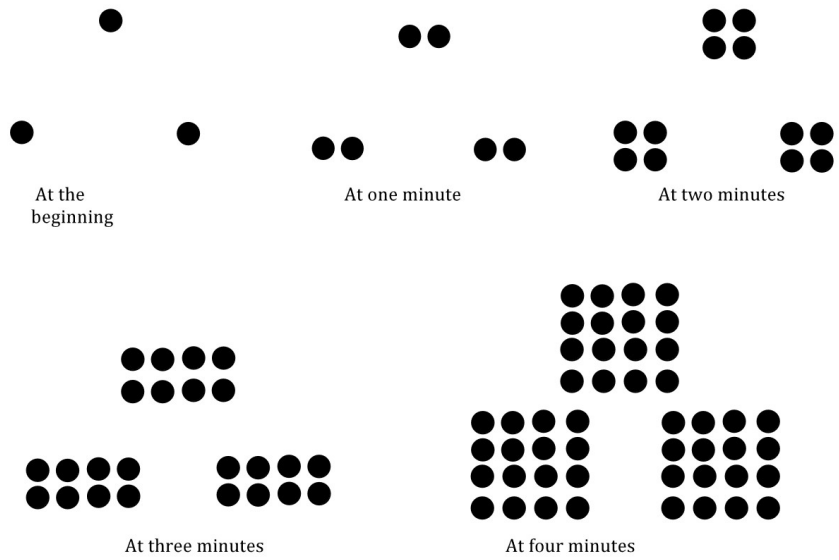
Lesson 1.3 Notes



Describe the pattern.	How many dots will there be at 5 minutes?	Recursive rule:	Explicit rule:
The number of dots doubles each minute	At the beginning = 3 At one minute = 6 At two minutes = 12 At three minutes = 24 At four minutes = 48 At five minutes = 96	$f(0) = 3$ (Remember this is the number of dots at the beginning) $f(x)$ = This term; $f(x-1)$ = Previous term; $\cdot 2$ = The pattern	$f(x) = 2^x \cdot 3$**

**If we remember lesson 1.2, we said that adding four dots each minute and having one dot at the beginning would mean that we would have an explicit formula $f(x) = 4x + 1$. So, let's go back to some basics $4 + 4 + 4 + 4 + 4 = 4 \cdot 5$. A repeated addition can be written as a multiplication.

The pattern in lesson 1.3 is a multiplication. As we are trying to write this explicit rule, we need to consider what a repeated multiplication can be written as. Again, if we remember what we practiced in lesson 1.2, we can write $2 \cdot 2 \cdot 2 \cdot 2 = 2^4$. In other words, a repeated multiplication can be written as an exponent. That is why our explicit formula starts with $f(x) = 2^x$.

Each dot gets doubled every minute. $f(x) = 2^x$ would model the situation where you have one dot at the beginning and it doubles every minute. Since there are three dots at the beginning, we need to multiply $f(x) = 2^x$ by 3 so that every dot gets doubled. Hence, our formula is $f(x) = 2^x \cdot 3$.

Other important notes from today:

A) Use the given table to identify the indicated value for n.
B) Then using the value for n that you determine in A, use the table to find the indicated value for B.

n	1	2	3	4	5	6	7	8	9
$f(n)$	-1	2	-4	8	-16	32	-64	128	-256

A) When $f(n) = -16$, what is the value of n? We find -16 on the bottom row, the corresponding number on the top row is 5. So, $n = 5$.
B) What is the value of $f(n-1)$? The $n-1$ tells us to go back one space from the -16 that we were at. We are reading the $f(n)$ row. So, $f(n-1) = 8$.

A) When $f(n) = 2$, what is the value of n? We find 2 on the bottom row, the corresponding number on the top row is 2. So, $n = 2$.

B) What is the value of $f(n + 3)$? The $n + 3$ tells us to go forward three spaces from the 2 that we were at. We are reading the $f(n)$ row. So, $f(n + 3) = -16$.

A) When $f(n) = -256$, what is the value of n? We find -256 on the bottom row, the corresponding number on the top row is 9. So, $n = 9$.

B) What is the value of $f(n - 5)$? The $n - 5$ tells us to go back five spaces from the -256 that we were at. We are reading the $f(n)$ row. So, $f(n - 5) = 8$.

Use the given information to decide which equation will be the easiest to use to find the indicated value. Find the value and explain your choice.

The value of the 7th term is 32. The sequence is increasing by 5 at each step.

Explicit equation: $y = 5x - 3$

Recursive: $now = previous\ term + 5$

Find the value of the 8th term.

Since we are given the 7th term, it is easy to use the recursive rule to find the 8th term and just take the 7th term and add 5. So, the value of the 8th term is 37.

Find the value of the 40th term.

The 40th term is a long ways away from the 7th term. Typically, we don't want to sit down with a calculator and add 5 that many times. So, this is easier to solve using the explicit formula. We plug the term number in for x. $f(40) = 5(40) - 3 \Rightarrow f(40) = 200 - 3 \Rightarrow f(40) = 197$. The 40th term is 197.

Find the value of each.

1) 2^1 $2 = 2$

2) 2^2 $2 \times 2 = 4$

3) 2^3 $2 \times 2 \times 2 = 8$

4) 2^4 $2 \times 2 \times 2 \times 2 = 16$

5) 2^5 $2 \times 2 \times 2 \times 2 \times 2 = 32$

6) $(-2)^1$ $-2 = -2$

7) $(-2)^2$ $-2 \times -2 = 4$

8) $(-2)^3$ $-2 \times -2 \times -2 = -8$

9) $(-2)^4$ $-2 \times -2 \times -2 \times -2 = 16$

10) $(-2)^5$ $-2 \times -2 \times -2 \times -2 \times -2 = -32$

11) -2^1 $-2 = -2$

12) -2^2 $-2 \times 2 = -4$

13) -2^3 $-2 \times 2 \times 2 = -8$

14) -2^4 $-2 \times 2 \times 2 \times 2 = -16$

15) -2^5 $-2 \times 2 \times 2 \times 2 \times 2 = -32$

Notice that the negative inside ( ) creates an alternating sign, while a negative outside the ( ) creates all negative.