4.1

Is There a Pattern Here?

Recognizing Patterns and Sequences

LEARNING GOALS

In this lesson, you will:

- Recognize patterns.
- Describe patterns.
- Represent patterns as sequences.
- Predict the next term in a sequence.

KEY TERMS

- sequence
- term of a sequence
- infinite sequence
- finite sequence

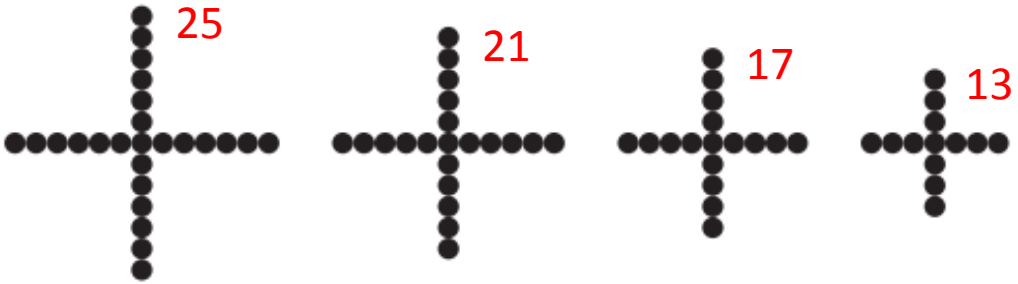
PROBLEM 1 Do You See a Pattern?

A **sequence** is a pattern involving an ordered arrangement of numbers, geometric figures, letters, or other objects. A **term of a sequence** is an individual number, figure, or letter in the sequence.

Examples of sequences are shown. Describe the pattern, draw or describe the next terms, and represent each sequence numerically.

How many dots does each figure have?

"Positive Thinking"



- Analyze the number of dots. Describe the pattern.

What is the difference between each figure?

Each figure has 4 fewer dots.

- Draw the next three figures of the pattern.

- Write the sequence numerically to represent the number of dots in each of the first 7 figures.

25, 21, 17, 13, 9, 5, 1

Family Tree

Jessica is investigating her family tree by researching each generation, or set, of parents. She learns all she can about the first four generations, which include her two parents, her parents' parents, her parents' parents' parents, and her parents' parents' parents' parents.

- Think about the number of parents. Describe the pattern.

  Each generation has 2 times the # of parents as the generation after it.

- Determine the number of parents in the fifth and sixth generations.

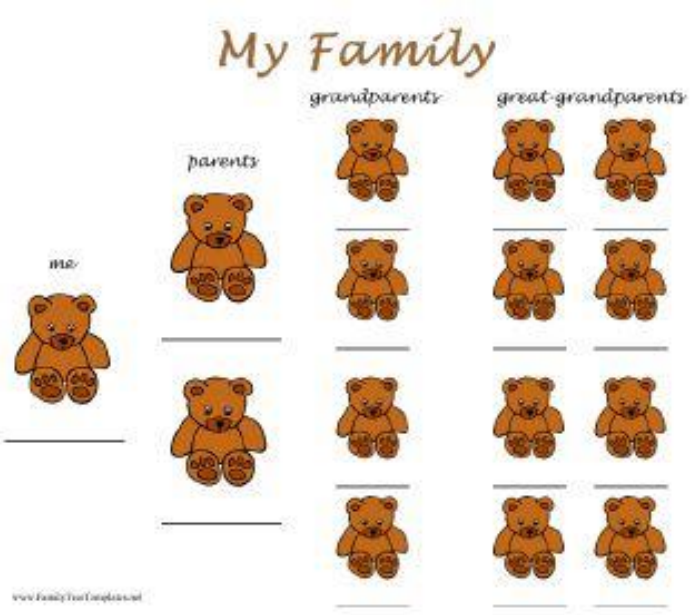
  5th generation - 2^5 or 32 parents

  6th generation - 2^6 or 64 parents

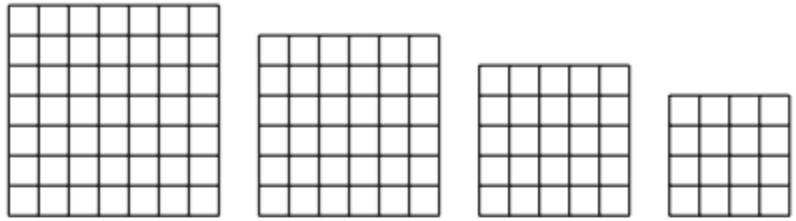
- Write a numeric sequence to represent the number of parents in each of the 6 generations.

  2, 4, 8, 16, 32, 64

If the 1st generation has 2 parents,
the 2nd generation has 4 parents,
the 3rd generation has 8 parents,
then…



A Collection of Squares



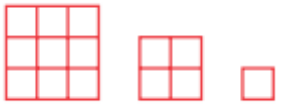
- Analyze the number of small squares in each figure. Describe the pattern.

  Each figure is a perfect square made up of smaller squares.

  1st figure - 7^2 or 49 squares 2nd figure - 6^2 or 36 squares

  3rd figure - 5^2 or 25 squares 4th figure - 4^2 or 16 squares

- Draw the next three figures of the pattern.



- Write the sequence numerically to represent the number of small squares in each of the first 7 figures.

  49, 36, 25, 16, 9, 4, 1

Al's Omelets

Al's House of Eggs N'at makes omelets. Al begins each day with 150 eggs to make his famous *Bestern Western Omelets*. After making 1 omelet, he has 144 eggs left. After making 2 omelets, he has 138 eggs left. After making 3 omelets, he has 132 eggs left.

- Think about the number of eggs Al has left after making each omelet. Describe the pattern.

  Al has 6 fewer eggs after each omelet.

- Determine the number of eggs left after Al makes the next two omelets.

  132 – 6 = 126 eggs are left after Al makes 4 omelets

  126 – 6 = 120 eggs are left after Al makes 5 omelets

- Write the sequence numerically to represent the number of eggs left after Al makes each of the first 5 omelets.

  150, 144, 138, 132, 126, 120

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Gamer Guru

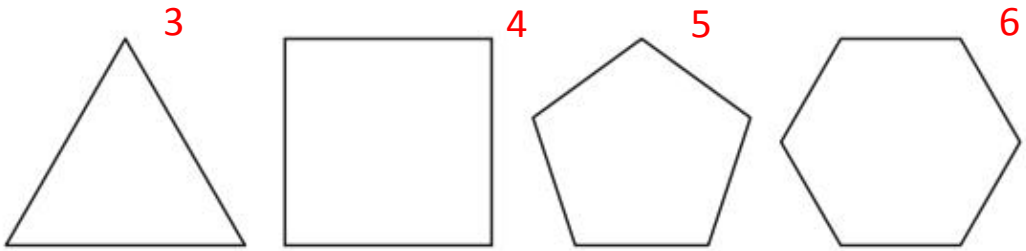
Mica is trying to beat his high score on his favorite video game. He unlocks some special mini-games where he earns points for each one he completes. Before he begins playing the mini-games (0 mini-games completed), Mica has 500 points. After completing 1 mini-game he has a total of 550 points, after completing 2 mini-games he has 600 points, and after completing 3 mini-games he has 650 points.

- Think about the total number of points Mica gains from mini-games. Describe the pattern.
  Mica gains 50 points after each mini-game.

- Determine Mica's total points after he plays the next two mini-games.
  After 4 mini-games - 700 points
  After 5 mini-games - 750 points

- Write the sequence numerically to represent Mica's total points after completing each of the first 5 mini-games. Include the number of points he started with.
  500, 550, 600, 650, 700, 750

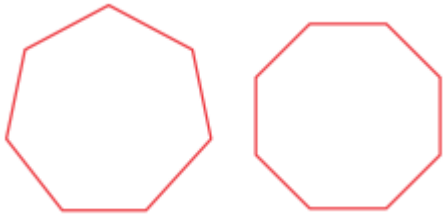
Polygon Party



- Analyze the number of sides in each polygon. Describe the pattern.

  Each figure has 1 more side than the previous polygon.

- Draw the next two figures of the pattern.



- Write the sequence numerically to represent the number of sides of each of the first 6 polygons. 3, 4, 5, 6, 7, 8

Pizza Contest

Jacob is participating in a pizza-making contest. Each contestant not only has to bake a delicious pizza, but they have to make the largest pizza they can. Jacob's pizza has a 6-foot diameter! After the contest, he plans to cut the pizza so that he can pass the slices out to share. He begins with 1 whole pizza. Then, he cuts it in half. After that, he cuts each of those slices in half. Then he cuts each of those slices in half, and so on.

- Think about the size of each slice in relation to the whole pizza. Describe the pattern.

  Each slice is ½ the size of the previous slice.

- Determine the size of each slice compared to the original after the next two cuts.

  1st cut - $\frac{1}{2}$ 2nd cut - $\frac{1}{4}$ 3rd cut - $\frac{1}{8}$

  4th cut - $\frac{1}{16}$ 5th cut - $\frac{1}{32}$

- Write the sequence numerically to represent the size of each slice compared to the original after each of the first 5 cuts. Include the whole pizza before any cuts.

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

Coin Collecting

Miranda's uncle collects rare coins. He recently purchased an especially rare coin for $5. He claims that the value of the coin will triple each year. So even though the coin is currently worth $5, next year it will be worth $15. In 2 years it will be worth $45, and in 3 years it will be worth $135.

- Think about how the coin value changes each year. Describe the pattern.

  The coin's value is 3 times greater each year.

- Determine the coin value after 4 years and after 5 years.

  In 4 years, the coin's value - $405 (= 135 × 3)

  In 5 years, the coin's value - $1215 (= 405 × 3)

- Write the sequence numerically to represent the value of the coin after each of the first 5 years. Include the current value.

  5, 15, 45, 135, 405, 1215