4.4: Tables & Sequences

SWBAT:

Identify patterns in function tables and use them to write function definitions Distinguish between arithmetic and geometric sequences Write function definitions based on sequences of numbers

> Assignments: HW27B

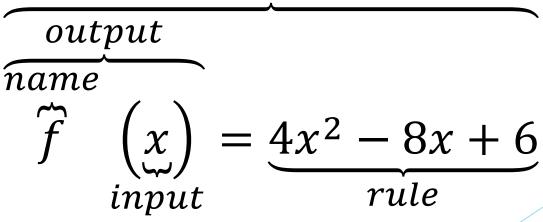
Review

Function:

- A relationship in which one value from the domain is matched with <u>exactly</u> one value from the range
- Domain: The set of input values to a function
- Range: The set of output values
- Function notation:

definition

Remember: the variable used for the input must be the *same* variable used in the function rule.



Tables

- Tables give us lists of input and output values.
- They are useful when we want specific points of data, or for giving us a starting point to graphing a function.
- Remember, that in function notation, a single variable (e.g. x) represents an *input* value. Output values are represented using the *name* and the *input* (e.g. f(x))

Determine whether the relation is a function.

x	У
1	-3
6	-2
9	-1
1	3

Complete the table.

C(x) = 3x + 1C(x)5 -2 6 -26 -14 19

1. $f(t) = 4t + 3$	t	f(t)
2. $g(n) = -n + 7$	0	
3. $A(l) = \frac{1}{2}l$		-13
4. $B(a) = \frac{1}{2}a - 3$		11
		23
	n	g (n)
	<i>n</i> -2	g (n)
		<i>g</i> (<i>n</i>) 4

l	A(l)
4	
	3
	-9
	2
а	B (a)
6	
	0
	-3
	-4

Writing the function definition from a table

- To find the function rule, look for a pattern relating the input to the output.
- Question to ask: How do I get from the input to the output?
- Be sure to check that the rule works for every pair of values in the table!

x	f(x)
0	5
1	6
2	7
3	8

x	$\boldsymbol{g}(\boldsymbol{x})$	
0	0	
1	5	
2	10	
3	15	
n	h (n)	
0	2	
1	3	
2	4	
3	5	

Write the function definition

x	g(x)
-1	-5
0	-4
1	-3
2	-2

x	f(x)
-2	8
0	0
2	-8
5	-20

k	j (k)
-10	-5
0	5
25	30
41	46

t	h(t)
4	6
12	14
15	17
31	33

Write the function definition

x	$\boldsymbol{g}(\boldsymbol{x})$
-13	13
-4	4
2	2
15	15

d	A(d)
-3	-12
-2	-10
-1	-8
0	-6

x	t(x)
0	-7
1	-5
2	-3
3	-1

k	p (k)
0	0
2	1
4	2
6	3
/	

Sequences

A **sequence** is a list of numbers in a specific order.

- **Example:** 1, 1, 2, 3, 5, 8, 13, 21, ...
- Question: Is a sequence a function? Discuss with a partner.
- Answer: Yes!
 - The domain of a sequence is the set of whole numbers and indicates the position in the sequence (e.g. first, third, twentieth...)
 - > The range of a sequence is the actual numbers in the sequence
 - So in the Fibonacci sequence, the ordered pairs would be {(1,1), (2,1), (3,2), (4,3), (5,5), (6,8), (7,13), ... }
- There are many, many types of sequences, but we're only looking at a few today.

Arithmetic Sequences

- Figure out the pattern.
- ▶ 1, 4, 7, 10 ...
- An arithmetic sequence is a sequence made by adding the same number every time
- The number added each time is called the common difference

- Identify the common difference and find the next three terms.
- ▶ 3, 15, 27, ...
- ▶ 10, 8, 6, 4, ...
- ▶ -4, -1.5, 1, 3.5, 6, ...
- ▶ 10, -13, -36, -59, ...

Geometric Sequences

- Figure out the pattern.
- ▶ 4, 8, 16, ...
- An geometric sequence is a sequence made by multiplying the same number every time
- The number multiplied each time is called the common ratio
- The common ratio can be a fraction, but is never 0 or 1

- *Identify the common ratio and find the next three terms.*
- > $3, 1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \dots$
- 2, 20, 200, 2000, ...
- ▶ -4,20, -100, 500, ...
- **400, 200, 100, 50, ...**

Writing Functions of Sequences

There are a *lot* of functions and formulas that can be written to describe sequences. Today we're focusing on *explicit* functions for two kinds of sequences.

Arithmetic Sequences

- $\blacktriangleright a(n) = I + d(n-1)$
- \triangleright *n* is the input
- I is the initial or starting value
- d is the common difference
- ▶ (n-1) is the previous term
- Note: this is a linear function

Geometric Sequences $g(n) = I * r^{n-1}$

- \triangleright *n* is the input
- I is the initial or starting value
- ▶ *r* is the common ratio
- (n-1) is the previous term

Write the explicit function definitions for the sequences

- ▶ 1, 4, 7, 10 ...
- *1.* 3, 15, 27, ...
- *2.* 10, 8, 6, 4, ...
- *3.* −4, −1.5, 1, 3.5, 6, ...
- *4.* 10, -13, -36, -59, ...

▶ 4, 8, 16, ...

- 1. $3, 1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \dots$
- *2.* 2, 20, 200, 2000, ...
- *3.* −4,20, −100, 500, ...
- *4.* 400, 200, 100, 50, ...