Algebra 1B Live Lesson

U1L4 – Review of Linear Functions

Agenda

1. Review selected problems and topics from U1L4

2. Use the 2-column note system to take better notes in math class. Bring your math notebook and pen or pencil to each math LiveLesson class.

2-Column Notes Template

1. Announcements/To Do's	1. Write down important details.
2. School-Wide Learner Outcomes	2. What are you going to work on this week?
3. LL Objectives	
4. Vocabulary words	4. Definitions (fill in as we go)
5. Problems	5. Steps to solving problems
6. Summary (End of class)	6. 1 or 2 sentences about the LL class.

Reminders and To – Do's

Information	What to do
1. Complete 1 math lesson per day.	1. Go to your Planner in Connexus to find the math lesson for the day
2. Check your WebMail every day	2. Go to Connexus to find WebMail
3. Be prepared to spend 4 - 6 hours per day on schoolwork.	3. Complete lessons for the day from your Planner. Do not get behind on lessons.
4. Remind your Learning Coach to take daily attendance	4. Have your Learning Coach log into Connexus daily.

Reminders and To – Do's

Information	What to do
5. Go to the Message Board first for information about our math class.	
6. Contact Mr. Elizondo for math questions. Remember: You need at least 2 phone calls with Mr. Elizondo per semester.	6. Call (559) 549 - 3244 and leave a voicemail if call is not answered. Make an appointment at: https://elizondo.youcanbook.me Send a WebMail

California Common Core State Standards

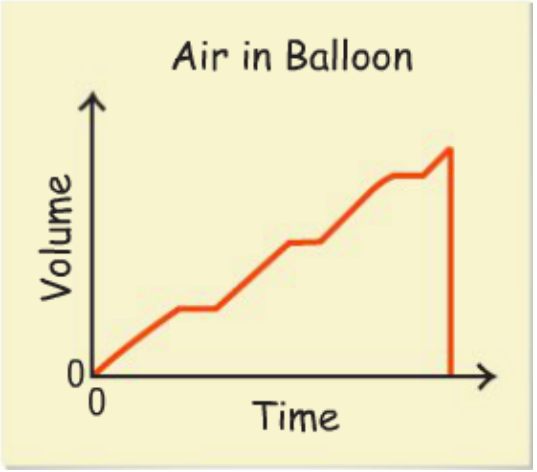
- HSF-IF.A.1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
- HSF-BF.A.1: Write a function that describes a relationship between two quantities.
- HSF-IF.C.7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- HSF-IF.A.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- HSF-IF.B.5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
- HSF-LE.A.2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- HSF-IF.A.3: Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
- HSF-BF.A.2: Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

U1L4 - Objectives

1. Represent mathematical relationships using graphs.
2. Identify and represent patterns that describe linear functions
3. Graph equations that represent functions
4. Write equations that represent functions
5. Determine whether a relation is a function
6. Find domain and range
7. Use function notation

U1L4 - Analyzing a Graph

The graph shows the volume of air in a balloon as you blow it up, until it pops. What are the variables? Describe how the variables are related at various points on the graph.



The variables are volume and time. The volume increases each time you blow, and it stays constant each time you pause to breathe. When the balloon pops in the middle of the fourth blow, the volume decreases to 0.

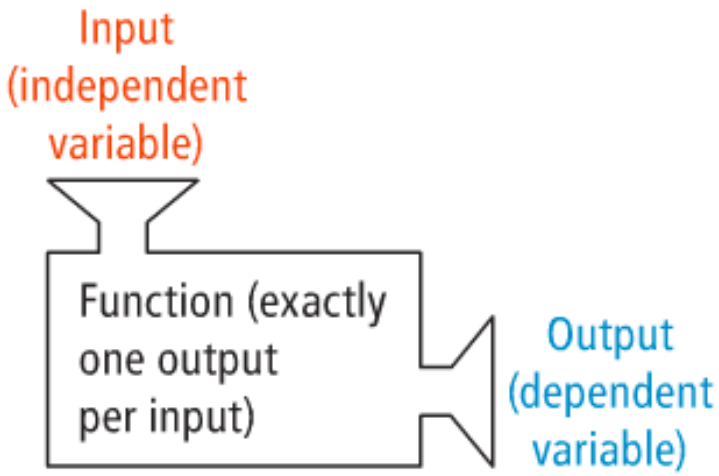
U1L4 – Patterns and Linear Functions

- In a relationship between variables, the ***dependent variable*** changes in response to another variable, the ***independent variable***.
- Values of independent variable are called ***inputs***. Values of the dependent variable are called ***outputs***.

U1L4 - Patterns and Linear Functions

A **function** is a relationship that pairs each input value with exactly one output value.

You have seen that one way to represent a function is with a graph. A **linear function** is a function whose graph is a nonvertical line or part of a nonvertical line.



U1L4 – Non-linear functions

- A ***nonlinear function*** is a function whose graph is not a line or part of a line.
- Just like linear functions, non linear functions can be represented using words, tables, equations, sets of ordered pairs, and graphs.

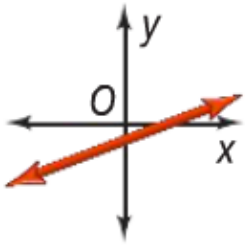
U1L4 - Non-linear functions

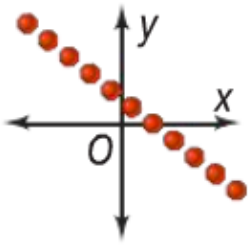
take note

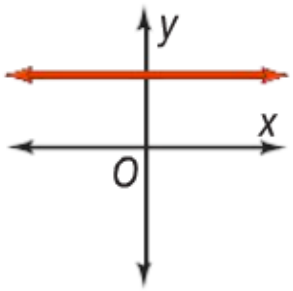
Concept Summary Linear and Nonlinear Functions

Linear Function

A linear function is a function whose graph is a nonvertical line or part of a nonvertical line.

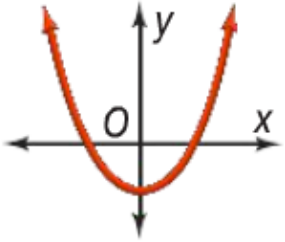


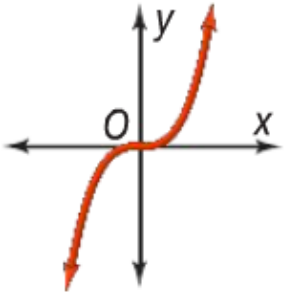


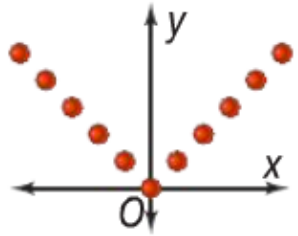


Nonlinear Function

A nonlinear function is a function whose graph is not a line or part of a line.







U4L1 - Classifying Equations as Linear or Nonlinear

Pizza The area A, in square inches, of a pizza is a function of its radius r, in inches. The cost C, in dollars, of the sauce for a pizza is a function of the weight w, in ounces, of sauce used. Graph these functions shown by the tables below. Is each function *linear* or *nonlinear*?

Pizza Area

Radius (in.), r	Area (in.^{2}), A
2	12.57
4	50.27
6	113.10
8	201.06
10	314.16

Sauce Cost

Weight (oz), w	Cost, C
2	\$.80
4	\$1.60
6	\$2.40
8	\$3.20
10	\$4.00

U4L1 - Classifying Equations as Linear or Nonlinear

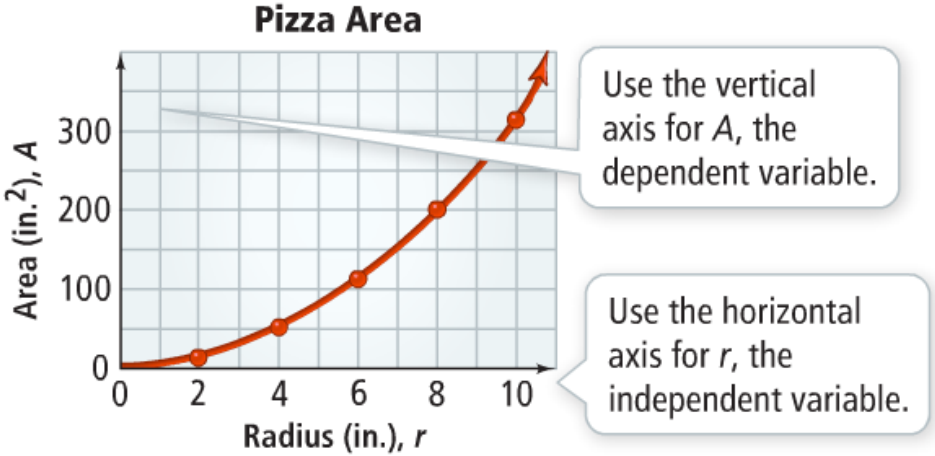
Pizza Area

Radius (in.), r	Area (in.^{2}), A
2	12.57
4	50.27
6	113.10
8	201.06
10	314.16

Sauce Cost

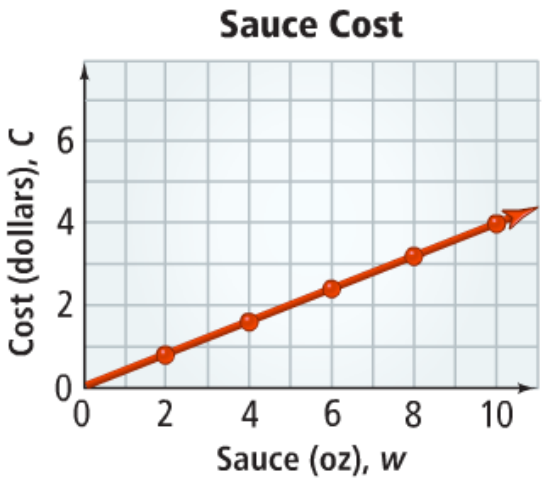
Weight (oz), w	Cost, C
2	$.80
4	$1.60
6	$2.40
8	$3.20
10	$4.00

Graph A as a function of r.



The graph is a curve, not a line, so the function is nonlinear.

Graph C as a function of w.



The graph is a line, so the function is linear.

U1L4 - Graphing Equations that represent functions

- The set of all solutions of an equation forms the equation's graph.
- A graph may include solutions that do not appear in a table.
- A real-world graph should only show points that make sense in the given situation.

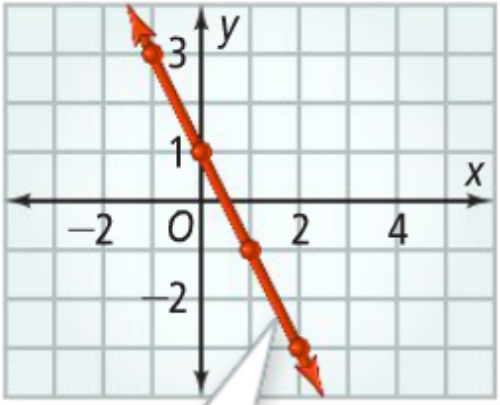
U1L4 - Graphing a Function Rule

What is the graph of the function rule $y = -2x + 1$?

Step 1 Make a table of values.

x	$y = -2x + 1$	(x, y)
-1	$y = -2(-1) + 1 = 3$	$(-1, 3)$
0	$y = -2(0) + 1 = 1$	$(0, 1)$
1	$y = -2(1) + 1 = -1$	$(1, -1)$
2	$y = -2(2) + 1 = -3$	$(2, -3)$

Step 2 Graph the ordered pairs.



Connect the points with a line to represent *all* solutions.

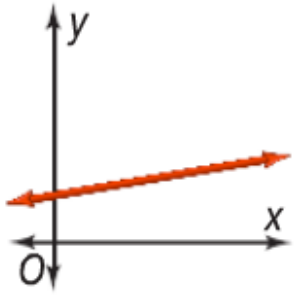
U1L4 - Continuous and Discrete Graphs

take note

Key Concept Continuous and Discrete Graphs

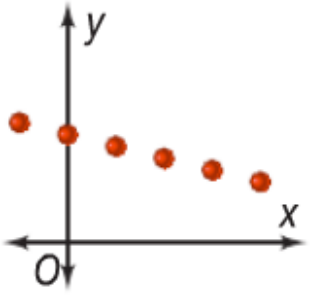
Continuous Graph

A **continuous graph** is a graph that is unbroken.



Discrete Graph

A **discrete graph** is composed of distinct, isolated points.



U1L4 - Graphing Nonlinear Function Rules

$$y = |x| - 4$$

Step 1

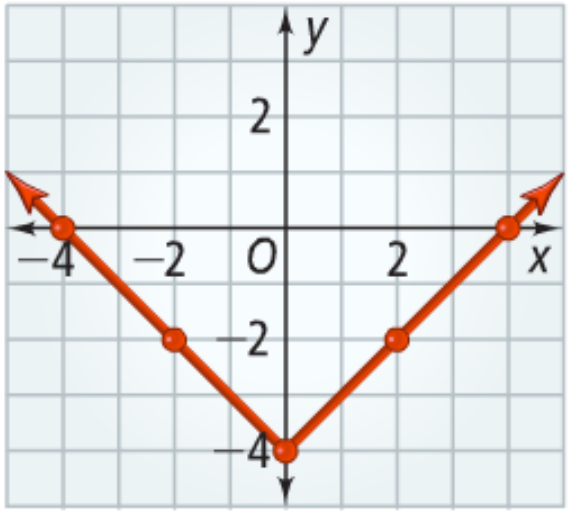
Make a table of values.

x	$y = \|x\| - 4$	(x, y)
-4	$y = \|-4\| - 4 = 0$	$(-4, 0)$
-2	$y = \|-2\| - 4 = -2$	$(-2, -2)$
0	$y = \|0\| - 4 = -4$	$(0, -4)$
2	$y = \|2\| - 4 = -2$	$(2, -2)$
4	$y = \|4\| - 4 = 0$	$(4, 0)$

Step 2

Graph the ordered pairs.

Connect the points.



U1L4 - Graphing Nonlinear Function Rules

$y = x^2 + 1$

Step 1

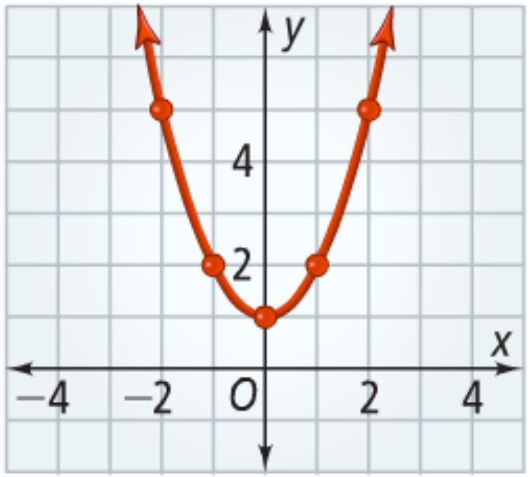
Make a table of values.

x	$y = x^2 + 1$	(x, y)
-2	$y = (-2)^2 + 1 = 5$	$(-2, 5)$
-1	$y = (-1)^2 + 1 = 2$	$(-1, 2)$
0	$y = 0^2 + 1 = 1$	$(0, 1)$
1	$y = 1^2 + 1 = 2$	$(1, 2)$
2	$y = 2^2 + 1 = 5$	$(2, 5)$

Step 2

Graph the ordered pairs.

Connect the points.



U1L4 - Writing and Evaluating a Function Rule

A vet charges $15 per day to board a dog. When a dog arrives, each dog must have a flea bath that costs $12. Write a function rule for the total cost for *n* days of boarding plus a bath. How much does a 10-day stay cost?

A function rule is $C = 15n + 12$

If n = 10 days, plug in the value of 10 into the function rule.

$$C = 15(10) + 12$$

$$C = 150 + 12$$

$$C = 162$$

A 10-day stay would cost $162.

U1L4 - Relations

A *relation* is a pairing of numbers in one set with numbers in another set

One set is called the *domain* (input)

The other set is called the *range* (output)

A common way of representing *relations* is by writing a **set** of ordered pairs (x, y)

U1L4 - Relations

An example of a relation:

{ (-2, 3), (4, 6), (10, 2.4) }

The *domain* is represented by the x-values

The *range* is represented by the y-values

So in this set…

The domain is { -2, 4, 10}

The range is { 3, 6, 2.4}

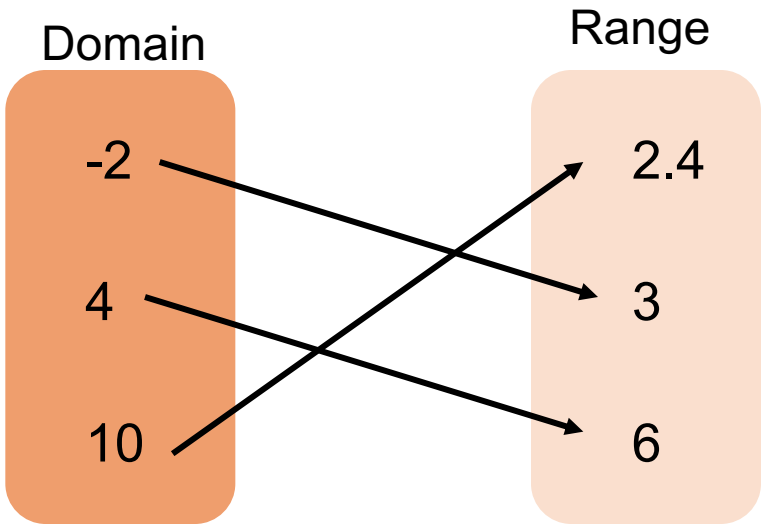
U1L4 - Mapping Diagrams

Another way to represent relations

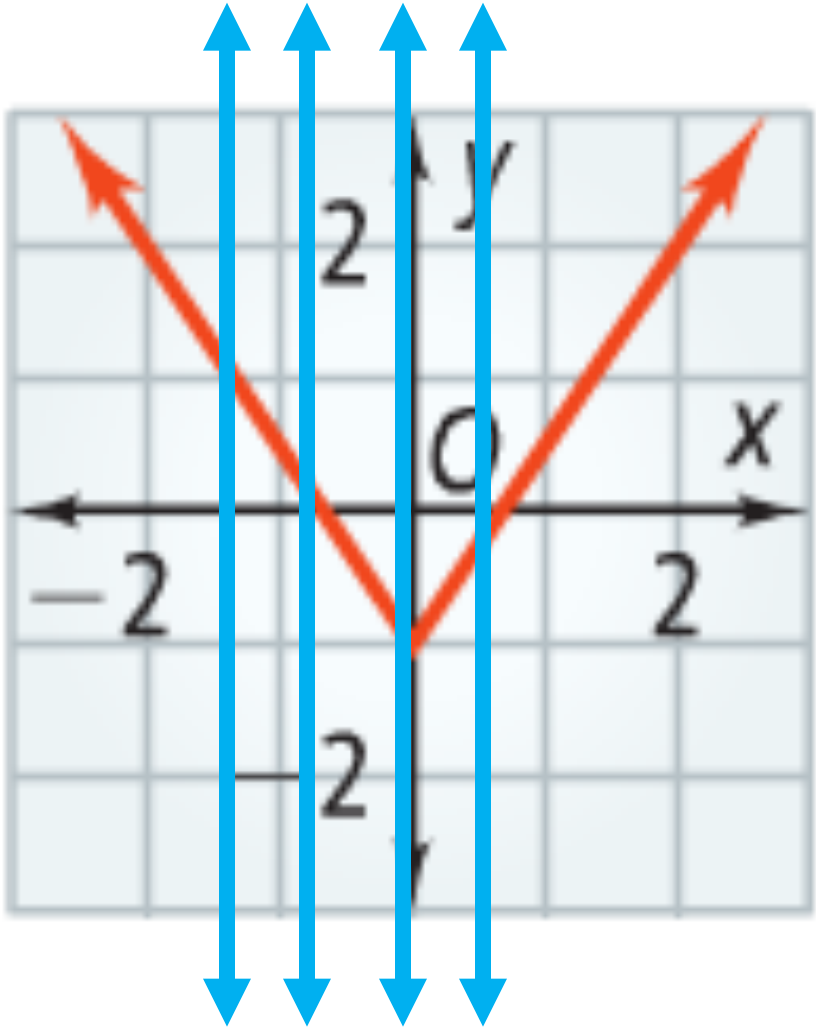
{ (-2, 3), (4, 6), (10, 2.4) }

The domain is { -2, 4, 10}

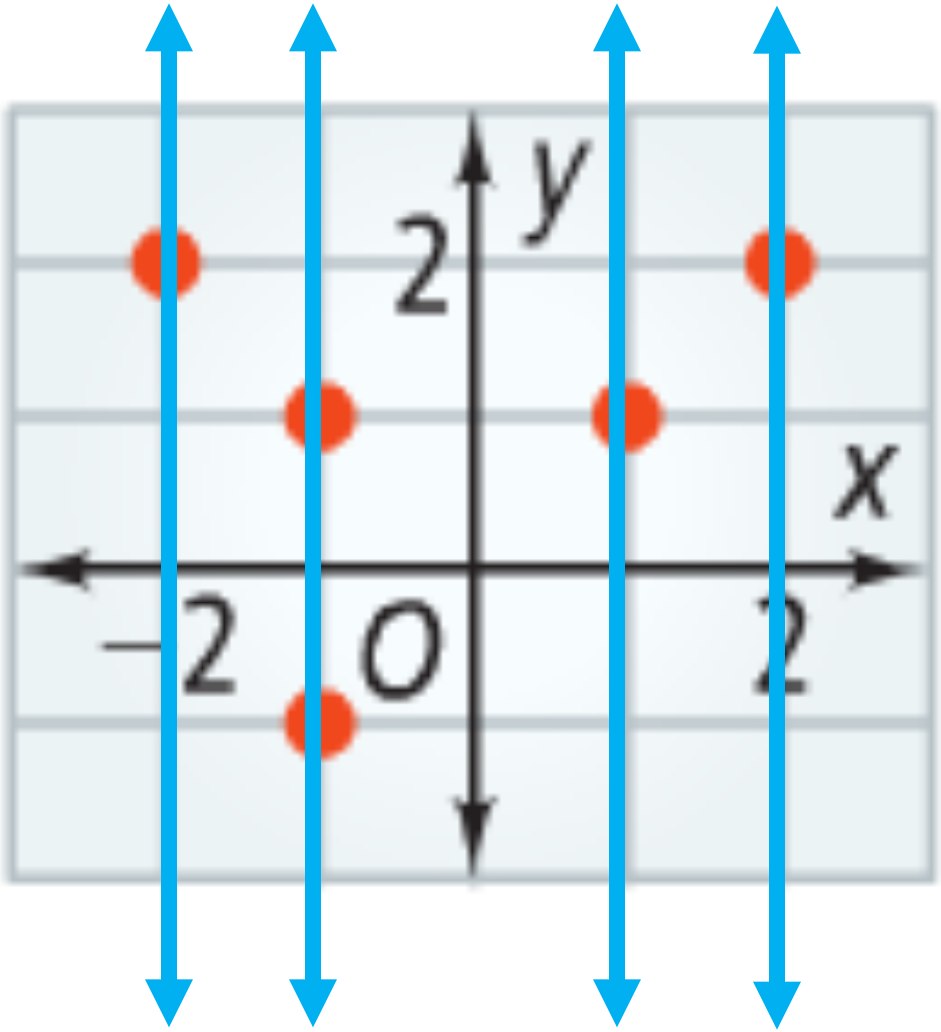
The range is { 3, 6, 2.4}



U1L4 - Vertical Line Test



U1L4 - Vertical Line Test



U1L4 - Function Notation

Why do we need function notation then?

$$y = -3x + 1$$

$$\boldsymbol{f(x) = -3x + 1}$$

Function notation helps us identify the independent variable x.

U1L4 - Evaluating a Function

What is *f(2)* for the function *f(x)* = 4x + 1?

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

$$f(2) = 4(2) + 1$$

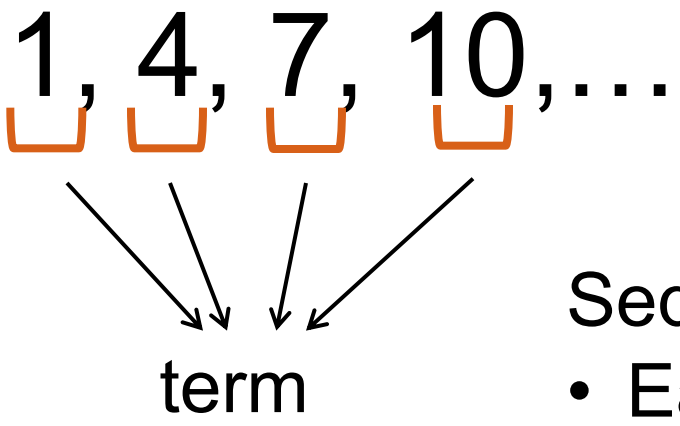
$$f(2) = 8 + 1$$

$$f(2) = 9$$

U1L4 - Sequence

A **sequence** is an ordered list of numbers that often form a pattern

Each number in the list is called a **term of a sequence**



Sequence Pattern:

- Each term increases by 3

U1L4 - Arithmetic Sequence - Function Rule

- Write a rule for an arithmetic sequence with a first term of 9 and a common difference of -2. What is the seventh term of the sequence?

$$A(n) = A(1) + (n-1)(d)$$

$$A(7) = 9 + (7-1)(-2)$$

$$A(7) = 9 + (6)(-2)$$

$$A(7) = 9 + (-12)$$

$$A(7) = -3$$

$$A(1) = 9$$

$$n = 7$$

$$d = -2$$

Questions?

- Check the Message Board first
- Send a WebMail
- You can also make an appointment at https://elizondo.youcanbook.me
- You can also call me at (559) 549-3244. If I'm not available to answer your call, please leave a voicemail with your full name and phone number.