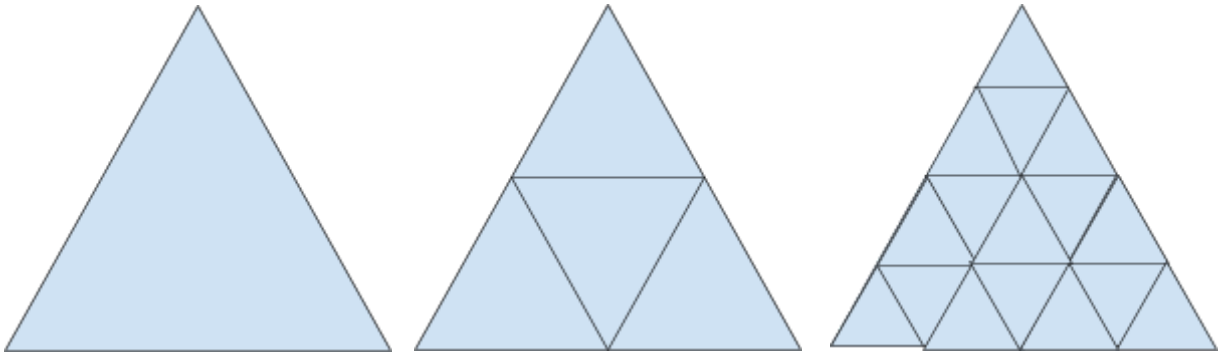
Name: _____

Pre-Assessment: Logarithmic Functions - Answer Key

1. Below is a pattern showing a triangle being successfully split into four similar triangles at each step.



Step 0 Step 1 Step 2

1. If n is the step number, how many of the smallest triangles are there when n is 4? What about when n is 8?

   When n = 0, there is one triangle. When n = 1, there are 4 triangles. When n=2 there are 16 triangles. We can see that with each new step, we can calculate the number of triangles by multiplying the previous number by 4. So when n = 3 there are 16 x 4 or 64 triangles and then when n = 4, there are 64 x 4 or 256 triangles. By extending this 4 more times to n = 8, there are 65,536 triangles.

2. At some step n, there are 1,048,576 smallest triangles.
   a. Write an equation to represent the relationship between the step n and the number of triangles in step n.

Since we saw from #1 that we multiply by 4 with each new step, we know this will be an exponential equation where we are multiplying by 4 over and over again. This would be 4^n = the number of triangles in step n.

b. Explain how you might find the value of that step number.

Answers may vary but one valid process would be to continue from n = 8 from #1 to notice that 65536 x 4 = 262144 when n = 9 and then 262144 x 4 = 1048576 when n = 10 so it must be in step 10 when there are 1048576 triangles.