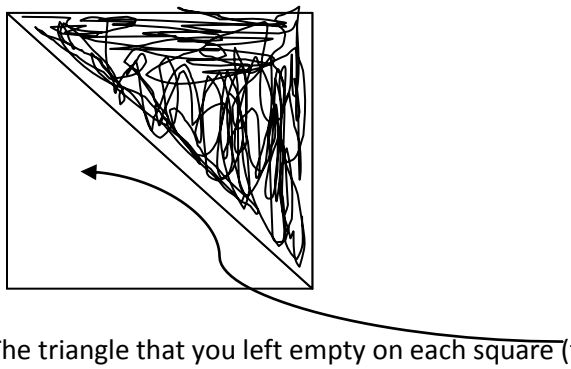
Geometry – Special Right Triangles – Intro and Explore

For this activity, you may use either your electronic resources (GSP or Geogebra), or you can use white, lines, or graph paper… whichever you prefer.

1. Draw 4 as-perfect-as-possible squares. One with side length 2 cm, one with side 4 cm, one with side 6 cm, and one with side 8 cm.

2. Draw a single diagonal on each square. You should have formed two triangles inside of each square. Shade in one of the triangles and leave the other triangle empty.

   (it will probably look something like this.)



3. The triangle that you left empty on each square (that one), what kind of triangle is it?

   (Feel free to circle more than one)

   a. Right
   b. Acute
   c. Obtuse
   d. Isosceles
   e. equilateral
   f. scalene

   … because …

4. Great! Now we've established that the "half-square" triangles that you drew were RIGHT ISOSCELES triangles.

What are the measures of the acute angles?

Prove your answer (using rigid motion, triangle congruence, or Isosceles Triangle Theorem.)

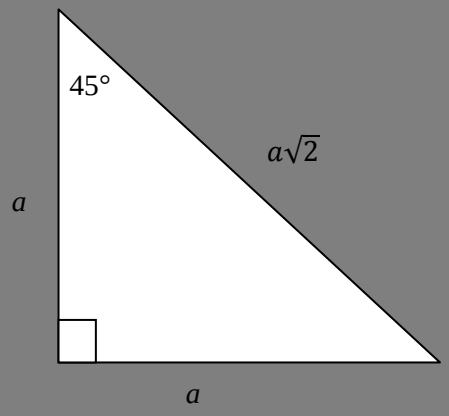
5. Since those are right triangles, we can use Pythagorean Theorem to find the length of that diagonal! Go ahead and do that. (No decimals! Give your answer in reduced radical form. Trust me, it's better this way.)

Fill in the table with your answers.

Square	Leg length	Diagonal/hypotenuse
2 cm		
4 cm		
6 cm		
8 cm		

6. So, we could continue to call these "half-square triangles", but formally they are called…

45-45 TRIANGLES



Remember, you can use this formula ANYTIME you know that you are dealing with a 45-45 triangle.

You can assume that anytime you have **a right triangle with a 45-degree acute angle**, OR any time you have **a right triangle with congruent legs**.

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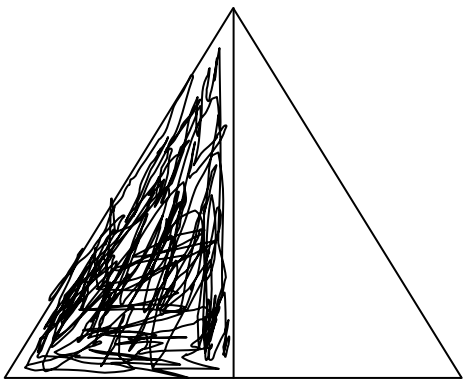
7. Draw 4 as-perfect-as-possible equilateral triangles. One with side length 2 cm, one with side 4 cm, one with side 6 cm, and one with side 8 cm.

8. For each triangle, drop a perpendicular from the upper-most vertex to its opposite segment. You should have made two triangles. Shade in one of the two triangles and leave the other triangle empty.

(it might look something like this)



9. What are the measures of the three angles of each of your unshaded triangles?

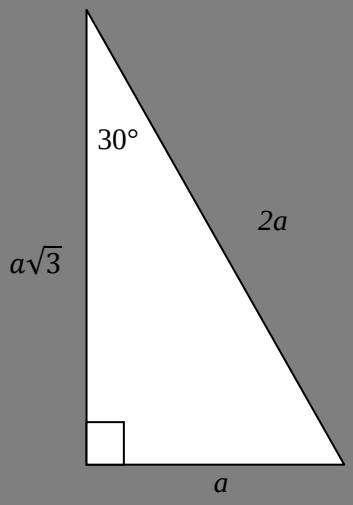
Prove your answer using rigid motions, equilateral triangle theorem, or congruent triangles.

10. You may need to use Pythagorean Theorem a few times, but fill out the following table for the unshaded "half-equilateral-triangles" that you drew. Remember, no decimals. Simplified radical form!

Triangle	Longer leg	Shorter leg	Hypotenuse

11. So, we could continue to call these "half-equilateral-triangles", but formally they are called…

30-60-90 TRIANGLES



Remember, you can use this formula ANYTIME you know that you are dealing with a 30-60-90 triangle.

You can assume that anytime you have **a right triangle with a 30-degree or a 60-degree acute angle**, OR any time you have **a right triangle with a leg half the size of the hypotenuse**.