Author:_____ **More on Area ...**

Group Members:

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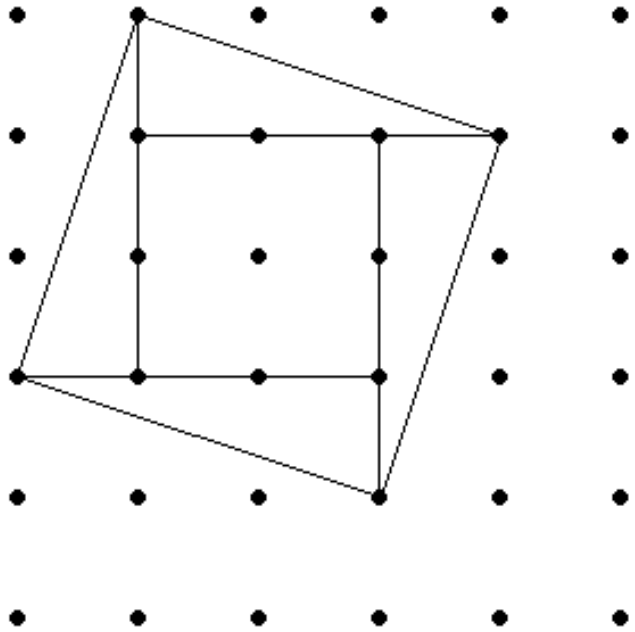
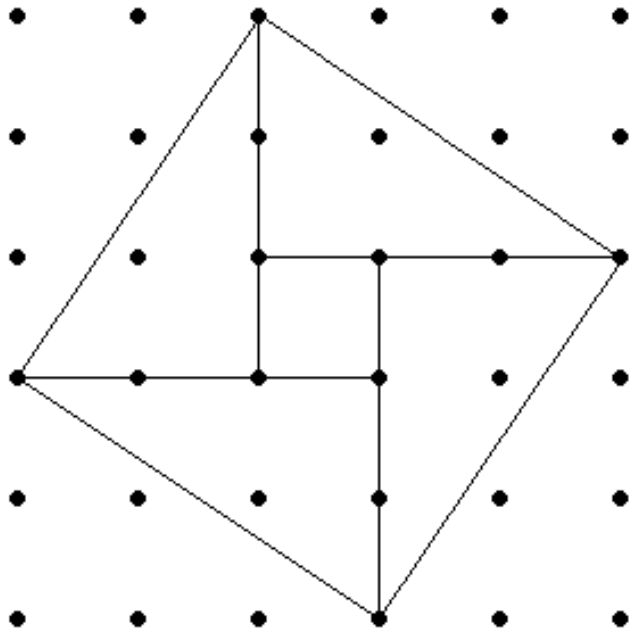
1. Find the area of the shape below. (You may only use what we have learned in this class.)



There are four triangles with base 1 and height 3. There is also a square with area 4. Therefore the total area is

$$A = 4\left(\frac{1}{2}(1)(3)\right) + 4 = 10$$

2. Find the area of the shape below. (You may only use what we have learned in this class.)



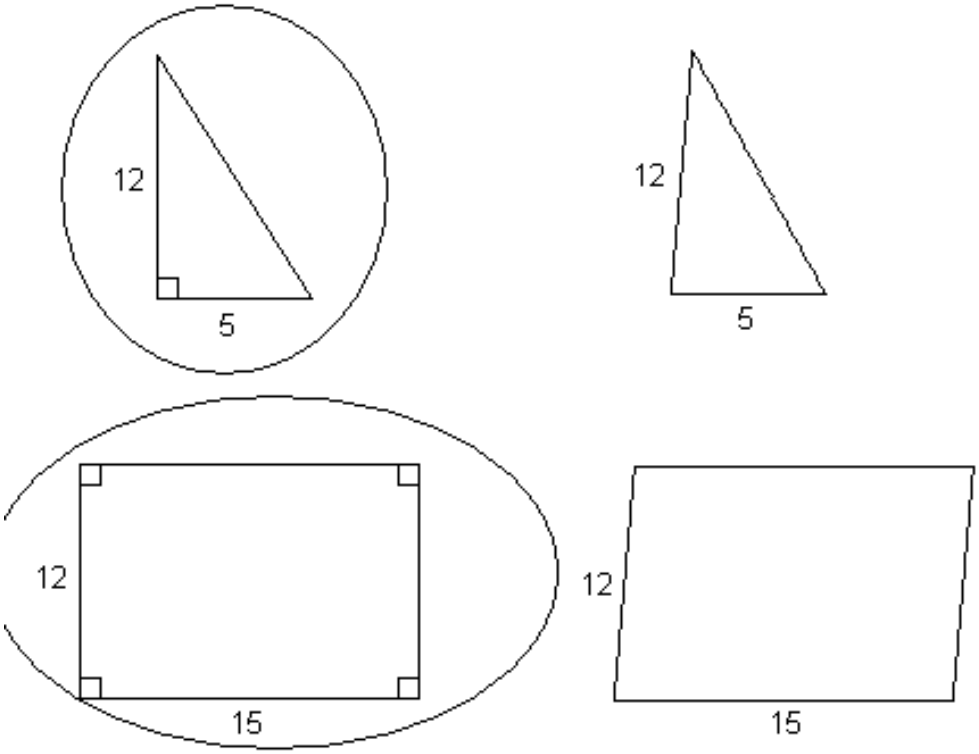
There are four triangles with base 2 and height 3. There is also a square with area 1. Therefore the total area is

$$A = 4\left(\frac{1}{2}(2)(3)\right) + 1 = 13$$

3. Both of the shapes you found the area of are squares. Explain how you can tell they are squares.

   All the sides are equal since they are the hypotenuse of the same triangle. We also know that the angles are $90°$ since the two angles in the triangle must add up to $90°$.

4. Consider the shapes below. Which of the following can you find the area of with the given information?



5. Use the four triangles and the small square to make the larger square.

6. Suppose the dimensions of the triangle are as follows. The hypotenuse has length c, the larger leg has length b and the smaller leg has length a.

   (a) What are the dimensions of the large square? c by c

   (b) Now that you know the dimensions of the large square, what is the area of the large square? c^2

   (c) What is the area of one of the triangles? $\frac{1}{2}ab$

   (d) What are the dimensions of the small square? $b-a$ by $b-a$

   (e) Now that you know the dimensions of the small square, what is the area of the small square? $(b-a)^2$

   (f) Using the fact that the large square is made up of four triangles and the small square, what is the area of the large square? $4(\frac{1}{2}ab)+(b-a)^2$

   (g) In problem 6b you computed the area of the large square, but you also computed the area of the large square in problem 6f. You just computed the area of the same square in two different ways. Even though you used two different methods, they both give you the area of the large square. Therefore your result from problem 6b must be equal to your result from problem 6f. Write that fact down in equation form.

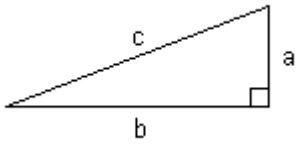
   $$c^2 = 4(\frac{1}{2}ab)+(b-a)^2$$

   (h) Simplify the above equation as much as possible.

$$c^2 = 4(\frac{1}{2}ab) + (b-a)^2$$
$$c^2 = 2ab + b^2 - 2ab + a^2$$
$$c^2 = a^2 + b^2$$

(i) What theorem did you just prove? Pythagorean Theorem

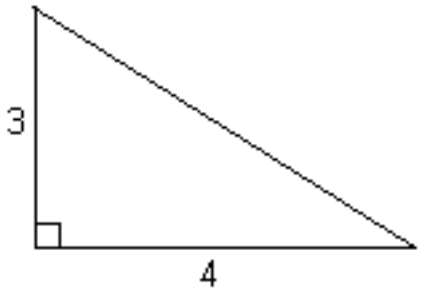
Pythagorean Theorem: In a right triangle the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.



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

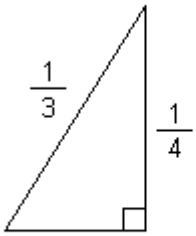
7. Use the Pythagorean Theorem (which you just proved) to find the missing length in each of the following triangles.

(a)



$$3^2 + 4^2 = c^2$$
$$25 = c^2$$
$$c = 5$$

(b)



$$\left(\frac{1}{4}\right)^2 + b^2 = \left(\frac{1}{3}\right)^2$$
$$\frac{1}{16} + b^2 = \frac{1}{9}$$
$$b^2 = \frac{7}{144}$$
$$b = \frac{\sqrt{7}}{12}$$