Functions1a - What is a Function?

Standards F-IF.1, F-IF.9

GLOs: #3- Complex Thinker

Math Practices:
-Reason abstractly & quantitatively
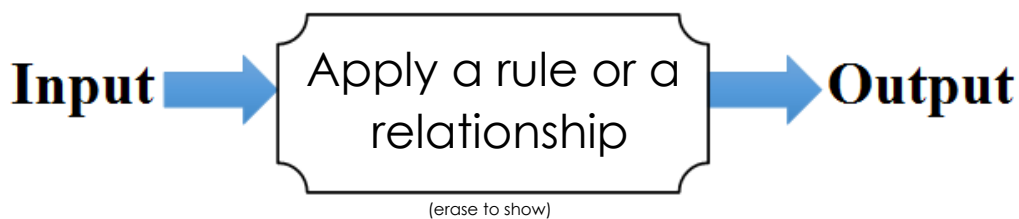
HW#4: Func 1a ws #1-5

Learning Target(s):
What is a function, domain, & range?
How can you tell when you have a function?

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Functions arise very naturally in the world around us, and we use them every day without even thinking about it. A simple way to think about a function is to picture an "input-output" machine:

Input ➡ Apply a rule or a relationship ➡ **Output**

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1. The statements below represent real world situations that are examples of functions. Create a possible table of values for the situation.
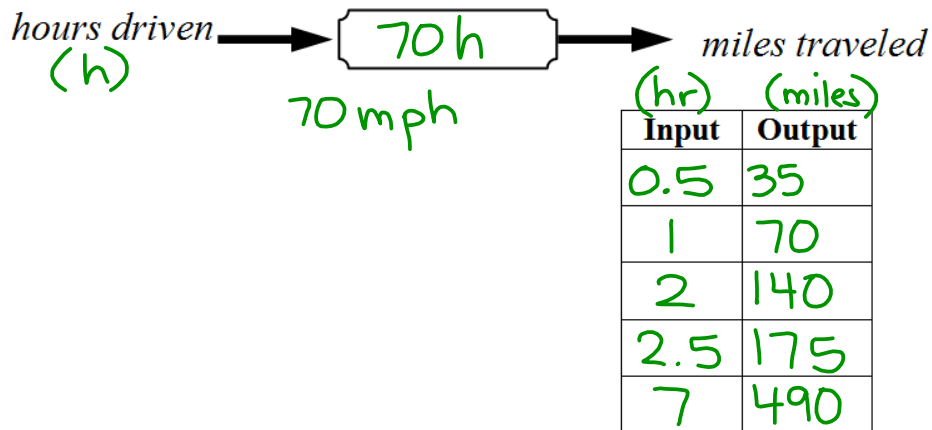
a. The total cost (output) for buying a designated number (input) of pounds of apples.

pounds of apples ➡ 2a ➡ *total cost*

$2/lb

(a)
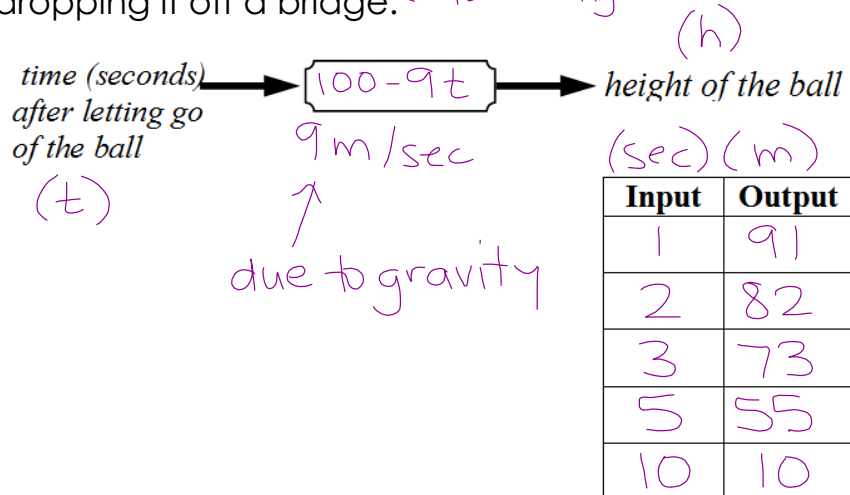
Input	Output
1	$2
1.5	$3
3	$6
5	$10
10	$20

b. The number of miles (output) traveled after driving for x-hours (input) after beginning a trip.

hours driven (h) → $70h$ → miles traveled (h)

$70\,mph$

(hr) Input	(miles) Output
0.5	35
1	70
2	140
2.5	175
7	490

c. The height (output) of a ball, t-seconds (input) after dropping it off a bridge. ← 100m high

time (seconds) after letting go of the ball (t) → $100-9t$ → height of the ball (h)

$9\,m/sec$

↑ due to gravity

(sec) Input	(m) Output
1	91
2	82
3	73
5	55
10	10

d. The official high temperature (output) each day of 2013 (input) at the Honolulu Airport

n^{th} day of the year → → highest temperature on that day

varies ↗

	Input	Output
Jan	1	70°
April	100	80°
June/July	180	90°
August	250	97°
December	350	71°

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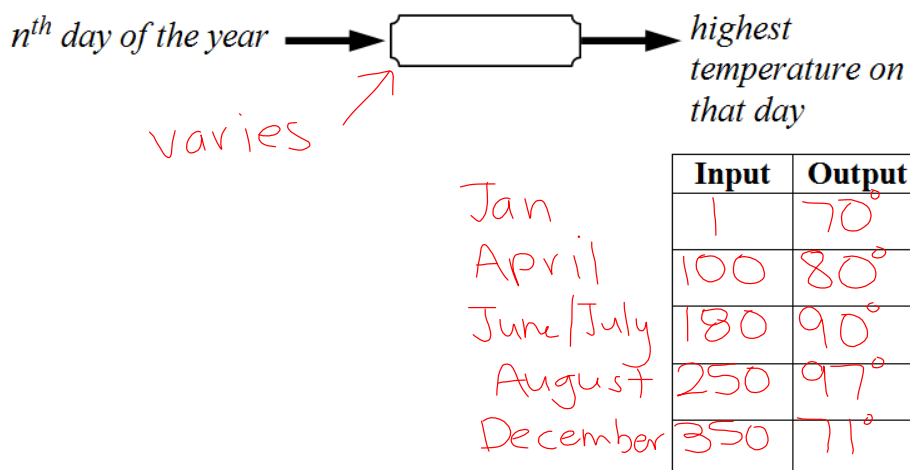
There is another important characteristic of a function: the number of possible outputs for each input.

2. Refer back to the table of values you created in question #1. For the situations can you think of any input values that would result in more than 1 output value? For example:

   · If you go to the cashier to buy x pounds of apples, is there any number of pounds that would result in more than one total cost?

   · If you drop a ball over the side of a bridge, is there any moment in time when the ball could be at 2 different heights?

If you answered "yes" for your situation, provide an example. If you cannot think of an example, state "none".

None, each input would only give us 1 output.

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3. The data in the table below was collected by measuring the height and weight of several students in Mrs. Okunaga's Algebra 2 class.

Height (in.)	61	67	63	71	70	63	63	67	70	64	73	65
Weight (lb.)	120	162	144	168	170	139	133	188	182	145	175	165

Are there any input values (height) that have more than 1 output value (weight)? If so, circle all input values that have more than 1 output value.

4. Elijah wanted to know how fast he could run from one goal line of a football field to the other goal line and then turn around and run back to where he started. His friend timed him and recorded the data in the table below.

input
output

Distance from starting point (yds.)	0	20	40	60	80	100	80	60	40	20	0
Time (seconds)	0	5	9	13	18	21	28	34	41	47	55

Are there any input values (distance from starting point) that have more than 1 output value (time)? If so, circle all input values that have more than 1 output value.

Definition: *A function is a collection of input/output pairs such that <u>for each input</u> there is* **<u>Exactly One Output.</u>** *"one-to-one"*

(erase to show)

Equivalently: *A function is a collection of ordered pairs (e.g. (x,y)), no two of which have the same first coordinate.*

5. Based on this definition explain whether the collection of input/output pairs in questions #3 and #4 above is a function or not a function. Provide an example from the data set to support your conclusion.

a. Height and weight of students in Mrs. Okunaga's Algebra 2 class:

No, the inputs 63,65,&70 have multiple outputs.

b. The distance and time as Elijah ran on a football field from one end to the other and back:

No, all inputs except 100 have multiple outputs.

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  DOMAIN : The **set of INPUTS** for a function (or, all possible numbers that could be used as an input value for the function).

  RANGE : The **set of OUTPUTS** for a function (or, all possible numbers that could result as output values for the function).

For example, in a function relating the number of hours worked to the amount of money earned:

· the **Domain** would be the set of all numbers that you could possibly work in one week;

· the **Range** would be the set of all the possible amounts that you could earn for numbers in the domain.

Domain *(all possible number of hours worked)*		*Range* *(all possible amounts that you could earn)*
4 16 35 . . . x	$12 per hour	$48 $192 $420 . . . $12x
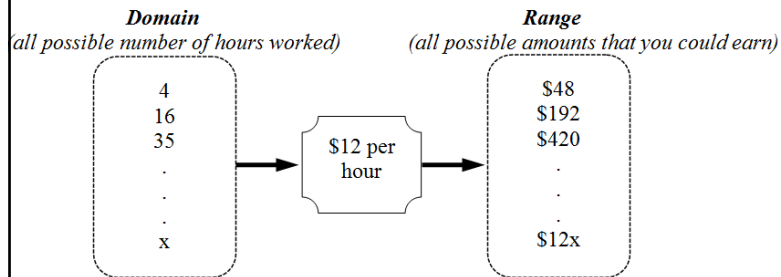
6. Decide whether each of the following represents a function and either describe or create a table of values to show what the domain and range might be. For each non-function explain why it fails to be a function.

a. The distance (output) you have left to walk on your way home from school after the amount of time (input) that you started walking. Assume you walk home at a constant rate of 3 miles per hour.

Yes, this is a function because each input will only have 1 output.

time (hr)	distance (mi)
0	15
1	12
2	9

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