Name: _____ **Explore & Analyze 4** Math 9

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A rectangular prism made out of centimetre cubes has a face that is 4 cm by 8 cm. It is placed in a large tank of water. How can you determine the volume of the prism?

You can determine the volume of the prism by measuring the change in volume of the water. The initial volume of water was $2000\ cm^3$. With the prism fully submerged, the water line is now at $3024\ cm^3$.

1. Determine the volume of the prism and the length of the missing dimension of the prism.

2. Borna notices that you can express all of the dimensions of the rectangular prism and its volume as powers of 2. Verify this.

3. Using the same process you used in #1 to find the missing side length, rewrite each number as a power of base 2. What pattern(s) do you notice?

4. How could you use the patterns from #3 to multiply and divide large numbers more easily? Use different numbers to check whether your patterns/strategies apply to other powers.

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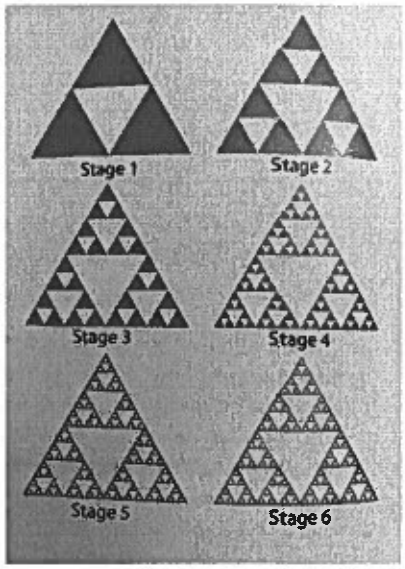
A fractal is a never-ending pattern. As you zoom in on a portion of the pattern, you see the same structure at any level of scale. Mathematicians create fractals using common geometric shapes, such as the one above. This pattern is found in Italian art dating back to the thirteenth century. Sierpinski described the pattern mathematically over 100 years ago, in 1915. How would you describe the pattern?

1. What patterns do you see?



2. How many solid red triangles do you see in the first few stages? How are these numbers related?

3. How could you determine the number of solid red triangles in the fifth stage? Sixth stage? nth stage?