Intro. to Functions and Intervals

Relation vs. Function

Relation – Any set of _____ _____

Example 1: Average Gross Monthly Salaries=
{(Physician, $11,698),(Airline Pilot, $5,884), (Computer Programmer, $5,378),
(Salesperson, $2,260), (furniture finisher, $1,977)}

Domain ("input") – The set of all _____ components in a relation.
(a.k.a. *x-values*)

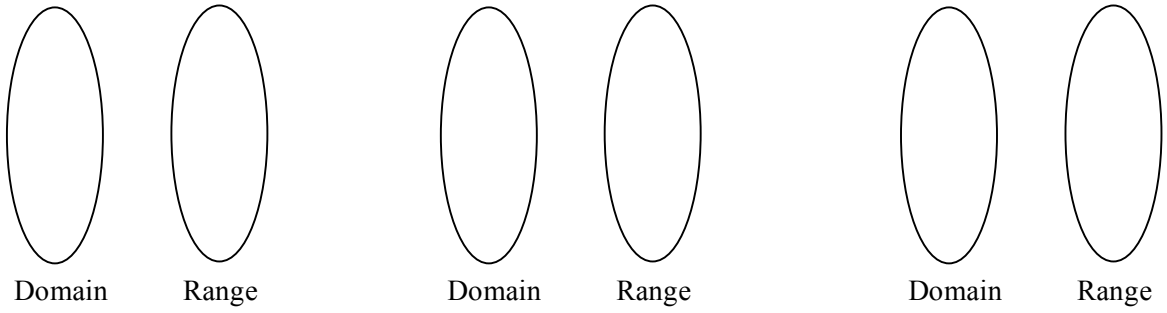
Range ("output")– The set of all _____ components in a relation.
(a.k.a. *y-values*)

Example 2:
Salary Domain:
{physician, airline pilot, computer programmer, salesperson, furn. Finisher}
Salary Range : { $11,698 , $5,884, $5,378, $2,260, $1,977}

Mapping: A relation can be mapped to show how the domain is connected to the range.

Example 2: *Draw a map for these relations.*

a. {(2,0), (4,2),(5,1),(10,12)} b. {(3,4),(5,4),(6,-1),(7,5)} c. {(3,2),(3,9),(4,6),(5,9)}



Functions

Some relations are unique because they define *one specific outcome for every domain element.*

Example 3: Which of the following statements are *always* true?

a. A person's height is determined by their age.
b. An hourly employee's paycheck is determined by the hours they work.
c. A person's vision is determined by the amount of T.V. they watch.
d. The distance a car drives on the freeway (at the speed limit) is determined by the amount of time it drives.
e. The number of assigned homework problems and the time needed to complete them.

Which of these statements describe functions?

Definition: *A* ***function*** *is a relation such that*

for every _____(x) value, there is only one _____(y) value

Basically, a ***function*** *is a tool that changes one set of numbers into another.*

Example 2b: Which relations in Example 2 are functions?

Definition: ***Function Notation*** *is a useful way to describe how a function maps one number to another*

$f(a) = b$ *if the function "f" maps a to b*

Or, we can say "b" is the output of "a".

We can also view the sets in Example 2 as tables:

Example 2c: {(2,0), (4,2),(5,1),(10,12)} → Is it a function?

x	2	4	5	10
$f(x)$	0	2	1	12

Find these values:

$f(2) =$ $f(5) =$ $f(2) + f(5) =$ $2f(5) =$

Function as equations and graphs

We have seen how functions change one set of numbers (the domain) into another set (the range).

So far, it just looks like these are random connections. In real life, these connections do appear random, or at least very complicated (like daily temperatures and stock market levels).

For functions that we will study, there is a method to the madness!

Consider these:

Find an equation that describes these functions (most will be familiar… $e(x)$ is tough!)

x	$a(x)$
-1	-2
0	0
1	3
2	6
3	9
4	12

x	$b(x)$
-1	1
0	0
1	1
2	4
3	9
4	16

x	$c(x)$
-1	Does Not Exist!
0	0
1	1
4	2
9	3
16	4

x	$d(x)$
-1	½
0	1
1	2
2	4
3	8
4	16

x	$e(x)$
0	Does Not Exist!
1	0
2	1
4	2
8	3
16	4

$a(x) =$ $b(x) =$ $c(x) =$ $d(x) =$ $e(x) =$

Remember these definitions:

Domain: Set of all *possible* inputs for a function
Range: Set of all *possible* outputs for a function

Find the domain and range for each of the functions above. Describe them using inequalities.

Function	$a(x)$	$b(x)$	$c(x)$	$d(x)$	$e(x)$
Domain					
Range					

Interval Notation

We are not going to briefly look at another way to describe a set of numbers. We'll use this more later, so don't stress too much about getting a firm grasp on this!

Let's play a game… I'm thinking of a positive number that is not larger than 10? Can you guess it?

When talking about functions, we will often want to talk about an "Interval" of numbers. For example, we may want to describe:

$$"all\ real\ numbers\ that\ are\ greater\ than\ 0, but\ not\ larger\ than\ 10"$$

With an inequality, this is written as

$$0 < x \leq 10$$

We are now going to write this in interval notation like this:

$$(0,10]$$

What it means:

(or) : These are called "soft brackets" and mean that number is not included in the set

[or] : These are called "hard brackets" and mean that number is included in the set

Try it Write these inequalities in interval notation.

Inequality	Graph	Interval Notation
$0 \leq x < 5$		
$1 < x < 10$		
$x > 3$		
$x \leq -2$		

Now we can go back and describe the domain and range of our Important functions on page 3 using interval notation. From here we will dive into these important functions and see how to work with them and apply them.