Lesson 11:

Adding Up

Learning Targets:

- I can determine the sum of a sequence representing a situation.

Let's look at sequences and the sum of their terms.

11.1 Math Talk: Adding Terms

Evaluate mentally.

$$\frac{1}{2} + \frac{1}{4}$$

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

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

$$\frac{3}{2} + \frac{3}{4} + \frac{3}{8} + \frac{3}{16}$$

Activity Synthesis:

Who can restate [student]'s reasoning in a different way?

Did anyone have the same strategy but would explain it differently?

Did anyone solve the problem in a different way?

11.2 Paper Trail

1. Tyler has a piece of paper and is sharing it with Elena, Clare, and Andre. He cuts the paper to create four equal pieces, then hands one piece each to the others and keeps one for himself. What fraction of the original piece of paper does each person have?

2. Tyler then takes his remaining paper and does it again. He cuts the paper to create four equal pieces, then hands one piece each to the others and keeps one for himself. What fraction of the original piece of paper does each person have now?

3. Tyler then takes his remaining paper and does it again. What fraction of the original piece of paper does each person have now? What happens after more steps of the same process?
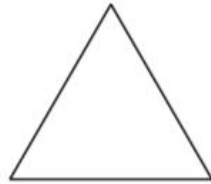
Activity Synthesis:

number of cuts	0	1	2	3
Tyler	1	$\frac{1}{4}$	$\frac{1}{16}$	$\frac{1}{64}$
each other group member	0	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{21}{64}$

Explain where the values for Tyler and the other group member came from.

11.3 A Threefold Design

Here is a geometric shape built in steps.

- Step 0 is an equilateral triangle.

- To go from Step 0 to Step 1, take every edge of Step 0 and replace its middle third with an outward-facing equilateral triangle.
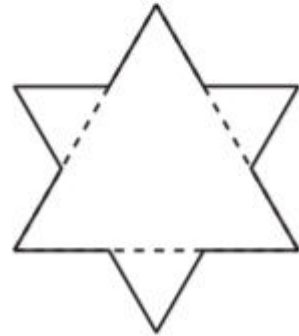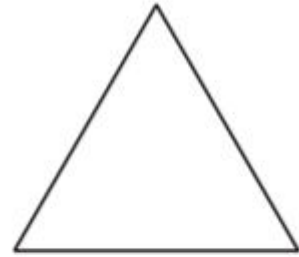
Describe how the second triangle was drawn in your own words.

State how many sides Steps 0 and 1 have.

Complete task with your partner.

Activity Synthesis:

- How did you find the terms to add up to find the total number of triangles used in building Step 3?

- What would it mean to sum the terms in sequence S from n=0 to n=3 ?

Lesson Synthesis:

What it would mean to find the sum of the sequence defined by:

$$f(0) = \tfrac{3}{10}, f(n) = \tfrac{1}{10} \cdot f(n-1) \text{ for } n \geq 1.$$