

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Math Lab: Explore Infinite Sums**

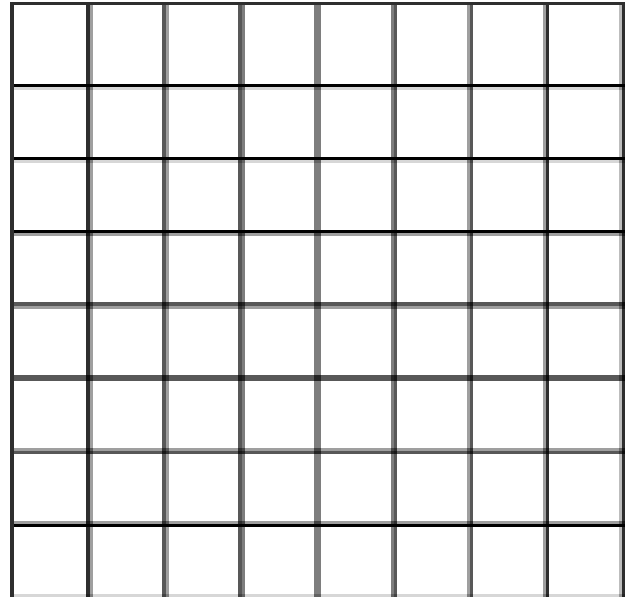
**Question:** What is the sum of  $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \dots$

What happens to the sum if we go on forever? Very exciting!

Before we answer this question, let's look at some simpler questions first.

**DO:** Using the grid provided, shade in  $\frac{1}{2}$ .

**Q:** What does  $\frac{1}{2}$  mean?



**DO:** Now shade in  $\frac{1}{4}$  (one-fourth) using a different colour. Don't overlap the  $\frac{1}{2}$  you have already shaded.

**Q:** What does  $\frac{1}{4}$  mean?

**DO:** Now shade in  $\frac{1}{8}$  (one-eighth) using a different colour. Don't overlap the other shaded pieces.

**Q:** What does  $\frac{1}{8}$  mean?

**DO:** Now shade in  $\frac{1}{16}$  (one-sixteenth) using a different colour. Don't overlap the other shaded pieces.

**Q:** What does  $\frac{1}{16}$  mean?

Complete the following table, using the grid above to help you.

Expressions	Shaded Colours Used	Fraction of the Whole Grid (sum)	Fraction as a Decimal
$\frac{1}{2} + \frac{1}{4}$			
$\frac{1}{2} + \frac{1}{4} + \frac{1}{8}$			

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16}$			
$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32}$			

### Connect and Reflect:

1. Do you see a pattern? What is it? Explain it in words.



2. What pattern do you notice about the sums?

3. Predict the next 4 sums. (that are not in the table)

4. Explain how the diagram and the table are connected.

5. What is the sum of  $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \dots$ ? Explain why you think that this is the answer.

**Extending Question:** What infinite sum and pattern do the following pictures show? Explain.

