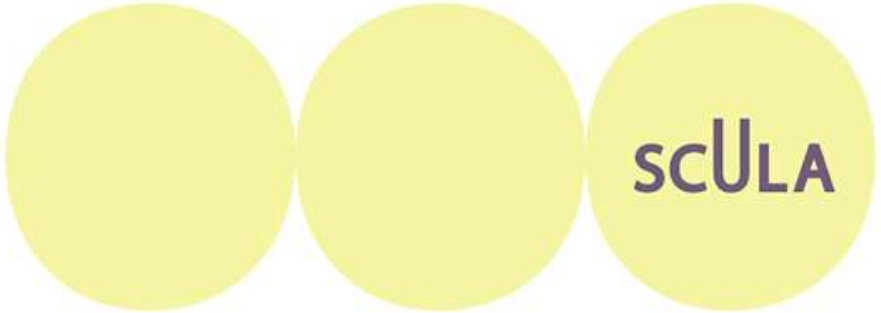
SAT MATH SECTION

Linear Equations

How do we manipulate Linear Functions?

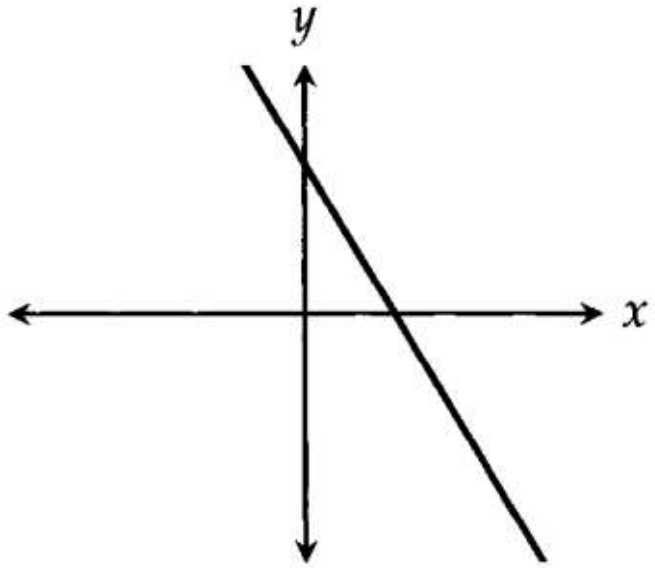
- Slope, x-intercept, and y-intercept
- Y-intercept form Sum of Complex Numbers
- Parallel Lines
- Perpendicular Lines



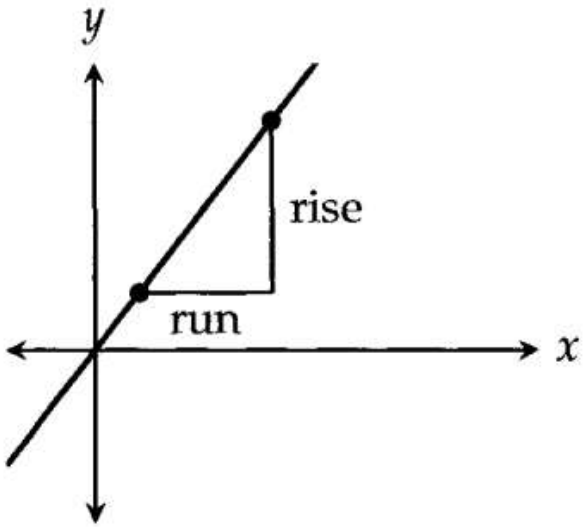
Linear Functions And Lines

Lines : Slope

Lines are functions in the form of f(x) = mx + b, which is why we refer to them as linear equations .



Let’s consider two points of a line (x.($_2$y,$_2$x) dna ($_1$y,$_1$



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

Lines: Intercepts

1. **x-intercepts is where the line crosses the x-axis .**
2. **y-intercept is where the line crosses the y-axis .**

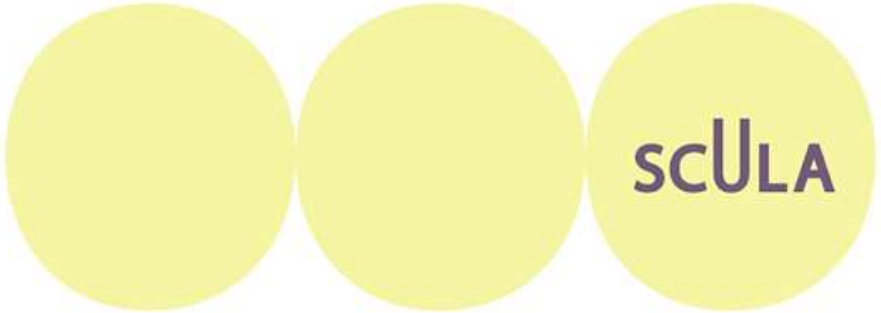
Let's consider the equation : $3x+2y = 12$

To find the x-intercept, set y = .0

$3x = \Rightarrow 12 \quad x = 4$

To find the y-intercept, set x = .0

$2y = \Rightarrow 12 \quad y = 6$



EXAMPLE 4: If the line $ax + 3y = 15$, where a is a constant, has an x-intercept that is twice the value of the y-intercept, what is the value of a?

Set x = 0 to find the y-intercept :

3y = ⇒15 y = 5

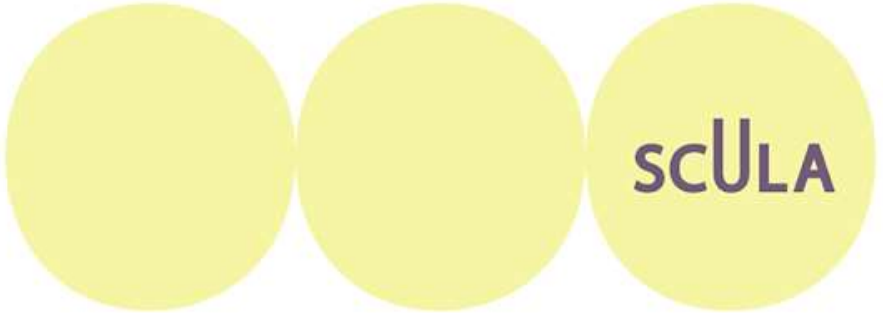
x-intercept is twice the value of the y-intercept .

⇒x-intercept = 10 = tpecretni-y ×2

If x = 10 then y = (tpecretni-x a si ti)0

10 ⇒a = 15

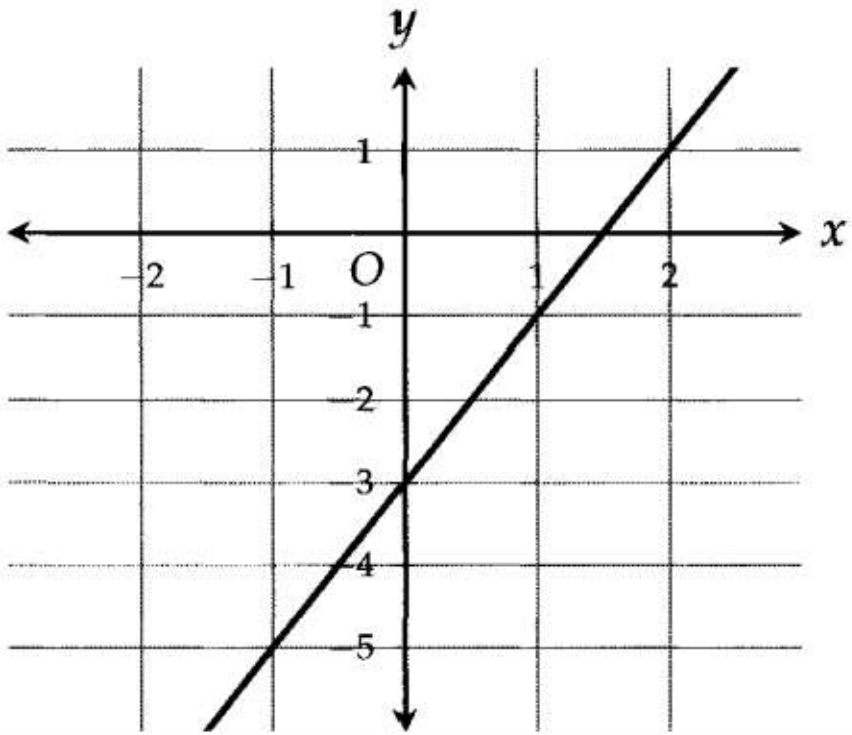
⇒ **a = 1.5**



The slope-intercept form

All lines can be expressed in the form of y = mx + b where m is the slope and b is the y-intercept .

Find the slope- intercept form of this line .



From the graph, you can see that the y-intercept is -3.

We will use (1,-1) and (0,-3) to calculate the slop.

$$Slope\ of\ a\ line = \frac{rise}{run} = \frac{-1+3}{1-0} = 2$$

y = 2x - 3

One more example…

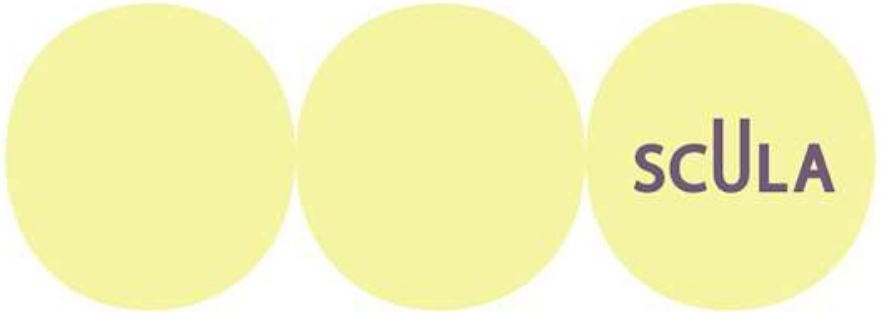
A line l passes through (1,2) and (-2,1). What is the y-intercept of the line l?

- **Slope :**

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

- **The y-intercept :**

$$2 = \frac{1}{3} + b$$ (1,2) in the equation

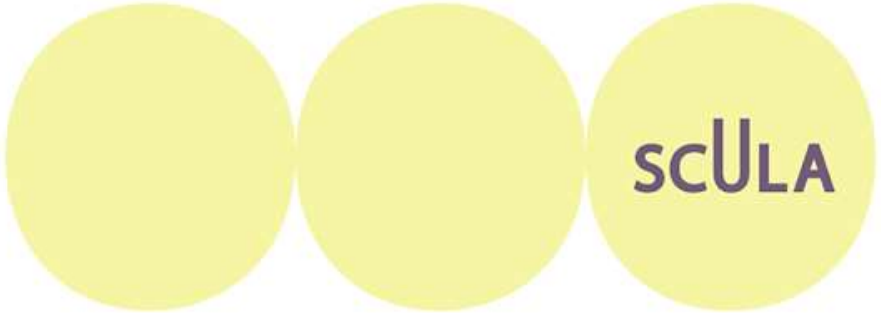


$$b = \frac{5}{3}$$

The y-intercept value is, therefore, equal to .5/3

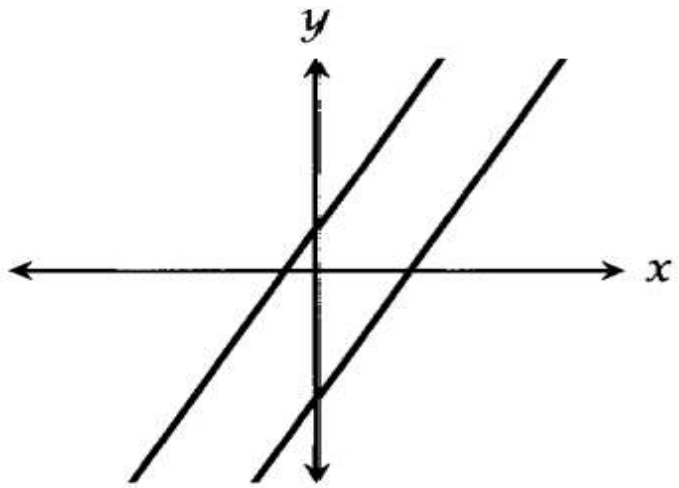
The final equation of the line l is as follow :

$$y = \frac{1}{3}x + \frac{5}{3}$$



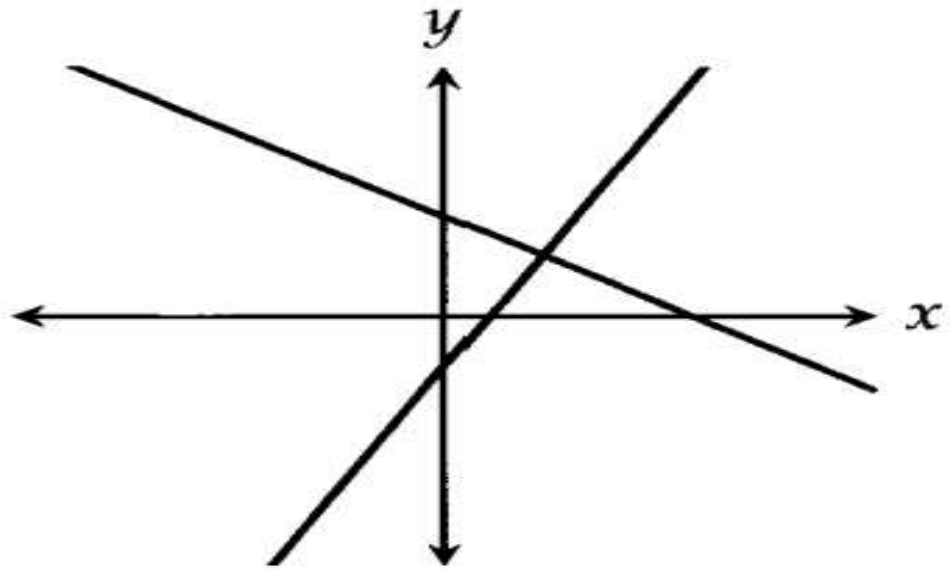
Parallel Lines

Two Parallel Lines have the same slope and two different y-intercepts. Remember this, we will come across the same concept when we deal with systems of linear equations .



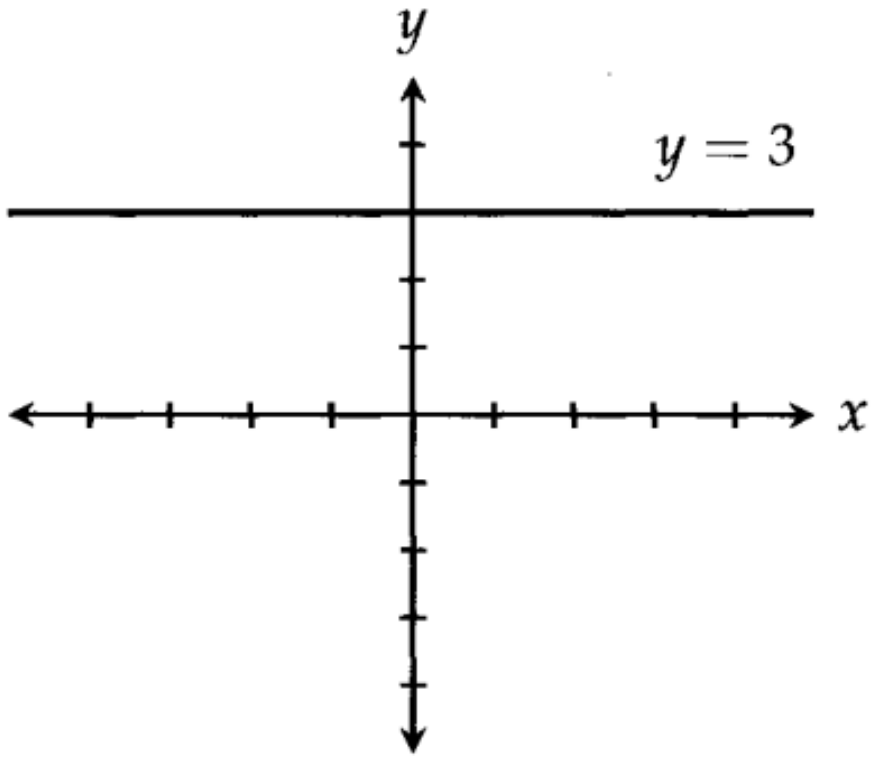
Perpendicular Lines

The product of the slopes of two perpendicular lines is equal to - .1

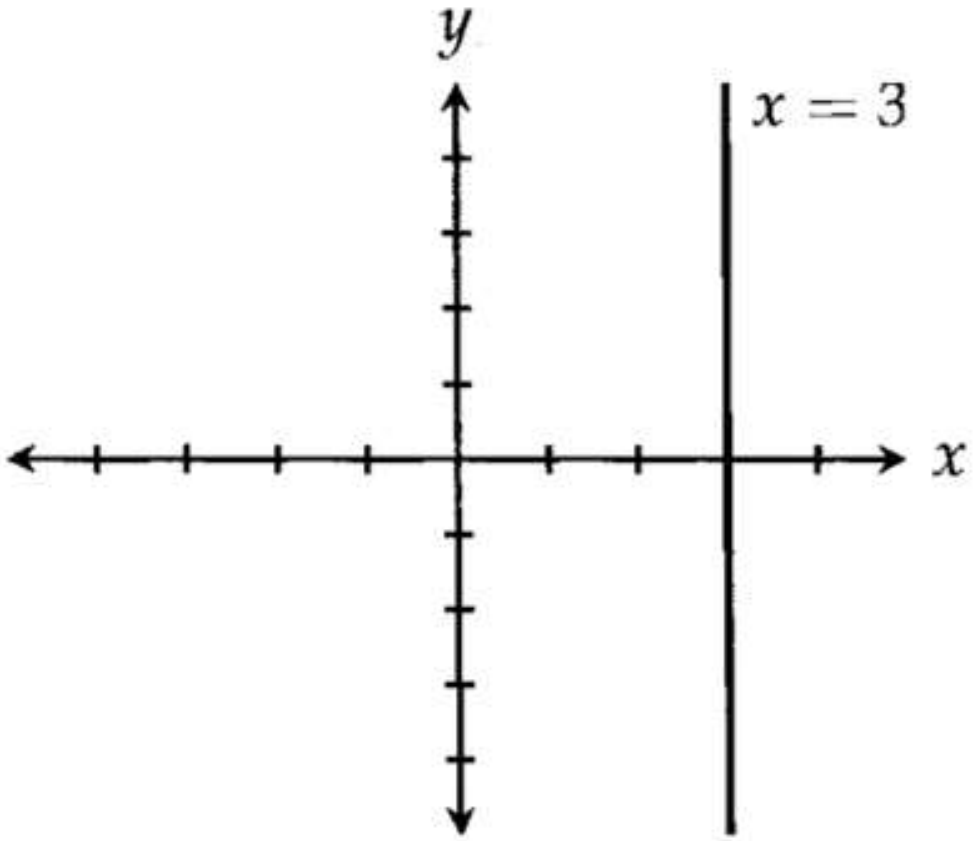


Horizontal and vertical Lines

The horizontal line has a slope equal to .0



A vertical line do no have a slope nor a y-intercept. The equation of a vertical line that passes through x = a is indeed x = a.



EXAMPLE 8: Line m has a slope of $\frac{2}{3}$ and passes through the point $(4,3)$. If line n is perpendicular to line m and passes through the same point $(4,3)$, which of the following could be the equation of line n?

A) $y = -\frac{2}{3}x + 9$ B) $y = -\frac{3}{2}x - 3$ C) $y = -\frac{3}{2}x + 6$ D) $y = -\frac{3}{2}x + 9$

Because it's perpendicular to line m, line n must have a slope of $-\frac{3}{2}$. Using point-slope form,

$$y-3=-\frac{3}{2}(x-4)$$

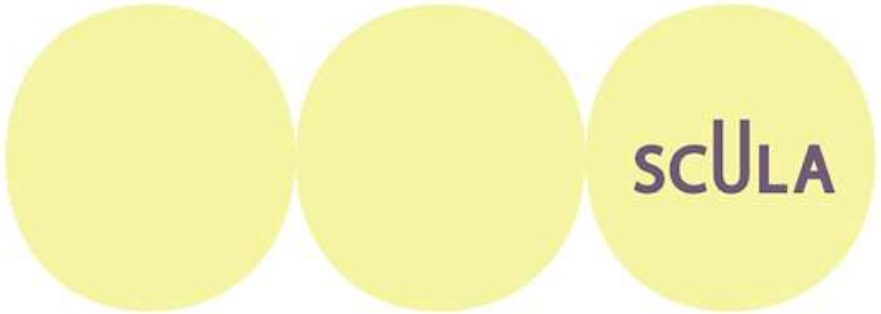
$$y=-\frac{3}{2}x+6+3$$

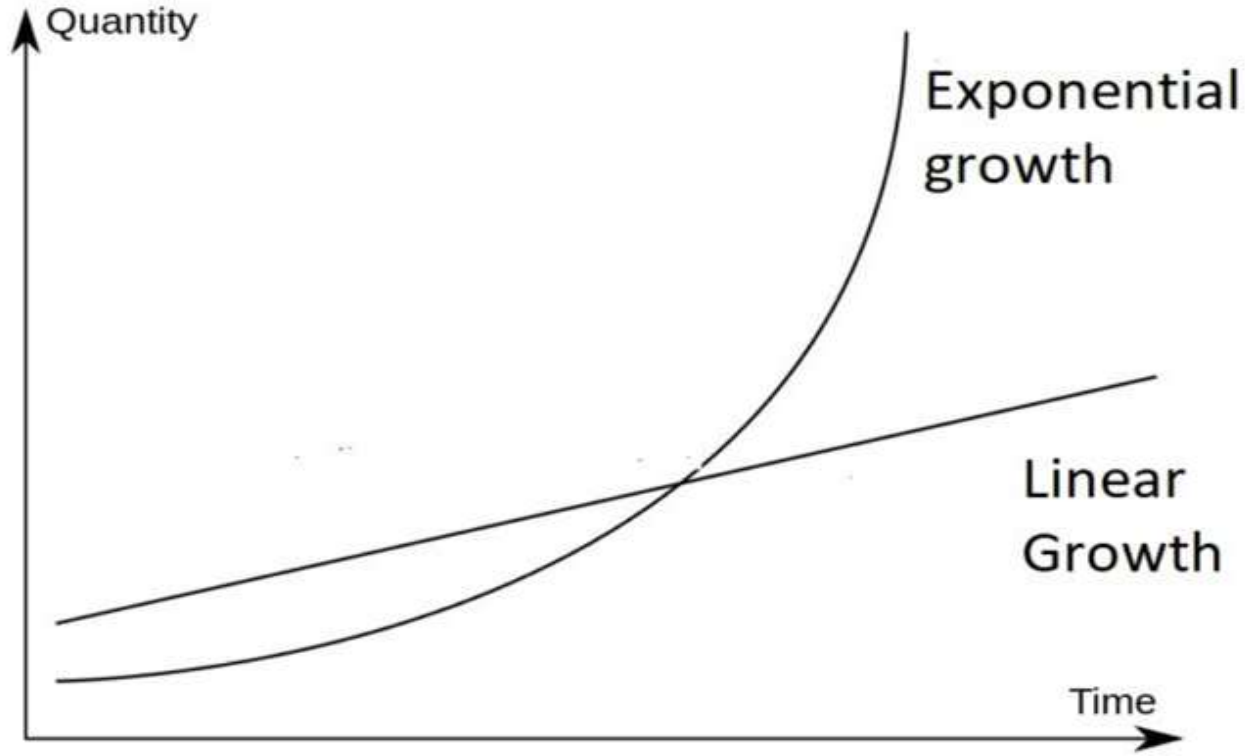
$$y=-\frac{3}{2}x+9$$

We get the equation into slope-intercept form to see that the answer is $\boxed{(D)}$.

An important note is to differentiate between the exponential and the linear growth .

- A linear function increases by a constant value, and an exponential function increases by a constant fraction of the previous value.
- Just like the simple interest represents a linear growth, the compound interest represents an exponential growth




Quantity
Exponential growth
Linear Growth
Time

PRACTICE

https://drive.google.com/file/d/19wCa-sQmLYdsxQrvZJqrGyRA6ExuJ4Ip/view?usp=drive_link

Linear & Exponential Growth :

https://drive.google.com/file/d/14KX4CicjQHEQv5wv2Ows_rPgOeP3Kk9z/view?usp=drive_link

THANK YOU!

DO YOU HAVE ANY QUESTIONS?