12-5 Algebra Lab

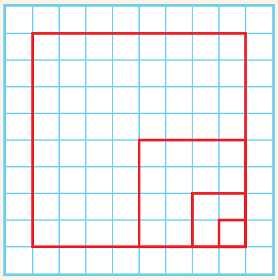
Explore Infinite Geometric Series

You can explore infinite geometric series by using a sequence of squares.

Use with Lesson 12-5

Activity

1. On a piece of graph paper, draw a 16×16 unit square. Note that its perimeter is 64 units.
2. Starting at one corner of the original square, draw a new square with side lengths half as long, or in this case, 8×8 units. Note that its perimeter is 32 units.
3. Create a table as shown at right. Fill in the perimeters and the cumulative sum of the perimeters that you have found so far.



Square	Perimeter	Sum
16×16	64	64
8×8	32	96
4×4	■	■
2×2	■	■
1×1	■	■
$\frac{1}{2} \times \frac{1}{2}$	■	■

Try This

1. Copy the table, and complete the first 6 rows.
2. Use summation notation to write a geometric series for the perimeters.
3. Use a graphing calculator to find the sum of the first 20 terms of the series.
4. **Make a Conjecture** Make a conjecture about the sum of the perimeter series if it were to continue indefinitely.
5. Evaluate $\frac{64}{1 - \frac{1}{2}}$. How does this relate to your answer to Problem 4?
6. Copy and complete the table by finding the area of each square and the cumulative sums.
7. Use summation notation to write a geometric series for the areas.
8. Use a graphing calculator to find the sum of the first 10 terms of the series.
9. **Make a Conjecture** Make a conjecture about the sum of the area series if it were to continue indefinitely.
10. Evaluate $\frac{256}{1 - \frac{1}{4}}$. How does this relate to your answer to Problem 9?
11. **Draw a Conclusion** Write a formula for the sum of an infinite geometric sequence.

Square	Area	Sum
16×16	■	■
8×8	■	■
4×4	■	■
2×2	■	■
1×1	■	■
$\frac{1}{2} \times \frac{1}{2}$	■	■