

Lesson 23 - Equation of a Line

A line is like a computer program: X is the input, Y is the output

$$f(x) = y = ax + b \quad \text{where } a \text{ is the slope (Rate of change)}$$

b is the y-intercept (Initial value)

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$$

Functional Form: $y = ax + b$

General Form: $Ax + By + C = 0$ (ie no fractions)

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Graphing a Line (using points):

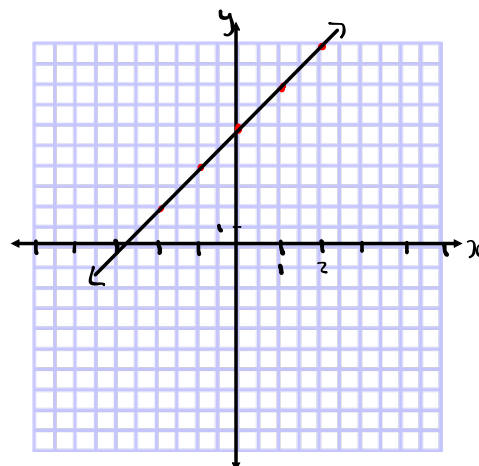
To graph, we need to find 2-3 points and put them on the graph paper
When you have your equation, write the equation above a table of values

Ex: $y = 2x + 6$

choose a number for x and solve for y

repeat at least 2 times

x	y
0	6
1	8
2	10
-1	4
-2	2



dom = \mathbb{R}
ran = \mathbb{R}

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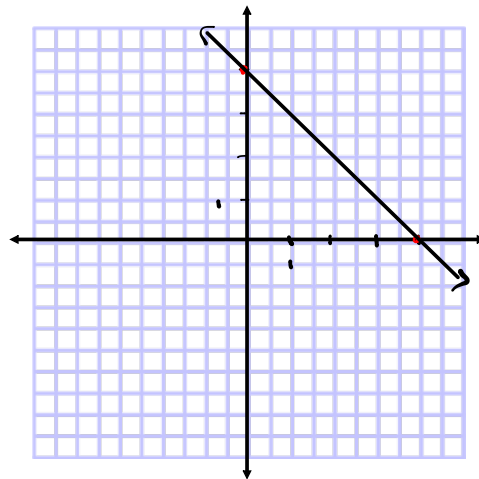
Intercepts :

The **y-intercept** is found when **$x = 0$**

The **x-intercept** is found when **$y = 0$**

Ex. Graph and find intercepts of $y = -x + 4$

x	y
0	4
4	0



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Ex. Graph and find intercepts of

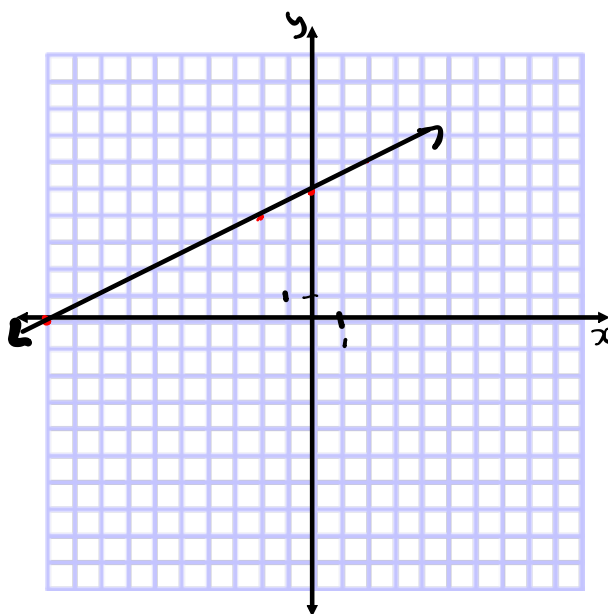
$$y = \frac{1}{2}x + 5$$

Multiples of the denominator

$$0 = \frac{1}{2}x + 5$$

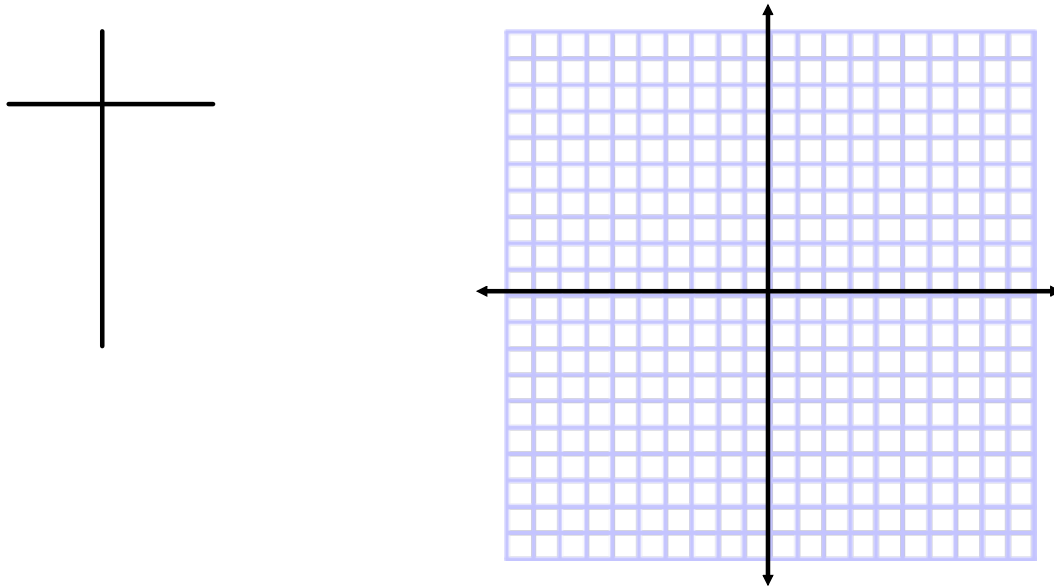
$$-\frac{5}{1} = -\frac{1}{2}x$$

x	y
0	5
-2	4
2	6
-10	0



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Ex. Graph and find intercepts of $y = -\frac{1}{3}x + 1$



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Graphing - using Rise over Run

We need the y intercept (b). This is the starting point

We then need the slope.

$$a = \frac{\text{rise}}{\text{run}}$$

Step 1: Use the y intercept (b)

and make a point

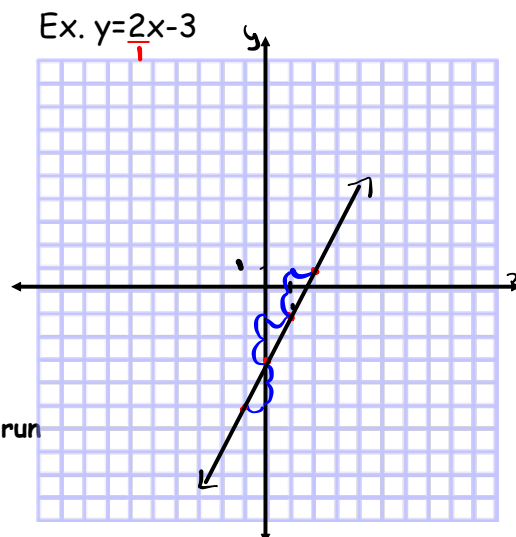
Step 2: The next point will be

- up if a is (+)
- down if a is (-)

Using the slope (a):

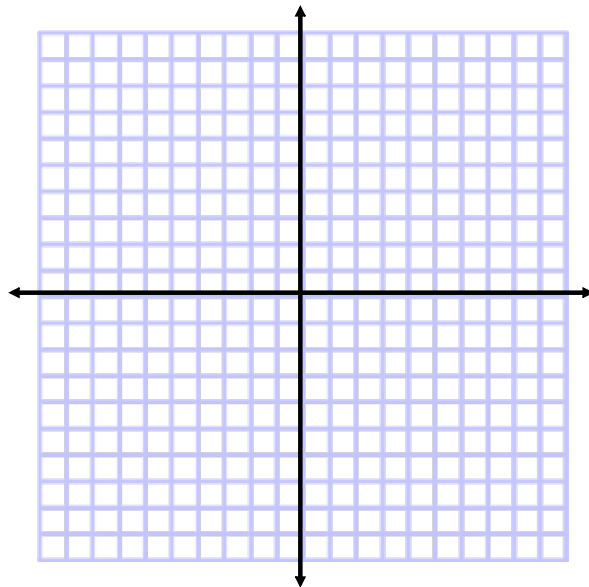
The top of the fraction is the **rise**

The bottom of the fraction is the **run**



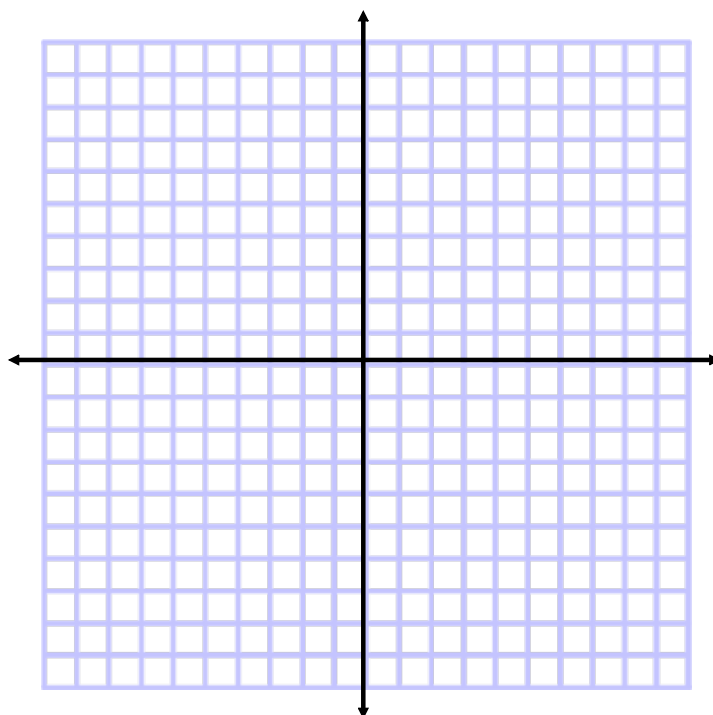
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Using the rise over run method, graph $y=-2x+6$



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Using the rise over run method, graph $y=1/2x-4$



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Finding the equation of a line

Step 1: Find a using: $a = \frac{y_2 - y_1}{x_2 - x_1}$

Step 2: Find b. Start with $y = ax + b$, plug in a, then use **one** of the known points and plug in x and y and solve for b.

Step 3: Write your equation using a and b.

Ex. Given A (x_1, y_1) and B(x_2, y_2) find the equation of the line.

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