M10 - 6.1 - Linear/Continuous Notes

Table of Values (Linear/Non-Linear)
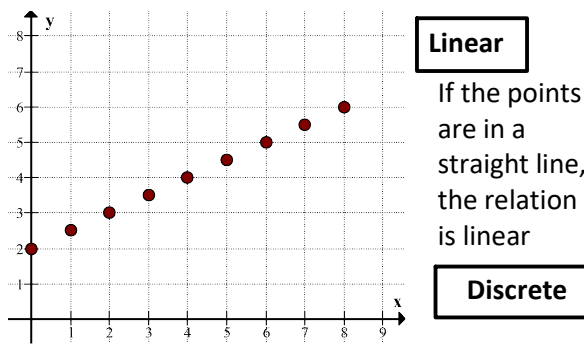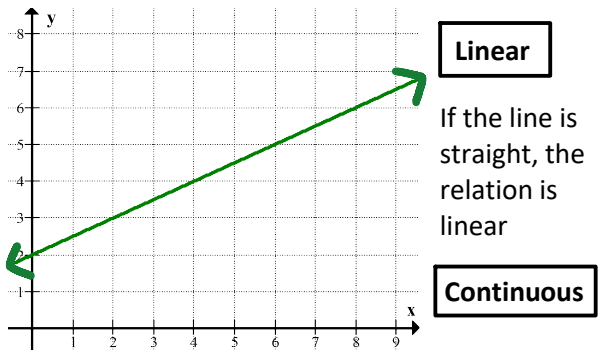
x	y
-4	0
-2	3
0	6
4	12
8	18

Δx $(+2$ ... $+3)$ Δy
Δx $(+2$ ... $+3)$ Δy
Δx $(+4$ ... $+6)$ Δy
Δx $(+4$ ... $+6)$ Δy

$If\ the\ fraction\ \dfrac{\Delta y}{\Delta x} = \dfrac{\Delta y}{\Delta x}, it\ is\ \boxed{Linear.}$

$\dfrac{3}{2} = \dfrac{3}{2}\ \boxed{Linear}$ ✓

$\dfrac{3}{2} = \dfrac{6}{4}$
$\dfrac{3}{2} = \dfrac{3}{2}\ \boxed{Linear}$ ✓

Graph (Linear/Non-Linear)(Continuous/Discrete)

Linear

If the line is straight, the relation is linear

Continuous

Linear

If the points are in a straight line, the relation is linear

Discrete

Continuous: Points are connected

Non-Linear

Continuous

If the points are/can be connected

Non-Linear

Discrete

If the points are not/cannot be connected
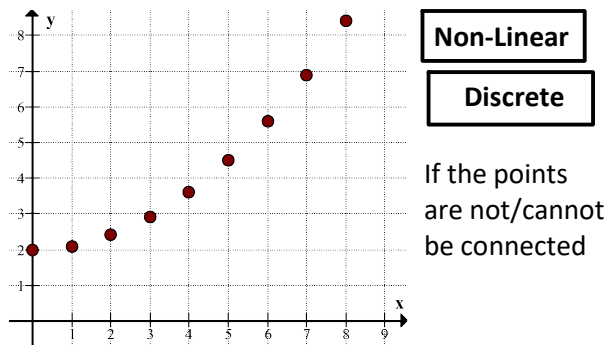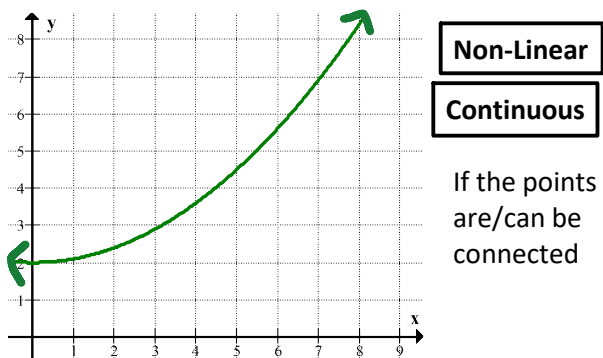
Information: (Continuous/Discrete)

Continuous

Walking to school
Filling a cup with water

The points can be connected because you are at each point throughout time.

Discrete

Counting the weight of apples
Counting number of Humans

The point not connected because you cannot have half an apple* or half a human.

Linear/Non-Linear   Make a table of values or graph information and see.

Equations (Linear/Non-Linear)

Linear

If the equation is degree/exponents 0 or 1

$y = 3x + 1$ $2y + 3x - 4 = 0$

Non-Linear

$y = x^2$ $y^2 + x^2 = 1$ $y = x^3 - 2x + 4$

$No\ y - int$

$x = -3$

Vertical

$m = (Und)efined$

Up to Right

$m = +(Positive)$

$(-3,2)$

$(-3,0)$

$y - axis: x = 0$

Infinite $y - intercepts$

$x - axis: y = 0$

Infinite $x - intercepts$

$(-2,-4)$ $(0,-4)$
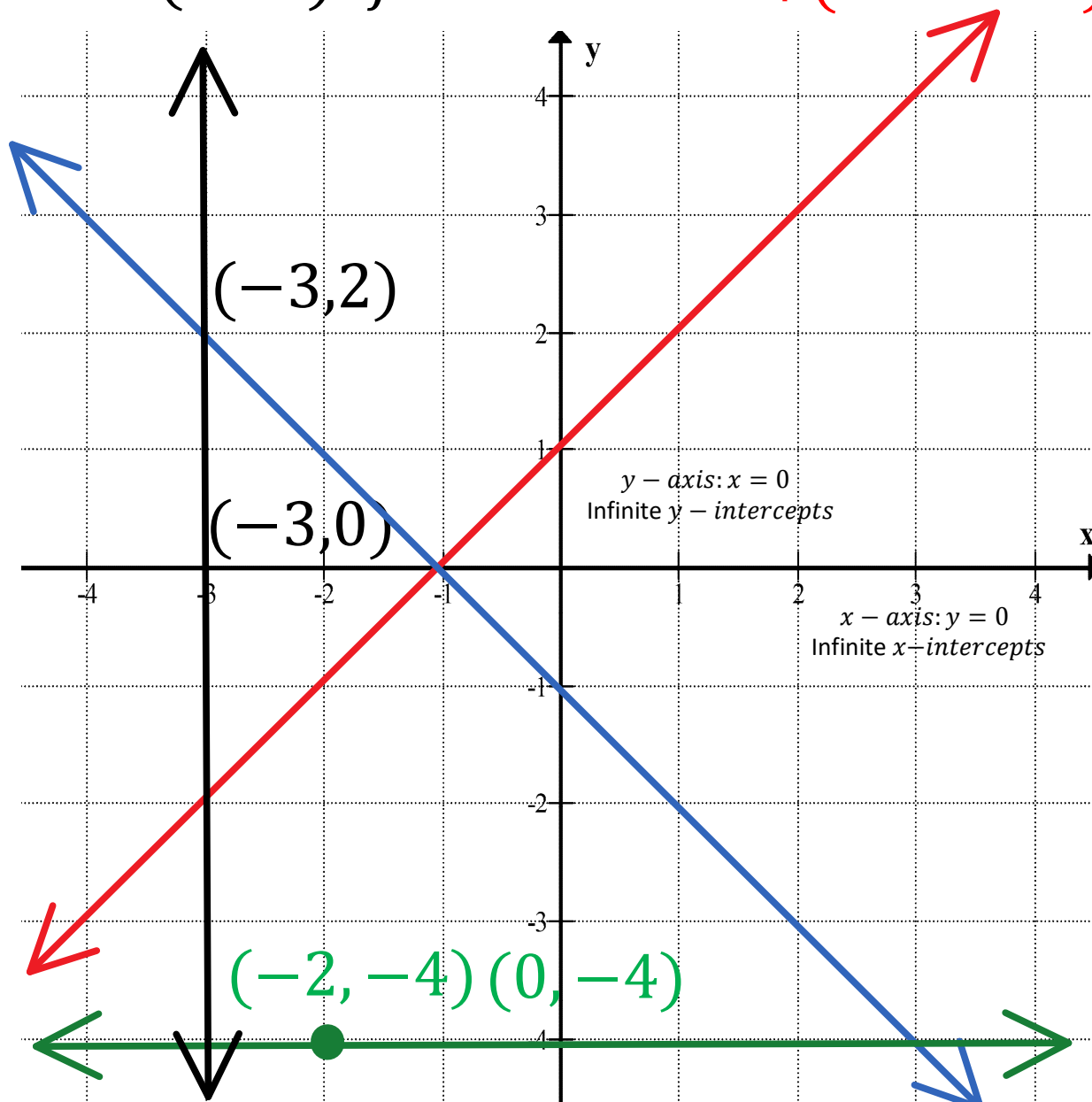
$m = 0\ (Zero)$

Flat - Horizontal

$y = -4$

$No\ x - int$

$m = +(Negative)$

Down to Right

(Up to Left)

M10 - 6.3 - Slope Formula Notes

Find the Slope

$(3,4)$
(x_1, y_1)

$(2,1)$
(x_2, y_2)
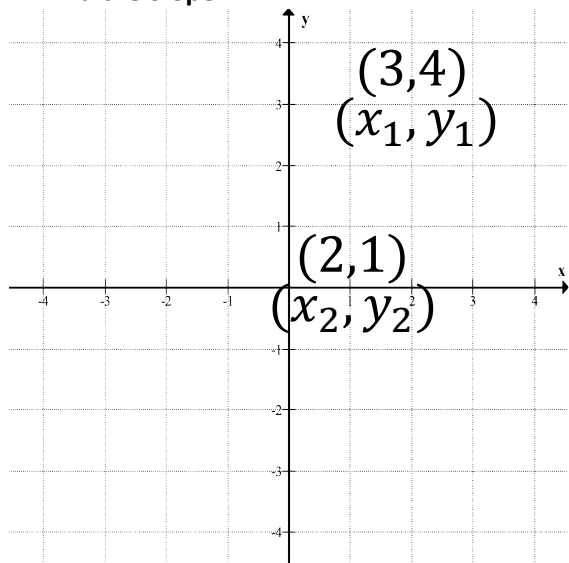
Slope Formula

$$Slope = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$ ← Vertical distance
← Horizontal distance

$(3,4) \qquad (2,1)$
$(x_1, y_1) \quad (x_2, y_2)$

$$Slope = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{(5) - (2)}{(2) - (1)}$$ Substitute with brackets

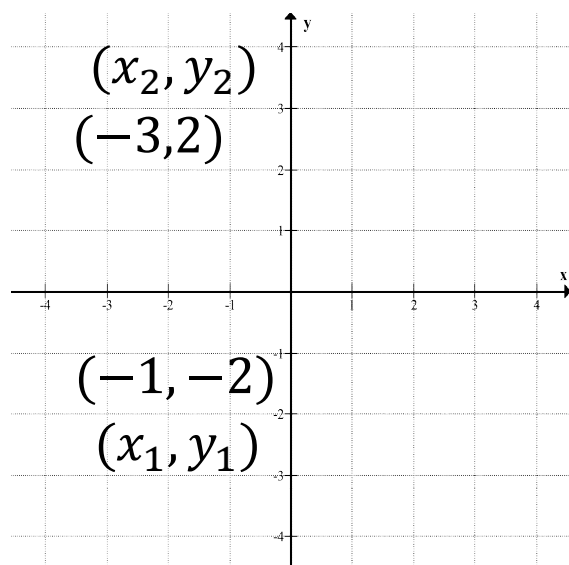$$= \frac{3}{1}$$

Slope $= 3$

Vertical distance

Horizontal distance
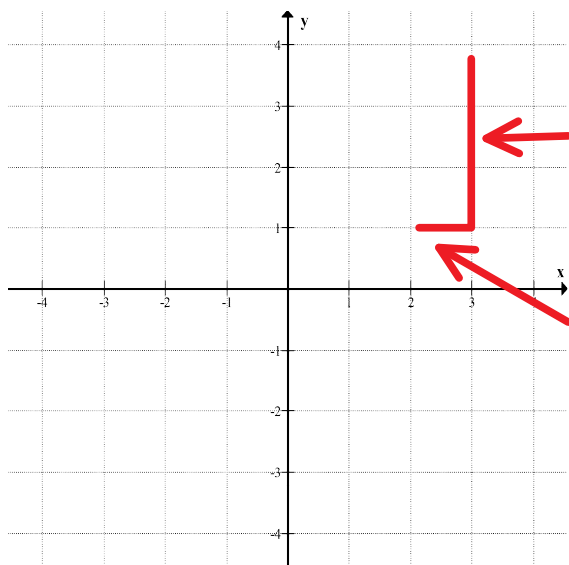
Slope is how much you go up by over how much you go over by.

1) Start at the point on the Left
2) Count straight up to the next point
3) count straight over to the next point

$$Slope = \frac{Up \ or \ Down}{Left \ or \ Right}$$

(x_2, y_2)
$(-3,2)$

$(-1,-2)$
(x_1, y_1)

$(-1,-2) \qquad (-3,2)$
$(x_1, y_1) \qquad (x_2, y_2)$

$$Slope = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{(2) - (-2)}{(-3) - (-1)}$$

$$= \frac{2 + 2}{-3 + 1}$$
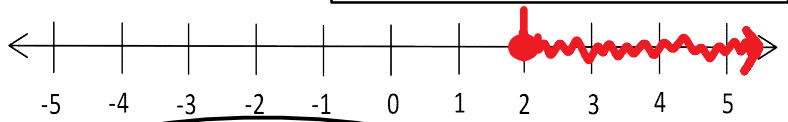
$$= \frac{4}{-2}$$

$Slope = -2$

M10 - 6.4 - Domain Range Notes

Domain: All possible x values. x

Range: All possible y values. y

$x \geq 2$

$\leq, \geq$ • Equal to (closed, square, solid) [ ] ——

$x \geq 2$

-5 -4 -3 -2 -1 0 1 2 3 4 5

Left Hand
Thumb Points Greater Than

Words: x is Greater than Equal to 2

Set Notation: Domain: $\{x|\ x \geq 2, x \in \mathbb{R}\}$

Interval Notation $[2, \infty)$
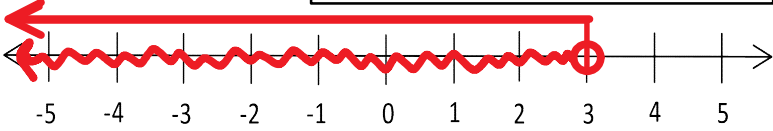
$x \in \mathbb{R}$:
x can be all
Real Numbers

(∞, ∞) Infinity Not Included

$x < 3$

$<, >$ ◯ ( ) $(-\infty, \infty)$ – – – –
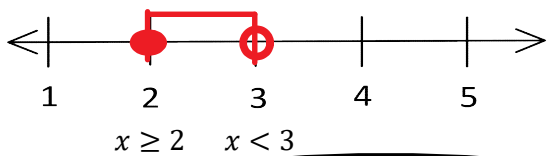Not Equal to (open, round, dotted)

$x < 3$

-5 -4 -3 -2 -1 0 1 2 3 4 5

Right Hand
Thumb Points Less Than

Words: x is Less than 3

Set Notation: Domain: $\{x|\ x < 3, x \in \mathbb{R}\}$

Interval Notation $(\infty, 3)$

$2 \leq x < 3$

Smaller #, Less Than*, Variable, Less Than, Bigger #

1 2 3 4 5

$x \geq 2$ $x < 3$

Line Between

−1 0 1 2 3

Shade Between

$-1 \leq x < 3$

Words: x is Greater than or Equal to 2 and Less Less than 3

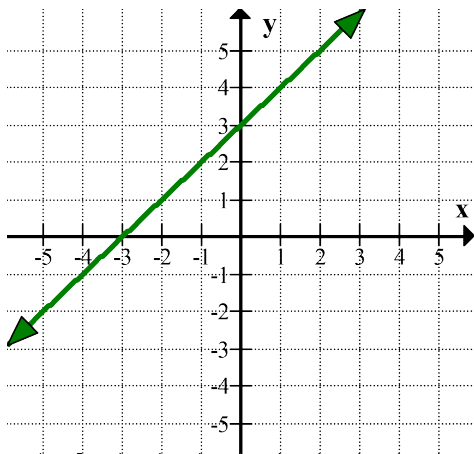Set Notation: Domain: $\{x|\ 2 \leq x < 3, x \in \mathbb{R}\}$

Interval Notation $[2,3)$

1 2 3 4 5

Words: $x = 2,4,5$ A List

Domain: $\{x|\ x = 2,4,5, \mathbb{Z} \in \mathbb{R}\}$

$\mathbb{Z} \in \mathbb{R}$
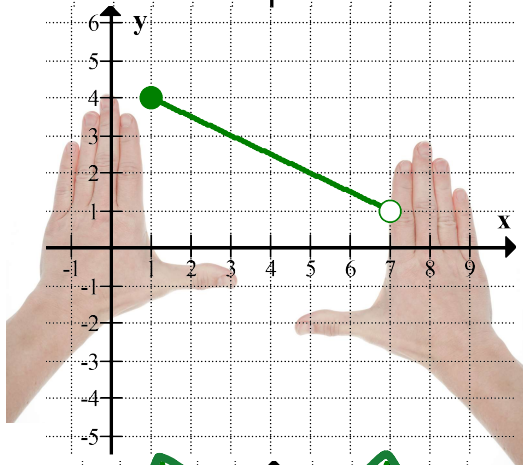x can be all
Real Integers

Domain:
Number Line:
Set Notation: $\{x|\ x \in \mathbb{R}\}$
Interval Notation: $(-\infty, \infty)$

$$\{x|\ -\infty < x < \infty\}$$

Range:
Number Line:
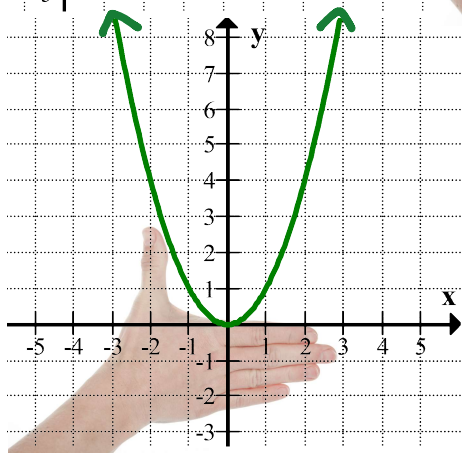Set Notation: $\{y|\ y \in \mathbb{R}\}$
Interval Notation: $(-\infty, \infty)$

Use your Hands

Domain:
Number Line:
Set Notation: $\{x|1 \le x < 7, x \in \mathbb{R}\}$
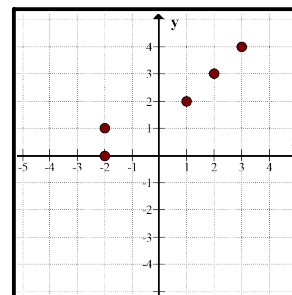Interval Notation: $[1,7)$

Rotate the Page!

Range:
Number Line:
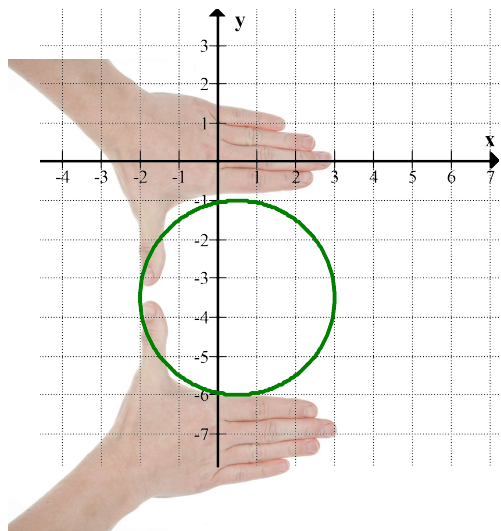Set Notation: $\{y|1 < y \le 4, y \in \mathbb{R}\}$
Interval Notation: $(1,4]$

Domain:
Number Line:
Set Notation: $\{x|\ x \in \mathbb{R}\}$
Interval Notation: $(-\infty, \infty)$

Range:
Number Line:
Set Notation: $\{y|\ y \ge 0, y \in \mathbb{R}\}$
Interval Notation: $[0, \infty)$

Domain: $\{-2,1,2,3\}$
Range: $\{0,1,2,3,4\}$

x	7
-2	0
-2	1
1	2
2	3
3	4

Domain:
Number Line:
Set Notation: $\{x|-2 \le x \le 3, x \in \mathbb{R}\}$
Interval Notation: $[-2,3]$

Range:
Number Line:
Set Notation: $\{y|\ -6 \le y \le -1, y \in \mathbb{R}\}$
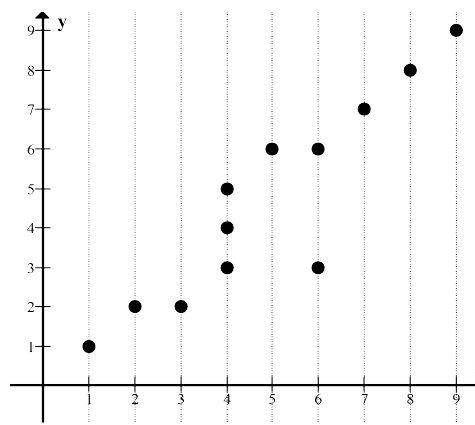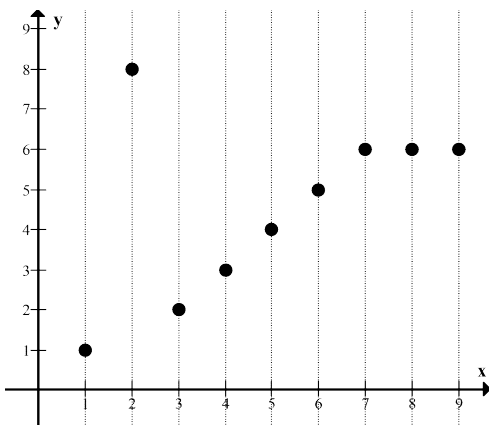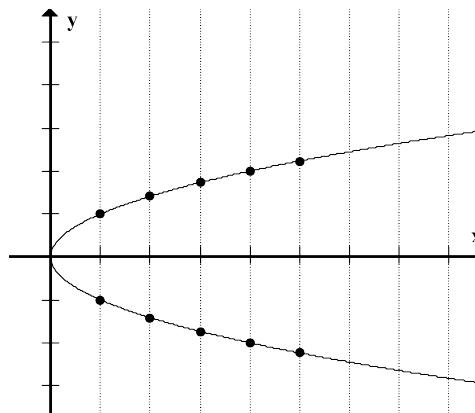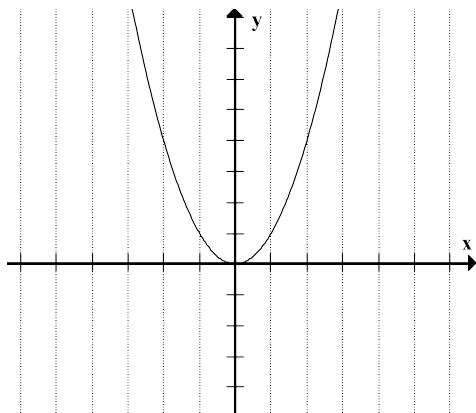Interval Notation: $[-6,-1]$

M10 - 6.6 - Function Vertical Line Test Notes

A **R**elation is a **Function** if you only have one y value for every x value.

A **R**elation is **NOT** a **F**unction **with more than** one y value for any x value.

Is a function

Not a function

$(0,1), (1,2), (2,3), (3,3), (4,5)$

$(0,1), (1,2), (1,3), (2,4), (3,5)$

x	y
1	1
2	2
4	3
5	6

Each x value only has one y value
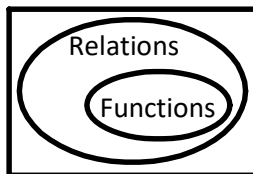
x	y
1	1
2	3
2	5
3	9

An x value with more than one y value

A **R**elation is a **Function** if you run your pencil vertically along the page and only cross the line once.

A **R**elation is a **Function** if you run your pencil vertically along the page and ever hits the line more than once.

Venn Diagram

Relations

Functions

All Functions are Relations
Not all Functions are Relations