Unit 6, Lesson 2

Patterns of Growth

Let's compare different patterns of growth.

2.1 Which Three Go Together: Patterns of Values

Which three go together? Why do they go together?

Pattern A

$f(0) = 1$

$f(n+1) = f(n) + (-1)$

Pattern B

x	y
0	1
2	17
4	33
6	49
8	65

Pattern C

$f(0) = 1$

$f(n+1) = 4 \cdot f(n)$

Pattern D

$f(0) = 4$

$f(n+1) = f(n) + 4$

2.2 Growing Stores

A food company currently has 5 convenience stores. It is considering 2 plans for expanding its chain of stores.

Plan A: Open 20 new stores each year.

1. Use technology to complete a table for the number of stores for the next 10 years, as shown here.

year	number of stores	difference from previous year	factor from previous year
0	5	-	-
1	25		
2			
3			
4			
5			
6			
7			
8			
9			
10			

2. a. What do you notice about the difference from year to year?

   b. What do you notice about the factor from year to year?

   c. If there are n stores one year, how many stores will there be a year later?

3. a. What do you notice about the difference every 3 years?

   b. What do you notice about the factor every 3 years?

   c. If there are n stores one year, how many stores will there be 3 years later?

Plan B: Double the number of stores each year.

1. Use technology to complete a table for the number of stores for the next 10 years, as shown here.

year	number of stores	difference from previous year	factor from previous year
0	5	-	-
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

2. a. What do you notice about the difference from year to year?

   b. What do you notice about the factor from year to year?

   c. If there are n stores one year, how many stores will there be a year later?

3. a. What do you notice about the difference every 3 years?

   b. What do you notice about the factor every 3 years?

   c. If there are n stores one year, how many stores will there be 3 years later?

Are you ready for more?

Suppose the food company decides it would like to grow from the 5 stores it has now so that it will have at least 600 stores, but no more than 800 stores 5 years from now.

1. Come up with a plan for the company to achieve this in which it adds the same number of stores each year.
2. Come up with a plan for the company to achieve this in which the number of stores multiplies by the same factor each year. (Note that you might need to round the outcome to the nearest whole store.)

2.3 Flow and Followers

Here are verbal descriptions of 2 situations, followed by tables and expressions that could help to answer one of the questions in the situations.

- Situation 1: A person has 80 followers on social media. The number of followers triples each year. How many followers will she have after 4 years?
- Situation 2: A tank contains 80 gallons of water and is getting filled at a rate of 3 gallons per minute. How many gallons of water will be in the tank after 4 minutes?

Match each representation with one situation. Be prepared to explain how the representation answers the question.

A. $f(0) = 80$

$f(n+1) = f(n) \cdot 3$

$f(4) = 80 \cdot 3 \cdot 3 \cdot 3 \cdot 3$

B.

x	0	1	2	3	4
y	80	240	720	2,160	6,480

C. $f(0) = 80$

$f(n+1) = f(n) + 3$

$f(4) = 80 + 3 + 3 + 3 + 3$

D. $80 + 4 \cdot 3$

E.

x	0	1	2	3	4
y	80	83	86	89	92

F. $80 \cdot 81$

Lesson 2 Summary

Here are two tables representing two different situations.

- A student runs errands for a neighbor every week. The table shows the pay he may receive, in dollars, in any given week.

number of errands	pay in dollars	difference from previous week	factor from previous week
0	10	-	-
1	15	5	1.5
2	20	5	1.33
3	25	5	1.25
4	30	5	1.2

- A student at a high school heard a rumor that a celebrity will be speaking at graduation. The table shows how the rumor is spreading over time, in days.

day	people who have heard the rumor	difference from previous day	factor from previous day
0	1	-	-
1	5	4	5
2	25	20	5
3	125	100	5
4	625	500	5

Once we recognize how these patterns change, we can describe them mathematically. This allows us to understand their behavior, extend the patterns, and make predictions.

Notice that in the situation with the student running errands, the difference is constant from week to week, while the factor changes. In the situation about a rumor spreading, the difference changes from day to day, but the factor is constant. This can give us clues to how we might write out the pattern in each situation.