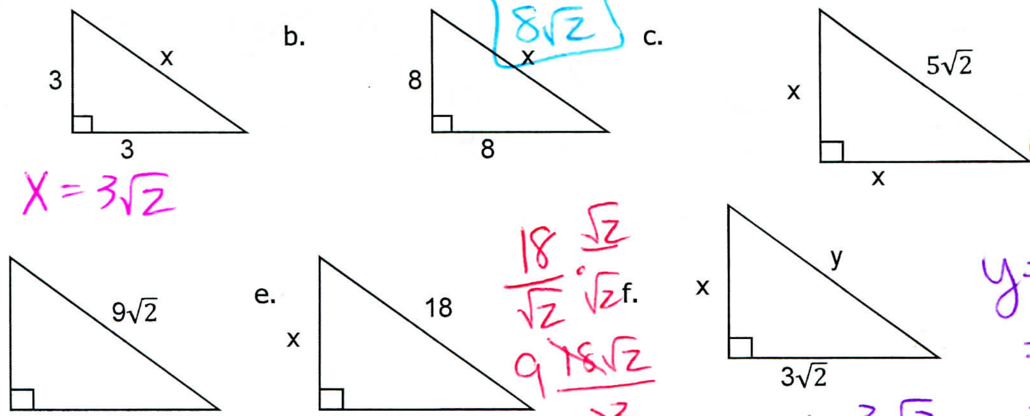
SF=2



3,4,5

9.2 Special Right Triangles

25. Given the isosceles right triangles, find the missing length using Pythagorean Theorem.



a. $x = 3\sqrt{2}$

b. $8\sqrt{2}$

c. $x = 5$

d. $x = 9$

e. $\frac{18}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{18\sqrt{2}}{2}$, $x = 9\sqrt{2}$

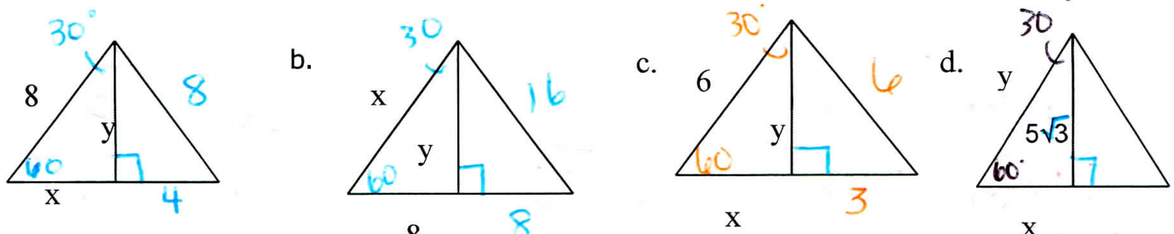
f. $x = 3\sqrt{2}$

$y = (3\sqrt{2})(\sqrt{2})$
$= 3\sqrt{4}$
$= 3(2)$
$y = 6$

29. The above triangles are all 45°-45°-90° triangles, are they all similar? Draw and label the base triangle that will always help you set up the proportion to find missing side lengths.

Leg	Leg	Hyp
1	1	$\sqrt{2}$

30. Given the equilateral triangles with **altitudes**, find the missing length using Pythagorean Theorem.



a. $x = 4$, $y = 4\sqrt{3}$

b. $x = 16$, $y = 8\sqrt{3}$

c. $x = 3$, $y = 3\sqrt{3}$

d.

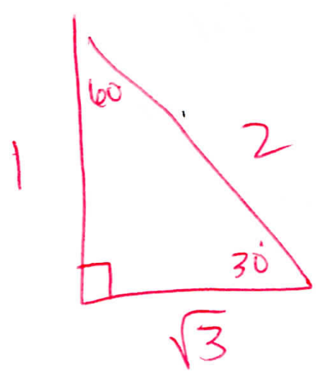
sl	ll	hyp
1	$\sqrt{3}$	2
x	$5\sqrt{3}$	y

$\frac{1}{x} = \frac{\sqrt{3}}{5\sqrt{3}}$, $x = 5$

$\frac{\sqrt{3}}{5\sqrt{3}} = \frac{2}{y}$, $y = 10$

31. Are all 30°-60°-90° triangles above similar? Draw and label the base triangle that will always help you set up the proportion to find missing side lengths.

sl	ll	hyp
1	$\sqrt{3}$	2



9.3 Similar Right Triangles

Find the Geometric mean of the two numbers.

32. 3 and 12

$\frac{3}{x} = \frac{x}{12}$

$x^2 = 36$

$x = 6$

33. 4 and 14

$\frac{4}{x} = \frac{x}{14}$

$x^2 = 56$

$x = 2\sqrt{14}$

34. 10 and 24

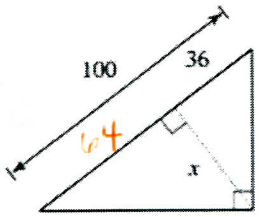
$\frac{10}{x} = \frac{x}{24}$

$x^2 = 240$

$x = 4\sqrt{15}$

Find the missing length indicated. Leave your answers exact (in simplest radical form).

35.

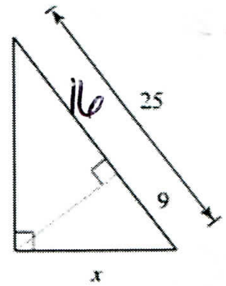


$\frac{36}{x} = \frac{x}{64}$

$x^2 = 2304$

$x = 48$

36.

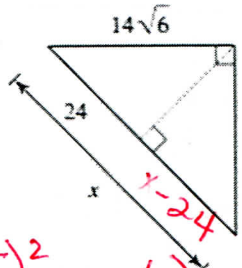


$x^2 = (9)(25)$

$x^2 = 225$

$x = 15$

37.



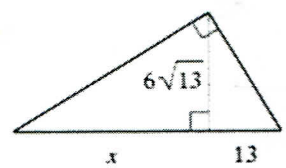
$(14\sqrt{6})^2 = 24(x)$

$196(6) = 24x$

$1176 = 24x$

$x = 49$

38.



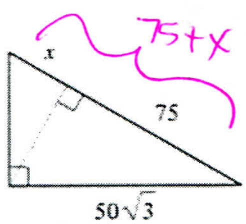
$\frac{x}{6\sqrt{13}} = \frac{6\sqrt{13}}{13}$

$13x = (6\sqrt{13})^2$

$13x = 36(13)$

$x = 36$

39.



$(50\sqrt{3})^2 = 75(75+x)$

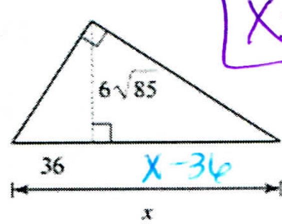
$(2500)(3) = 5625 + 75x$

$7500 = 5625 + 75x$

$1875 = 75x$

$25 = x$

40.



$\frac{36}{6\sqrt{85}} = \frac{6\sqrt{85}}{x-36}$

$36(x-36) = (6\sqrt{85})^2$

$36x - 1296 = (36)(85)$

$36x - 1296 = 3060$

$36x = 4356$

$x = 121$