Assignment

Write

Write a definition for each term in your own words.

1. fractal
2. self-similar
3. iterative process

Remember

You can analyze the characteristics of a fractal in its stages to complete tables of values, identify infinite geometric sequences and patterns, describe end behaviors, write formulas, and make predictions.

Practice

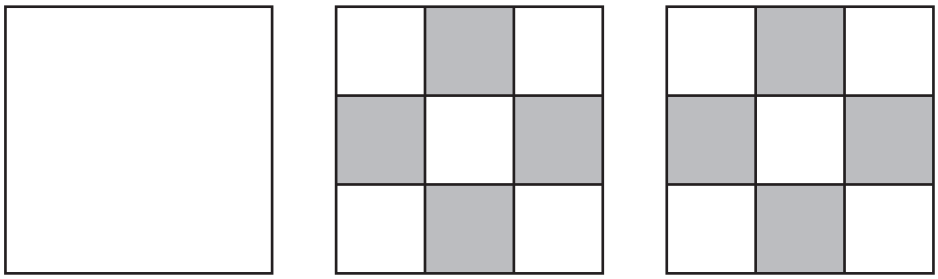
1. The following rules are used to create a certain fractal.

   Stage 0: Begin with a square.

   Stage 1: Divide the square into 9 congruent squares. Shade the square directly above the center square, the square directly below the center square, the square directly to the right of the center square, and the square directly to the left of the center square.

   Stages 2 and up: Repeat Stage 1 for the unshaded squares in the figure.

   a. Complete Stage 2 of the fractal. Stage 0 and Stage 1 are given.



Stage 0 Stage 1 Stage 2

   b. Determine the number of unshaded squares at each stage and complete the table.

Stage	0	1	2	3	4	5	*n*
Number of Unshaded Squares							

   c. Identify the type of sequence represented by the number of unshaded squares at Stage *n*.

   d. Write a function to represent the number of unshaded squares as a function of the stage, *n*. Describe the type of function you used.

e. Determine the total unshaded area at each stage and complete the table. The area of the initial square in Stage 0 is 1 cm^2.

Stage	0	1	2	3	4	5	*n*
Total Unshaded Area (cm^2)							

f. Identify the type of sequence represented by the total unshaded area at Stage *n*.

g. Write a function to represent the total unshaded area as a function of the stage, *n*. Describe the type of function you used.

h. Describe the amount of unshaded area as *n* increases. Explain your reasoning.

i. Determine the additional amount of shaded area at each stage and complete the table. Explain your reasoning.

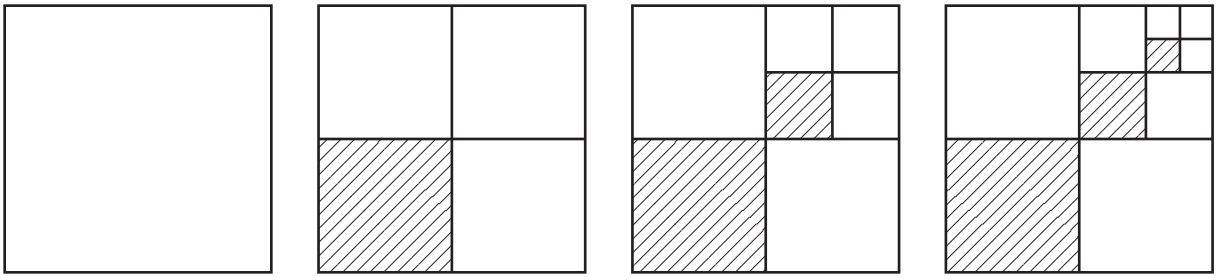
Stage	1	2	3	4	5	*n*
Additional Shaded Area (cm^2)						

j. Write a formula in sigma notation to represent the amount of shaded area at Stage *n*.

k. Describe the amount of shaded area as *n* increases.

Stretch

Consider the pattern given. The initial square in Stage 0 is 1cm^2



Stage 0 Stage 1 Stage 2 Stage 3

a. Describe how the next stage of the pattern is created.

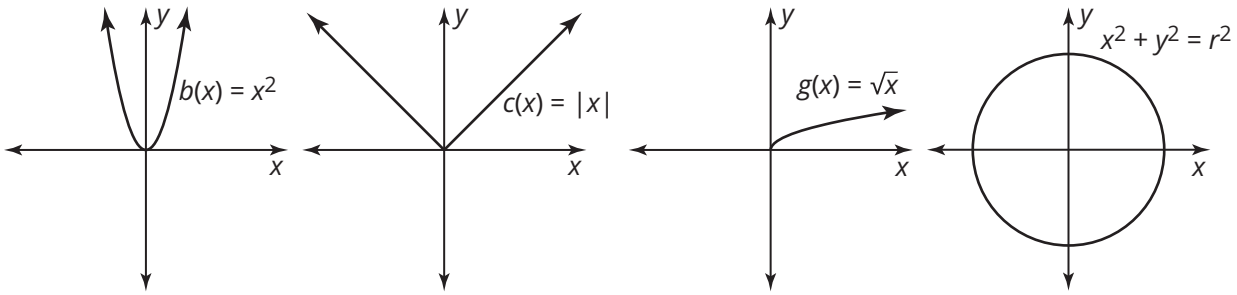
b. Identify the type of sequence represented by the area of each new shaded square at Stage *n*.

c. Write a function to represent the the area of each new shaded square as a function of the stage, n. Describe the type of function you used.

d. Use the formula for the sum of the first n terms of a geometric series, $S = a\left(\frac{1 - r^n}{1 - r}\right)$, where a is the first term of the sequence and r is the common ratio, to calculate the sum of the first 5 terms of the series.

Review

1. Consider the relations shown.



Graph each relation to create a picture.

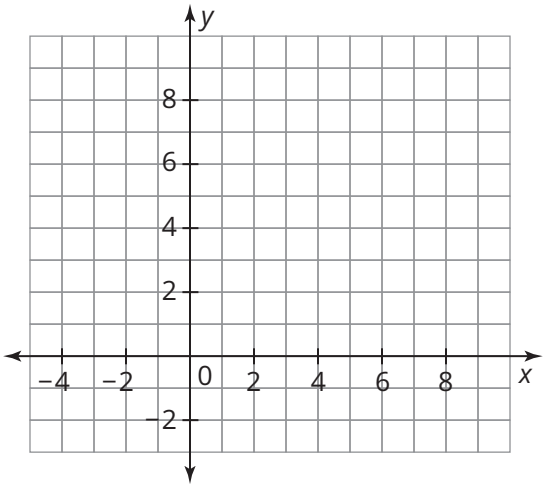
$y = -c(x - 2) + 2, \quad 0 \le x \le 4$

$y = -c(x - 6) + 2, \quad 4 \le x \le 8$

$(x - 4)^2 + (y - 3)^2 = 1$

$y = -0.25b(x - 4) + 6, \quad -1 \le x \le 9$

$y = -0.25b(x - 4) + 8, \quad -1 \le x \le 9$



2. A startup company is selling a new phone application for fitness. The sales, S, can be modeled by the function $S(m) = 50 \cdot 1.35^m$, where m represents the number of months since the app was put on the market.
   a. How many months will it take for the sales of the app to grow to $2,500?
   b. How many years will it take for the sales of the app to grow to $100,000?
3. Solve each exponential equation. Round your answer to the nearest hundredth.
   a. $2 + 6^{x+3} = 18$ b. $\frac{3^{3x-1}}{4} = 9$
4. Subtract $\frac{2x}{x+7} - \frac{x+3}{x}$.