8-2 Pythagorean Theorem & Its Converse
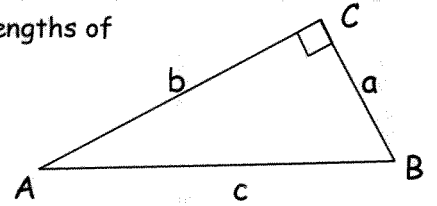
Name_____

Date_____Block___

Pythagorean Theorem: In a right triangle, the sum of the squares of the lengths of the legs equals the square of the length of the hypotenuse.

- If $\triangle ABC$ is a right $\triangle$, then ___$a^2 + b^2 = c^2$___

Pythagorean Triple: a set of ___3___ ___nonzero___ ___whole___ numbers a, b, and c, such that $a^2 + b^2 = c^2$.

Example:
9, 12, and 15
$15^2 = 12^2 + 9^2$
$225 = 144 + 81$
$225 = 225$

Are 3, 4, and 5 a Pythagorean triple?

$25 = 9 + 16$ yes

Name another one below.
6, 8, 10   9, 12, 15
12, 16, 20

Converse of the Pythagorean Theorem: If the sum of the squares of the lengths of the shortest sides of a triangle is equal to the square of the length of the longest side, then the triangle is a ___Right___ triangle.

Remember: Test for a Triangle:
If 3 sides form a triangle, the ___sum___ of the 2 smaller sides is ___>___ the third side.

Classify a Triangle by using these Theorems:

- If $c^2 = a^2 + b^2$, then $\triangle ABC$ is a ___right___ triangle.
- If $c^2 < a^2 + b^2$, then $\triangle ABC$ is a ___acute___ triangle.
- If $c^2 > a^2 + b^2$, then $\triangle ABC$ is a ___obtuse___ triangle.

Determine whether each set of numbers can be the measures of the sides of a triangle. If YES, classify the triangle, as *acute*, *right*, or *obtuse*.

3 lengths:	Is it a triangle?	What type of triangle? Show work!	Is it a Pythagorean Triple?
1. 12, 11, 17	23>17 Yes	Obtuse	No
2. 4, 8, 3	7<8 No	N/A ✗	✗ N/A
3. 11, 11, 15	22>15 Yes	225 < 242 Acute	No
4. 8, 8√3, 16	Yes	Right	No
5. 4, 6, 8	10>8 Yes	Obtuse	No

Solve for x. Write irrational answers in simplified radical form.

6.

6
8
x 10

7.

x
9
7

$\frac{81}{-49}$ $x = \sqrt{32}$ $(4\sqrt{2})$

8.

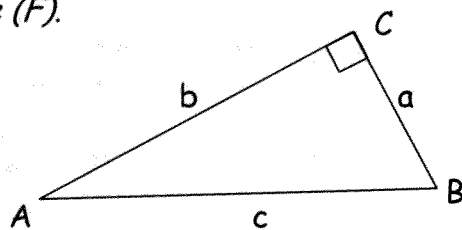12
20
x

400
-144

$x = \sqrt{256}$
16
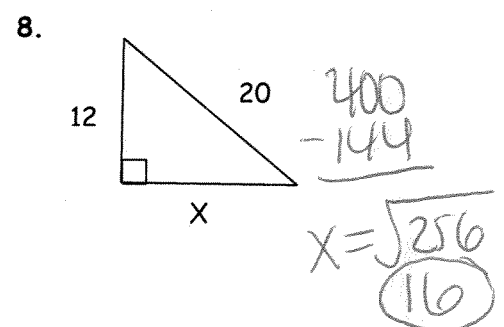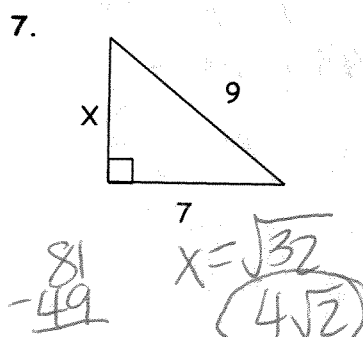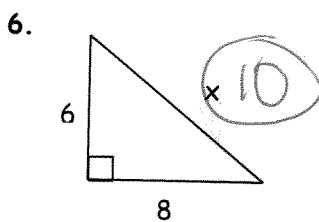
8-2 Practice Worksheet:

PYTHAGOREAN THEOREM: $c^2 = a^2 + b^2$

Use $\triangle ABC$ to determine if the equation is *true (T)* or *false (F)*.

1. $b^2 + a^2 = c^2$ T
2. $c^2 - a^2 = b^2$ T
3. $b^2 - c^2 = a^2$ F

4. $c^2 = a^2 - b^2$ F
5. $c^2 = b^2 + a^2$ T
6. $a^2 = c^2 - b^2$ T

Simplify the radical. Show work.

7. $\sqrt{12}$ $\sqrt{4\cdot3}$ $2\sqrt{3}$

8. $\sqrt{48}$ $\sqrt{16\cdot3}$ $4\sqrt{3}$

9. $\sqrt{20}$ $\sqrt{4\cdot5}$ $2\sqrt{5}$

10. $\sqrt{18}$ $\sqrt{9\cdot2}$ $3\sqrt{2}$

11. $\sqrt{60}$ $\sqrt{4\cdot15}$ $2\sqrt{15}$

12. $\sqrt{75}$ $\sqrt{25\cdot3}$ $5\sqrt{3}$

Find the unknown side length. Simplify answers that are radicals. Do the sides form a <u>Pythagorean Triple?</u>

PYTHAGOREAN TRIPLE: All 3 sides are positive integers!

13.   x, 4, 10 $2\sqrt{29}$ NO
$x = \sqrt{100+16}$
$x = \sqrt{116} = \sqrt{4\cdot29}$

14.   x, 9, 15   12   yes
$\begin{array}{r}225\\-81\end{array}$ $\sqrt{144}$

15.   x, 5, 8 $\sqrt{89}$ NO
$\begin{array}{r}25\\+64\\\hline \sqrt{89}\end{array}$

Decide whether the following 3 numbers can represent the side lengths of a right triangle. If not, then classify the triangle as acute or obtuse.   **Remember the right triangle test!**

16. $5, 12, 13$ $5^2+12^2=13^2$ Right P.S.

17. $\sqrt{8}, 4, 6$ $\begin{array}{c}8+16\\24\end{array} < \begin{array}{c}36\\36\end{array}$ Obtuse

18. $20, 21, 28$ $20^2+21^2 \quad 28^2$
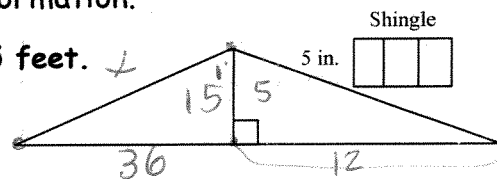$400+441 \quad 784$
$841 > 784$ acute

19. $15, 36, 39$ $15^2+36^2 \quad 39^2$
$1521 = 1521$ Right P.T.!

20. $\sqrt{13}, 10, 12$ $13+100$
$113 < 144$ obtuse

21. $14, 48, 50$ $14^2+48^2 \quad 50^2$
$2500 = 2500$ Right P.T.!

In exercises 22 and 23, use the diagram and the following information.

The slope of the roof shown is $\dfrac{5}{12}$. The height of the roof is 15 feet.

22. What is the length from gutter to peak of the roof?
$36^2+15^2 = \sqrt{1521}$ = 39 feet

23. If a row of shingles is 5 inches high, how many rows of shingles are needed for one side of the roof?
$39' = \dfrac{468''}{5''}$ 93.6 shingles