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

Linear Functions
LESSON ONE - *Slope of a Line*
Lesson Notes

Introduction Find the slope of each line.

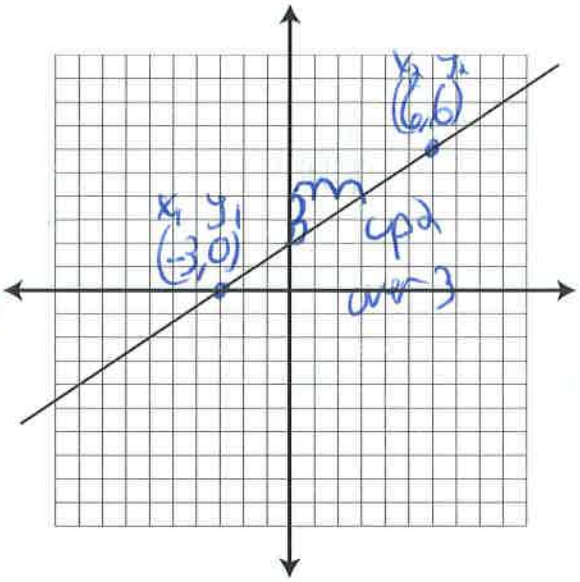
a) using slope = $\frac{\text{rise}}{\text{run}}$

$\frac{2}{3}$

using slope = $\frac{y_2 - y_1}{x_2 - x_1}$

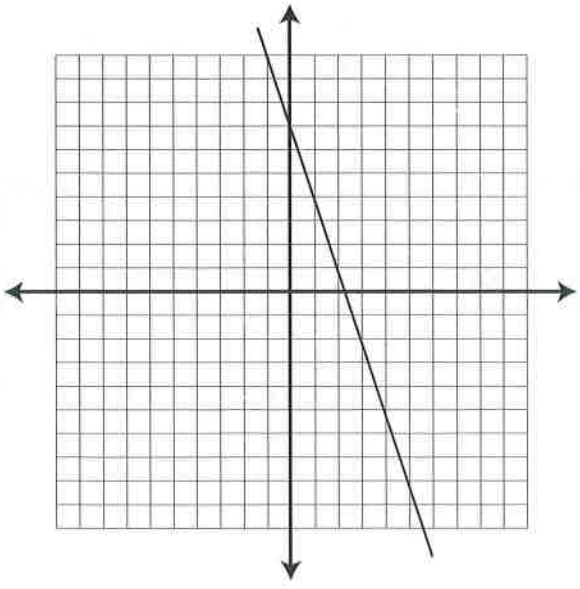
Any 2 points work

$\frac{6-0}{6-(-3)} = \frac{6}{9} = \boxed{\frac{2}{3}}$



b) using slope = $\frac{\text{rise}}{\text{run}}$

using slope = $\frac{y_2 - y_1}{x_2 - x_1}$



Linear Functions
LESSON ONE - *Slope of a Line*
Lesson Notes

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

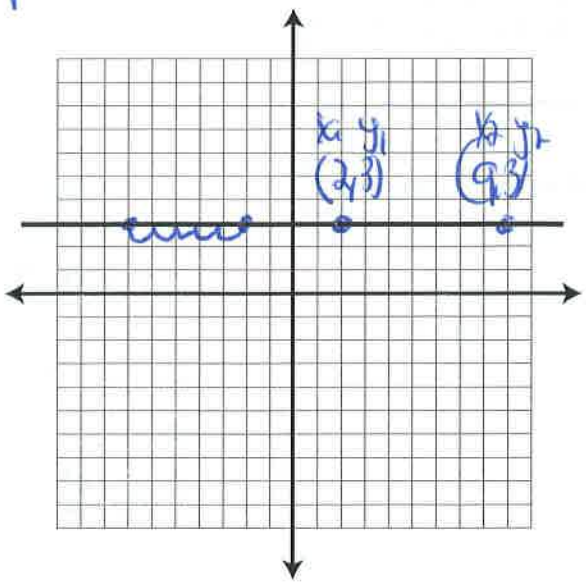
c) using slope = $\frac{\text{rise}}{\text{run}}$

rise = 0 (didn't go up)

run = 5 $\frac{0}{5} = 0$

using slope = $\frac{y_2 - y_1}{x_2 - x_1}$

$\frac{3-3}{4-2} = \frac{0}{7} = 0$



d) using slope = $\frac{\text{rise}}{\text{run}}$

rise = 5

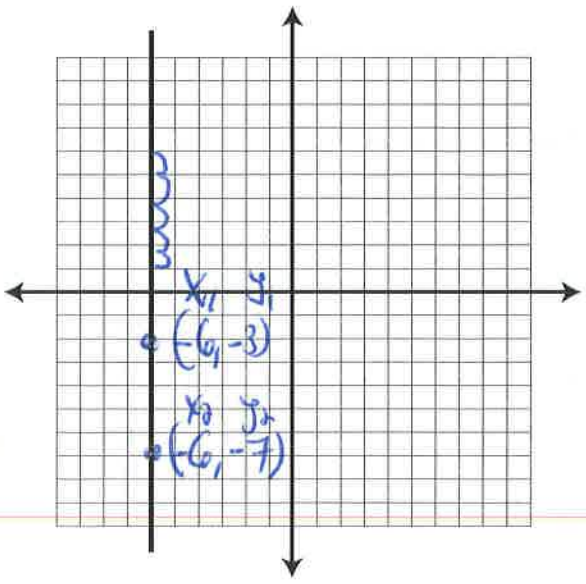
run = 0

$\frac{5}{0}$ = undefined

using slope = $\frac{y_2 - y_1}{x_2 - x_1}$

$\frac{-7-(-3)}{-6-(-6)} = \frac{-4}{0}$

= undefined



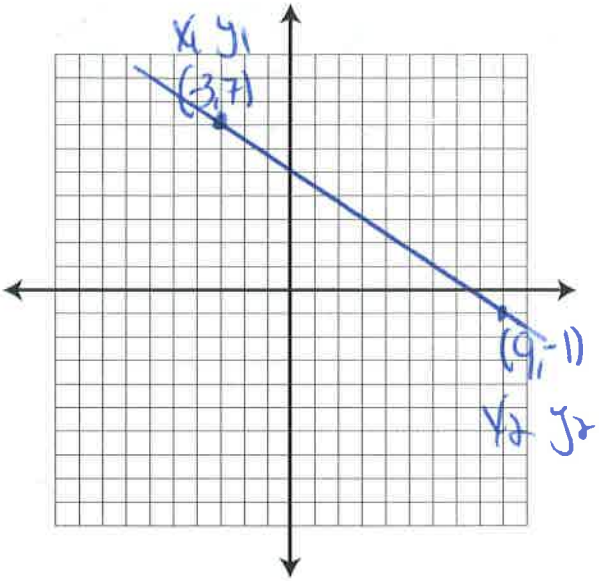
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Linear Functions
LESSON ONE - *Slope of a Line*
Lesson Notes

Example 1 For each pair of points, graph the line and calculate the slope.

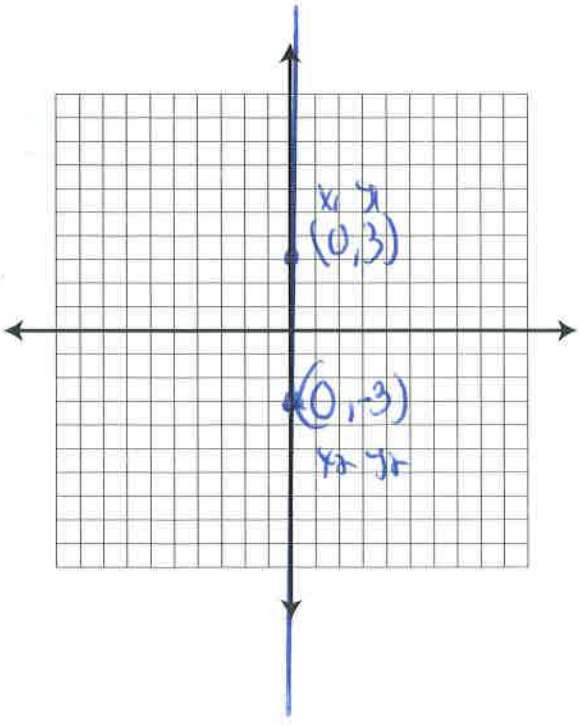
a) A line passes through (-3, 7) and (9, -1).

Slope: $\frac{-1-7}{9-(-3)} = \frac{-8}{12} = \frac{-4}{6} = \frac{-2}{3}$



b) A line passes through (0, -3) and (0, 3)

Slope: $\frac{-3-3}{0-0} = \frac{-6}{0}$ = undefined

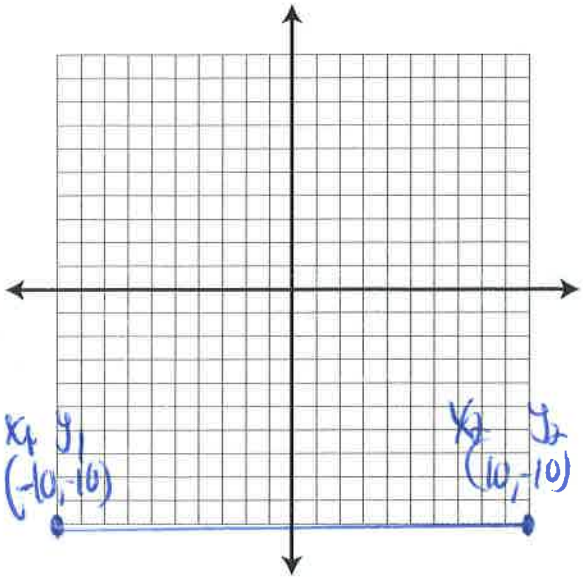


Linear Functions
LESSON ONE - *Slope of a Line*
Lesson Notes

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

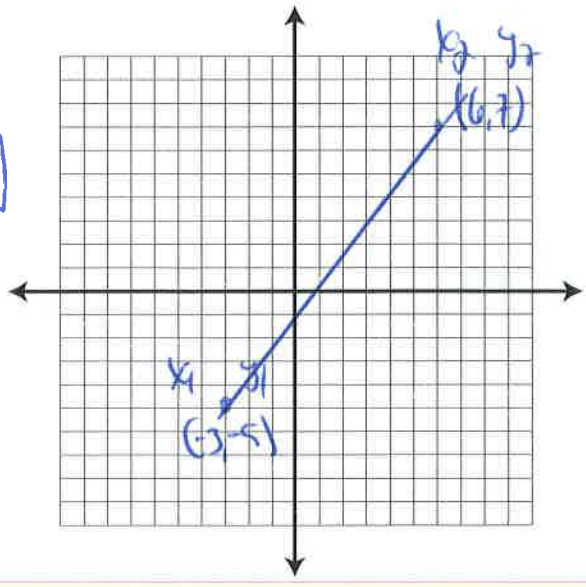
c) A line passes through (-10, -10) and (10, -10).

Slope: $\frac{-10-(-10)}{+10-(-10)} = \frac{0}{20} = 0$ Slope



d) A line passes through (-3, -5) and (6, 7).

Slope: $\frac{7-(-5)}{6-(-3)} = \frac{12}{9} = \frac{4}{3}$



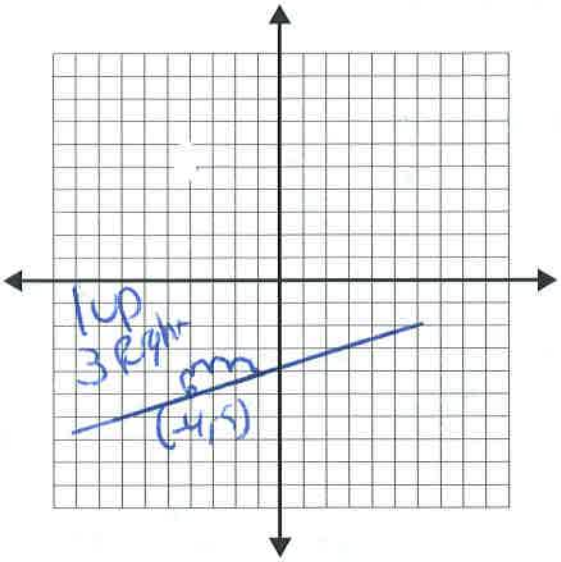
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Linear Functions
LESSON ONE - *Slope of a Line*
Lesson Notes

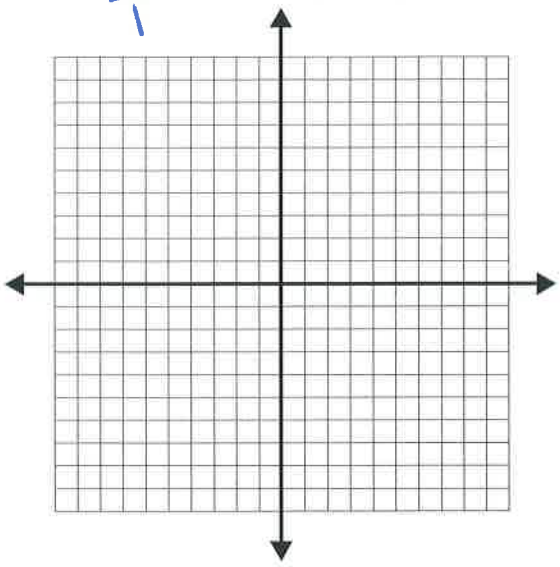
Example 2

Draw each of the following lines, given the slope and a point on the line.

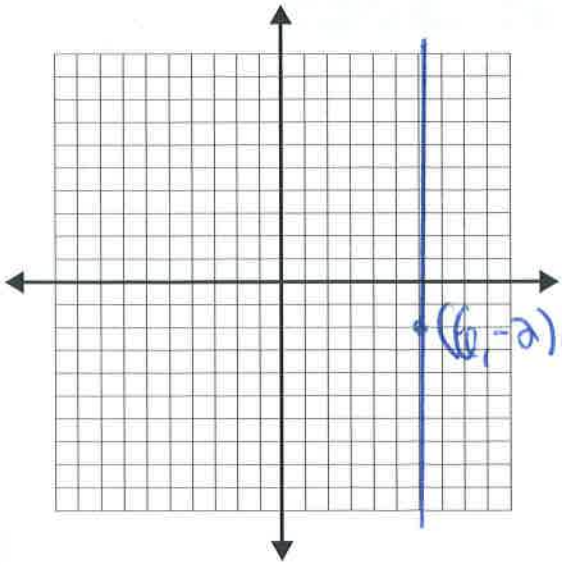
a) Slope = $\frac{1}{3}$, Point = (-4, -5)



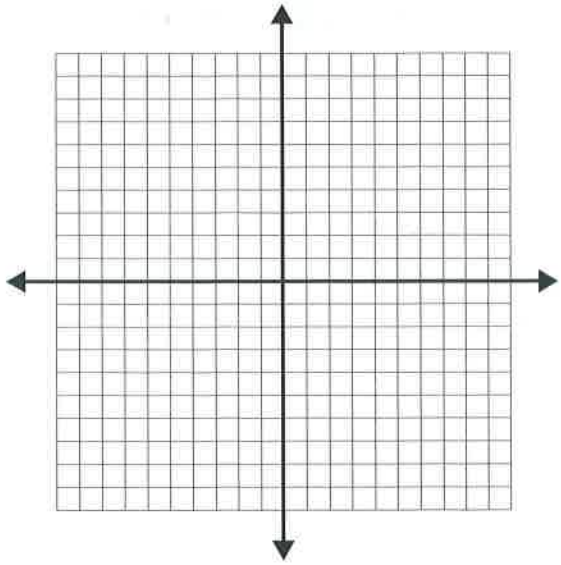
b) Slope = -2, Point = (-3, 7)



c) Slope = undefined, Point = (6, -2)



d) Slope = 0, Point = (-8, 9)



Linear Functions
LESSON ONE - *Slope of a Line*
Lesson Notes

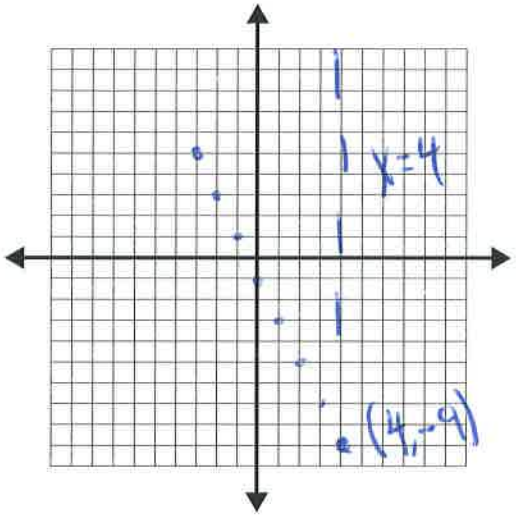
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Example 3

$x_1\ y_1 \quad x_2\ y_2$

a) A line has points located at (-3, 5) and (4, *a*). What is the value of *a* if the slope is -2? $= \frac{-2}{1}$
Solve this question both graphically and algebraically. (either way)

Graphical Solution



$a = -9$

Algebraic Solution

$$\text{Slope} = \frac{-2}{1} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{-2}{1} = \frac{A-5}{4-(-3)} \rightarrow \frac{-2}{1} = \frac{A-5}{7}$$

$\cdot 7 \quad \cdot 7$

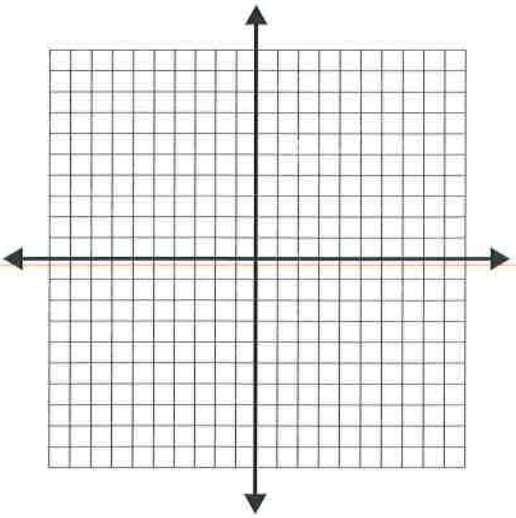
$-14 = A - 5$

$+5 \quad +5$

$a = -9$

b) A line has points located at (*a*, 3) and (2, 9). What is the value of *a* if the slope is $\frac{3}{5}$?
Solve this question both graphically and algebraically.

Graphical Solution



Algebraic Solution

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Linear Functions
LESSON ONE - *Slope of a Line*
Lesson Notes

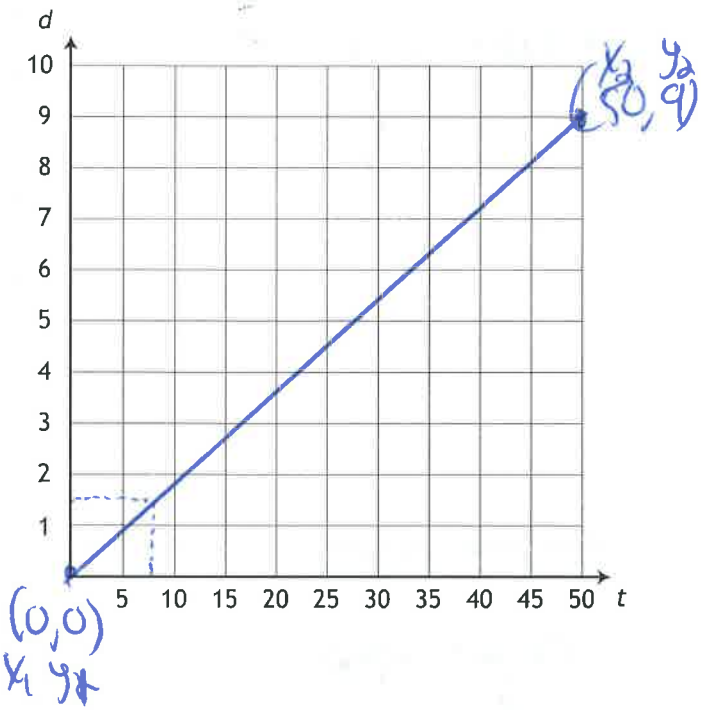
Example 4

The equation relating distance and time is d = st, where s is the speed. In a physics experiment, a motorized toy car drives across the floor and its position is measured every five seconds.

a) Graph the data

I used (0,0) and (50,9)

elapsed time (seconds)	position (metres)
0	0
5	0.9
10	1.8
15	2.7
20	3.6
25	4.5
30	5.4
35	6.3
40	7.2
45	8.1
50	9.0



b) Determine the speed of the car.

↳ Slope (as it's the constant rate of change.
↳ use any 2 points

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

$\frac{9-0}{50-0} = \boxed{\frac{9}{50}}$ A

c) State the dependent and independent variables, then write an equation that relates the variables.

Indepnd = x = time

dependent = y = distance

Linear Functions
LESSON ONE - *Slope of a Line*
Lesson Notes

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

d) How far would the car go if it drove for 8 minutes?

graph (use interpolation)

about 1.5m.

Algebra

Come up with an equation

$d = 5 \cdot t \rightarrow$ ~~$d = 5t$~~ $d = \frac{9}{50}(t)$

$d = \frac{9}{50}(8) = 1.44m.$

e) How many hours would it take for the car to travel 1 km?

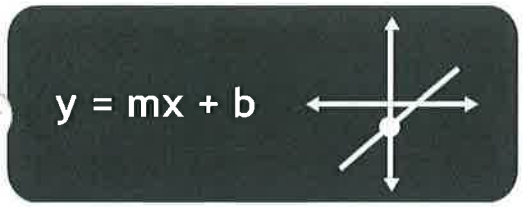
again graph

$d = 5 \cdot t$

$\times 9$ to $\times (9/9)$

$1 = \frac{9}{50}(t)$

$t = 5.55$



Linear Functions
LESSON TWO - *Slope-Intercept Form*
Lesson Notes

Introduction

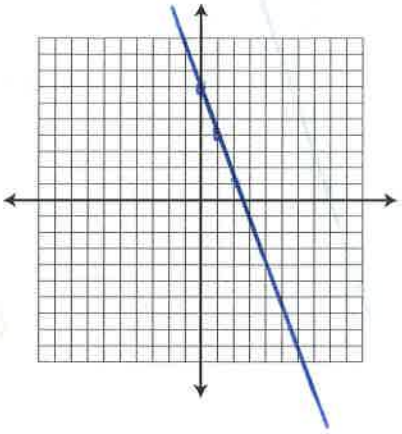
$y = mx + b$ ← y-intercept (or where $x = 0$)
↑ slope

Equation ⟶ Graph

a) Draw the graph of $y = -3x + 7$

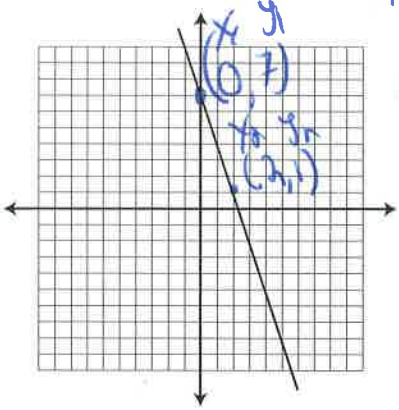
Use table of values

x	y
0	7
1	4
2	1



Graph ⟶ Equation

b) Determine the slope-intercept equation of the line shown.

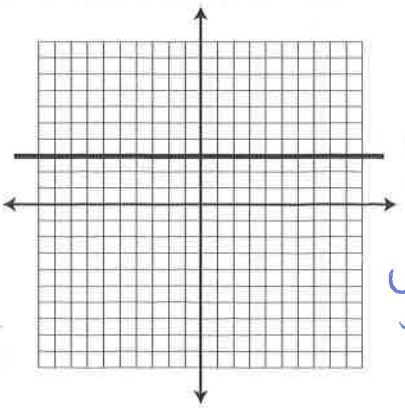


Slope $= \frac{y_2 - y_1}{x_2 - x_1} \quad \frac{1-7}{2-0} = \frac{-6}{2} = -3$

$y = -3x + 7$

Horizontal Line

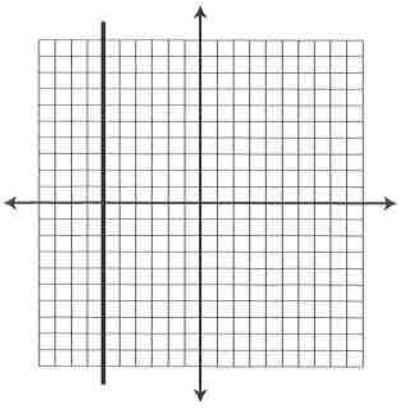
c) Find the equation of the horizontal line shown.



$y = 3$
or
$y - 3 = 0$

Vertical Line

d) Find the equation of the vertical line shown.



$x = -6$
or
$x + 6 = 0$

Linear Functions
LESSON TWO - *Slope-Intercept Form*
Lesson Notes

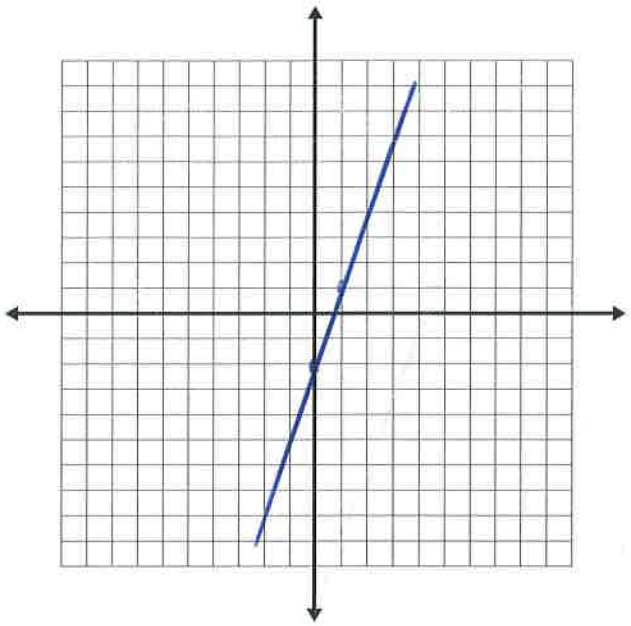
$y = mx + b$

Example 1 Given the following slope-intercept equations, graph the line.

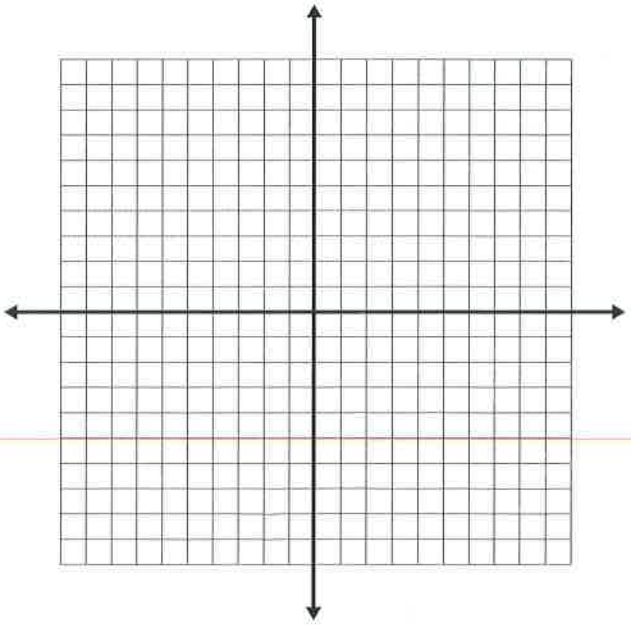
a) $y = 3x - 2$

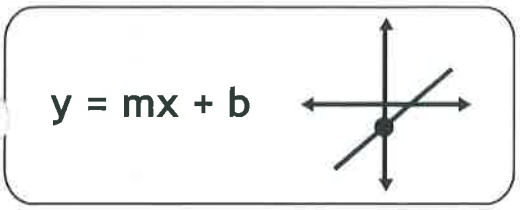
t.o.v

x	y
0	-2
1	1
2	4



b) $y = -\frac{4}{3}x + 1$

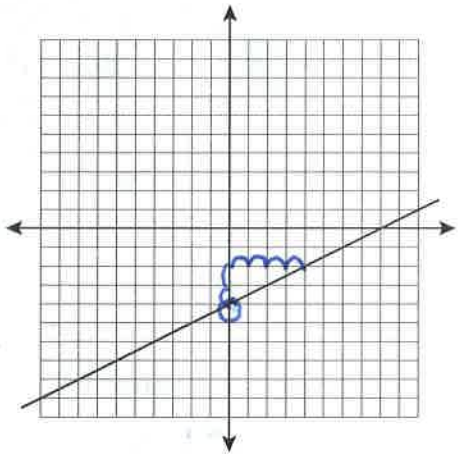




Linear Functions
LESSON TWO - *Slope-Intercept Form*
Lesson Notes

Example 2 Write the equation of each graph.

a)

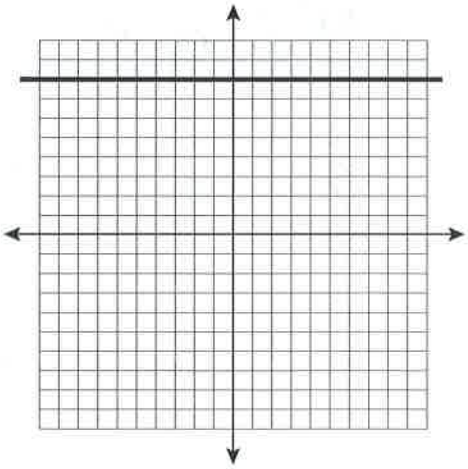


$m = \frac{4}{2} = 2$

$b = -4$

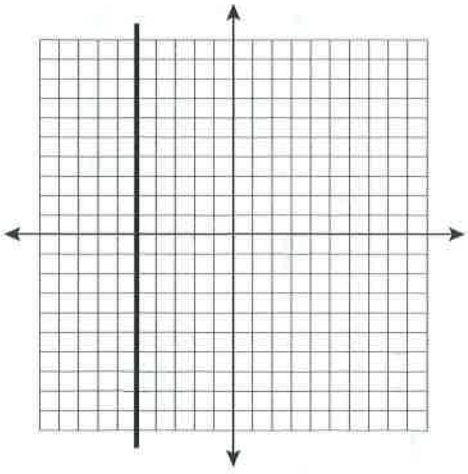
$y = 2x - 4$

b)



$y = 0$

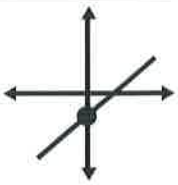
c)



$x = -5$

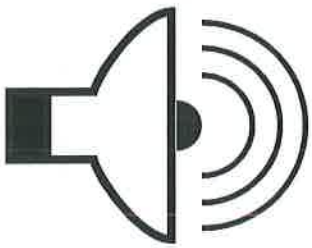
Linear Functions
LESSON TWO - *Slope-Intercept Form*
Lesson Notes

$y = mx + b$

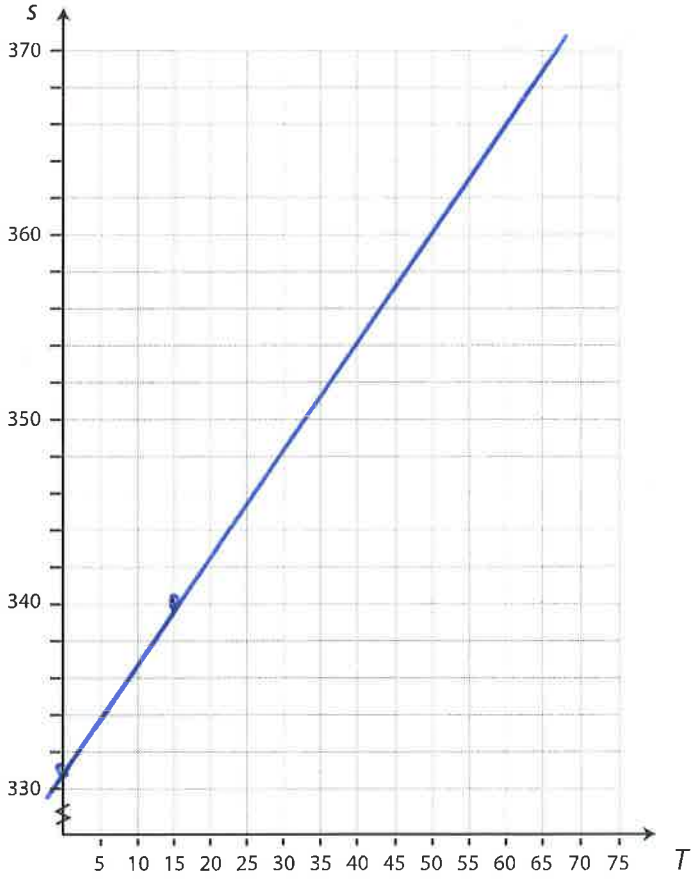


Example 3

The speed of sound at 0 °C is 331 m/s.
At 15 °C, the speed increases to 340 m/s.



a) Draw a graph representing this data.



b) Write an equation for the speed of sound as a function of temperature.

$y = \frac{10}{15}x + 330$

where x = temp

need slope

(x_1, y_1)

$(0, 330)$

$(15, 340)$

$\frac{340-330}{15-0} = \frac{10}{15}$

c) What is the speed of sound at 35 °C?

$y = \frac{10(35)}{15} + 330$

$= 353.3$ m/s

d) At what temperature is the speed of sound 364 m/s?

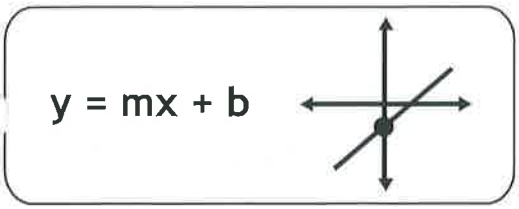
$364 = \frac{10}{15}(x) + 330$

$-330 \quad -330$

$\times 15 \quad 34 = \frac{10}{15}x \quad \times 15$

$\frac{510}{10} = \frac{10x}{10}$

$x = 56°$

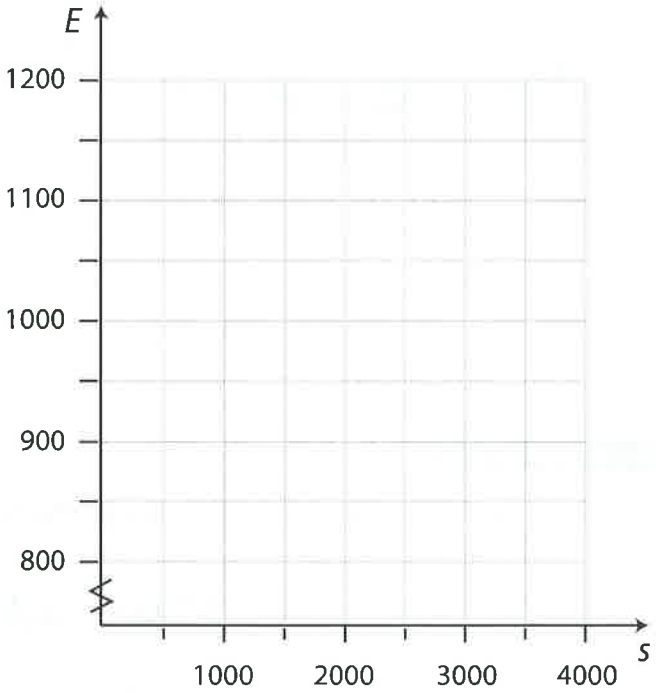


Linear Functions
LESSON TWO - *Slope-Intercept Form*
Lesson Notes

Example 4 John is a salesman earning $800 per week plus a 9% commission.

a) Write an equation for John's earnings as a function of sales. Graph the function.

$y = 800 + 0.09x$



b) If John sells $2500 worth of product in a week, what does he earn?

$y = 800 + 0.09(2500) = 1025$

c) How much did John sell if he earned $1016 in a week?

-800

$1016 = 800 + 0.09(x)$

-800

$216 = 0.09x$

$\frac{216}{0.09} = \frac{0.09x}{0.09}$

$x = \$2400$

$y - y_1 = m(x - x_1)$

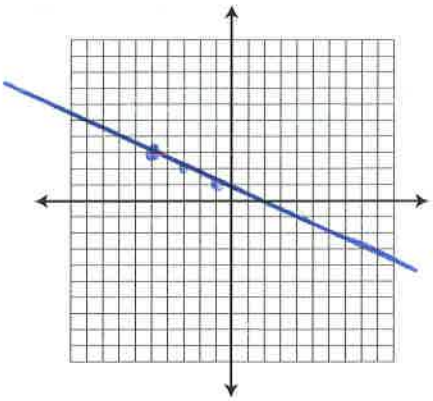
Linear Functions
LESSON THREE - *Slope-Point Form*
Lesson Notes

Introduction The equation of a line in slope-point form is $y - 3 = -\frac{1}{2}(x + 5)$

Equation ⟶ Graph

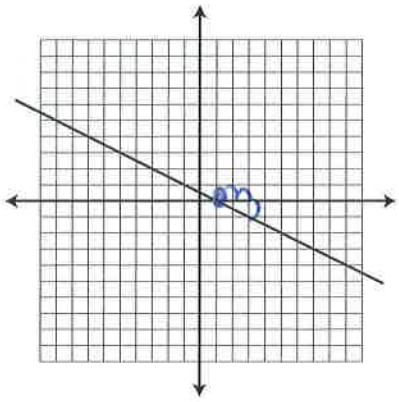
a) Draw the graph of $y - 3 = -\frac{1}{2}(x + 5)$

Slope: $-\frac{1}{2}$ point $(-5, 3)$



Graph ⟶ Equation

b) Determine the slope-point equation of the line shown.



need Slope + any point

down 1
Right 2 Slope: $-\frac{1}{2}$

point $(1, 0)$ $y - 0 = -\frac{1}{2}(x - 1)$

c) How can you tell if slope-intercept form or slope-point form should be used to find the equation of a line?

Linear Functions
LESSON THREE - *Slope-Point Form*
Lesson Notes

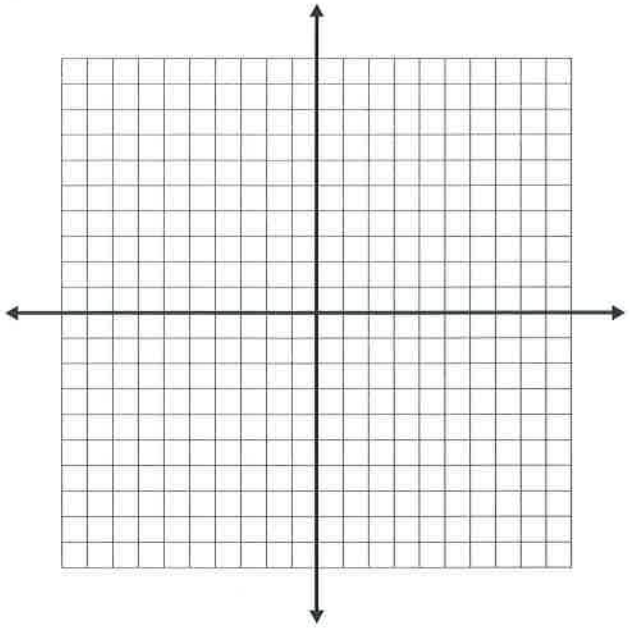
$y - y_1 = m(x - x_1)$

Example 1 Graph each of the following lines

a) $y + 4 = -\frac{1}{2}(x - 1)$

point $(1, -4)$

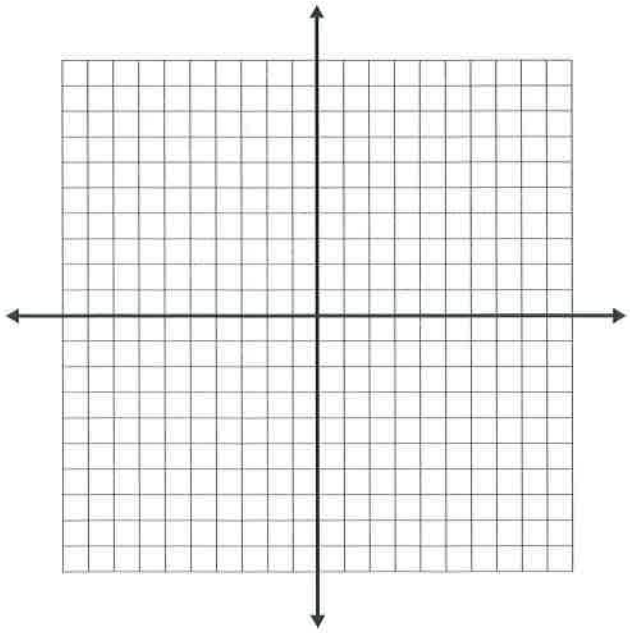
$m = -\frac{1}{2}$



b) $y = \frac{4}{3}(x + 5)$

point $= (-5, 0)$

↑ nothing with y



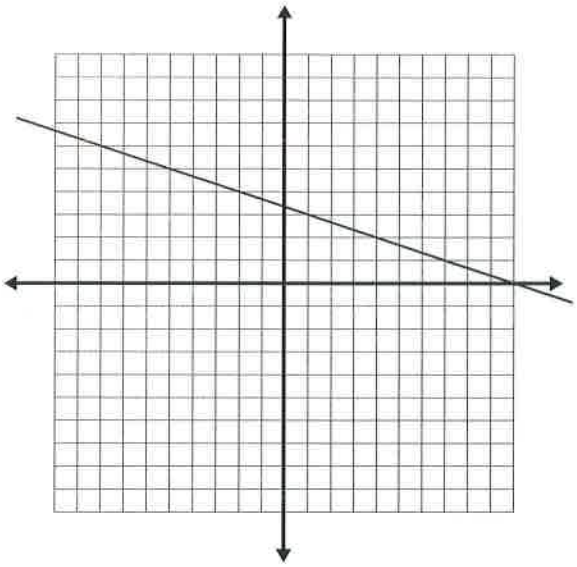
$y - y_1 = m(x - x_1)$

Linear Functions
LESSON THREE - *Slope-Point Form*
Lesson Notes

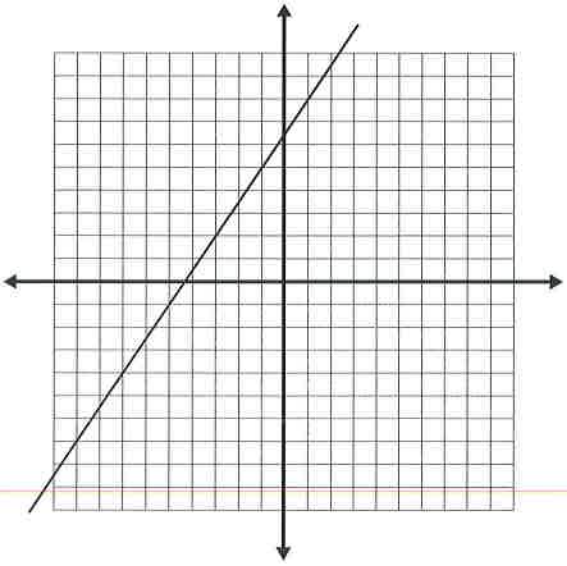
Example 2 Find the slope-point equation for each of the following lines.

*pick a point and find slope.

a)



b)



Linear Functions
LESSON THREE - *Slope-Point Form*
Lesson Notes

$y - y_1 = m(x - x_1)$

Example 3 Draw each line and determine its equation. Use a point and slope

a) A line passes through the points (-3, -1) and (2, -6).

x_2 y_2 x_1 y_1

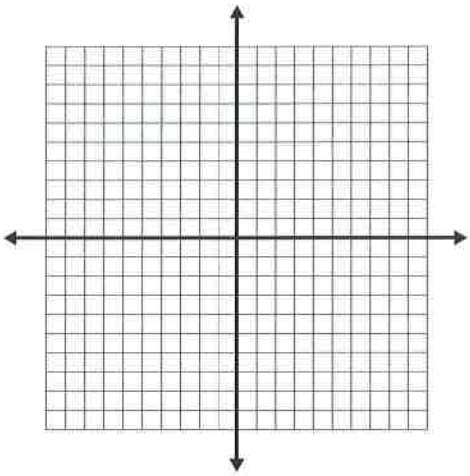
Use both points to find slope, then use 1 point and slope to make line.

$m = \frac{-1-(-6)}{-3-2} = \frac{5}{-5} = \frac{-1}{1}$

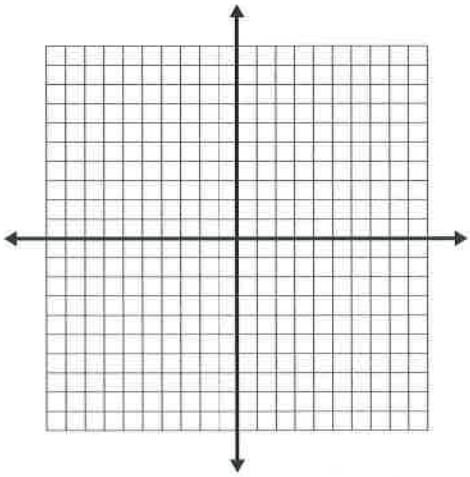
$y+1 = -1(x+3)$

or

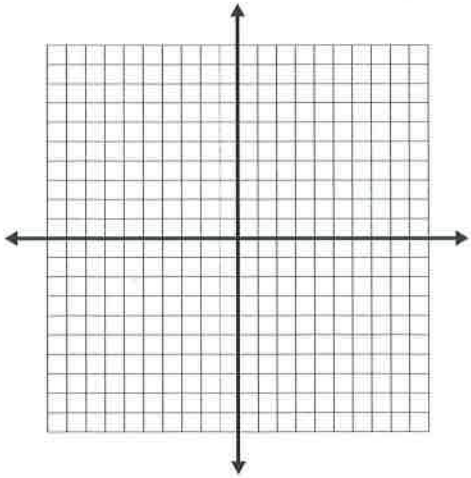
$y+6 = -1(x-2)$



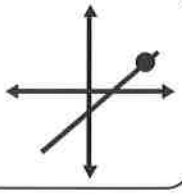
b) A line passes through the points (-4, 7) and (5, -3).



c) A line passes through the points (-9, -7) and (-9, -4).



$y - y_1 = m(x - x_1)$



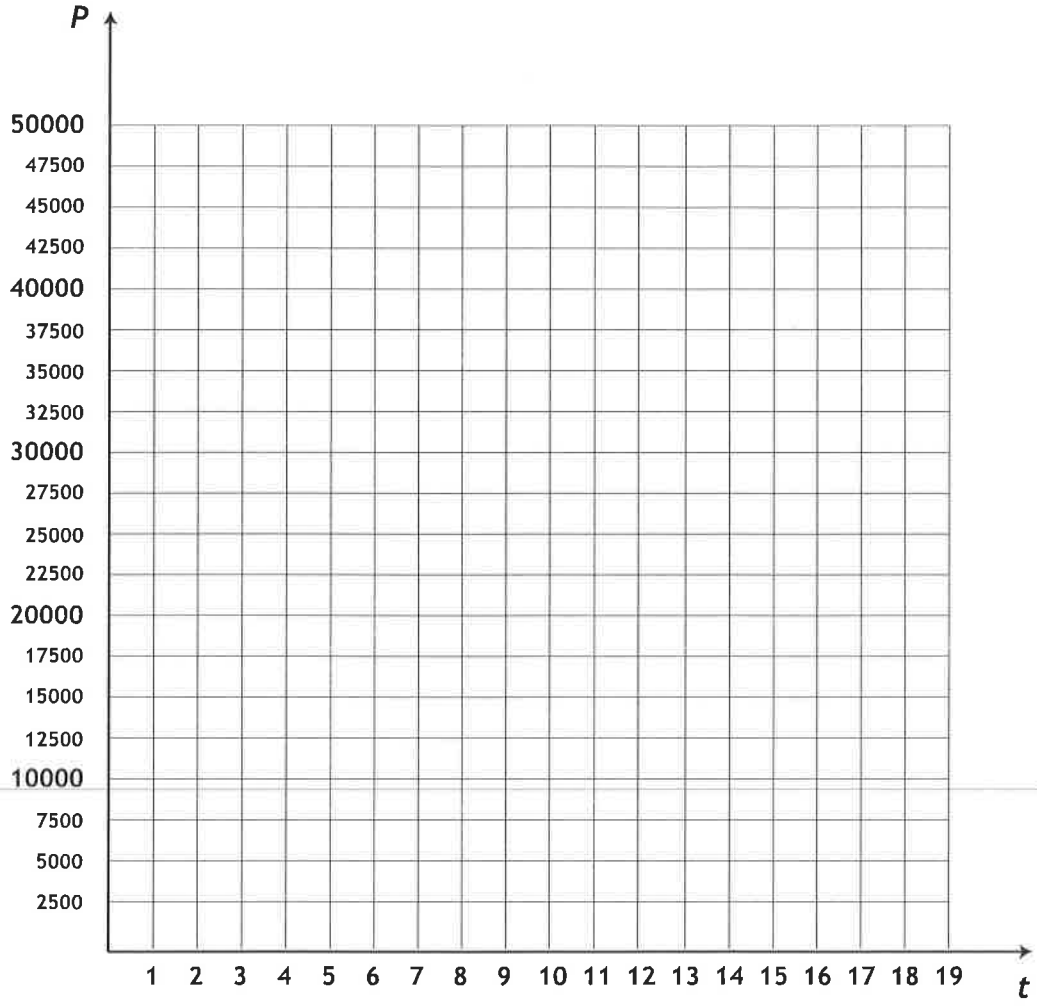
Linear Functions
LESSON THREE - *Slope-Point Form*
Lesson Notes

Example 4

The following table shows population data for two small cities.

Year	Population of City A	Population of City B
2012	34000	29170
2020	38960	27410

a) Represent this data on a graph where t represents the number of years since 2010 and P is the population.



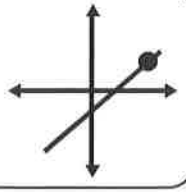
$y - y_1 = m(x - x_1)$

b) Determine the slope of each line. What does the slope tell you about the growth of each city?

c) For each city, write an equation for population as a function of time.

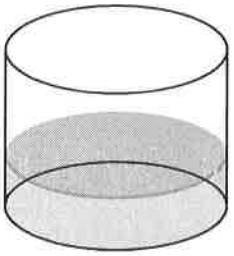
d) Predict the population of each city in 2029.

$y - y_1 = m(x - x_1)$



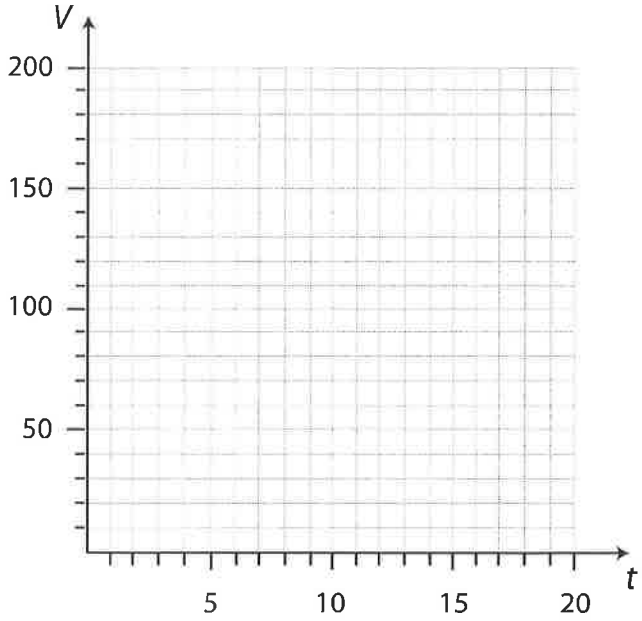
Linear Functions
LESSON THREE - *Slope-Point Form*
Lesson Notes

Example 5



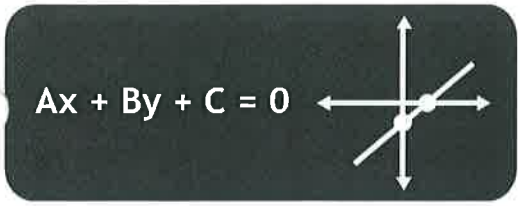
A cylindrical tank contains an unknown amount of water. If water is added to the tank at a rate of 5 L/min for 12 minutes, the volume of the water will be 89 L.

a) Write an equation for the volume of the tank as a function of time. Draw the graph.



b) What is the volume of water in the tank after 17 minutes?

c) The maximum volume of the tank is 134 L. How long can the tank be filled before it overflows?



Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

Introduction The equation of a line is $3x + y + 3 = 0$.

To get to $y = mx + b$ Isolate for y

Equation ⟶ Graph

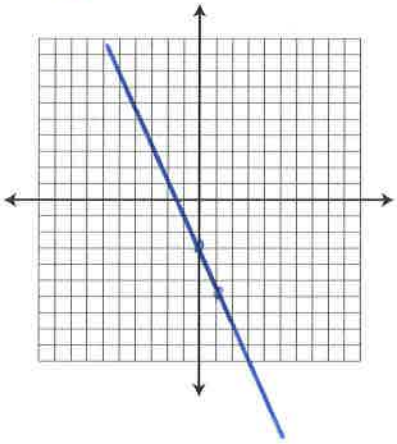
a) Write $3x + y + 3 = 0$ in slope-intercept form and draw the graph.

$-3x$

$y + 3 = -3x - 3$

-3

$y = -3x - 3$



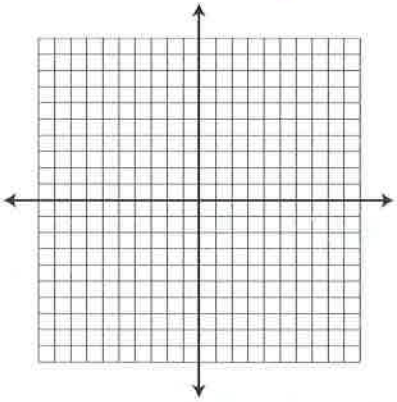
b) Find the intercepts of $3x + y + 3 = 0$ and draw the graph.

X is when $y = 0$

y is when $x = 0$

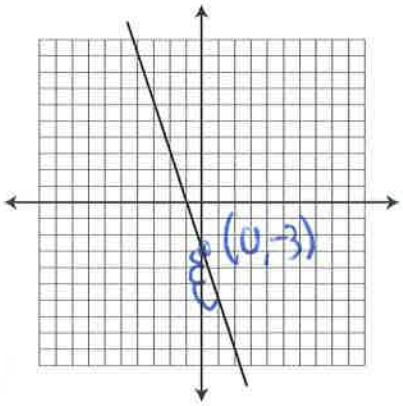
$X \to (-1, 0)$

$y \to (0, -3)$



Graph ⟶ Equation

c) Determine the general form equation of the line shown.



must be whole and positive 'A' value.

*Start w/ $y = mx + b$ then Convert.

Slope: $\frac{-3}{1}$

$y = -3x - 3$

not pos.

$3x + y + 3 = 0$

*$3x + 3$

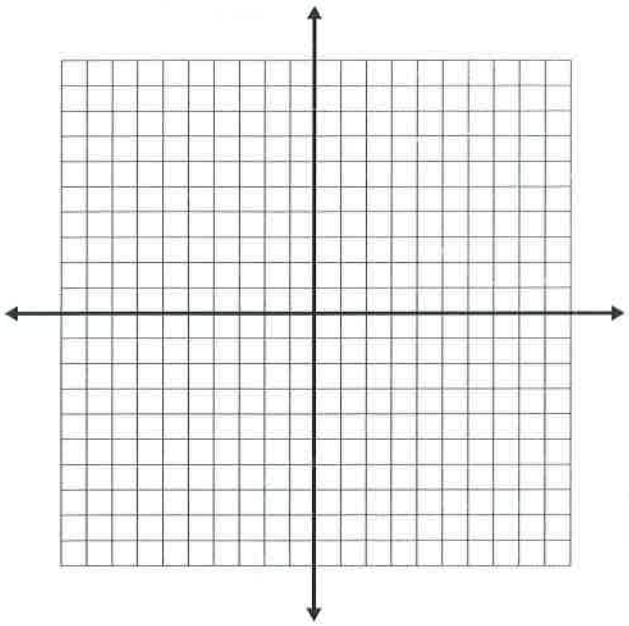
$+3x + 3$

Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

$Ax + By + C = 0$

Example 1 Write each equation in slope-intercept form and graph the line.

a) $2x - y + 3 = 0$



get rid of fractions by multiplying by LCM

b) $\frac{3}{4}x - \frac{3}{2}y - 6 = 0$

LCM: 2: 2, 4
4: 4

$\times 4 \quad \times 2 \quad \times 4 \quad \times 4$

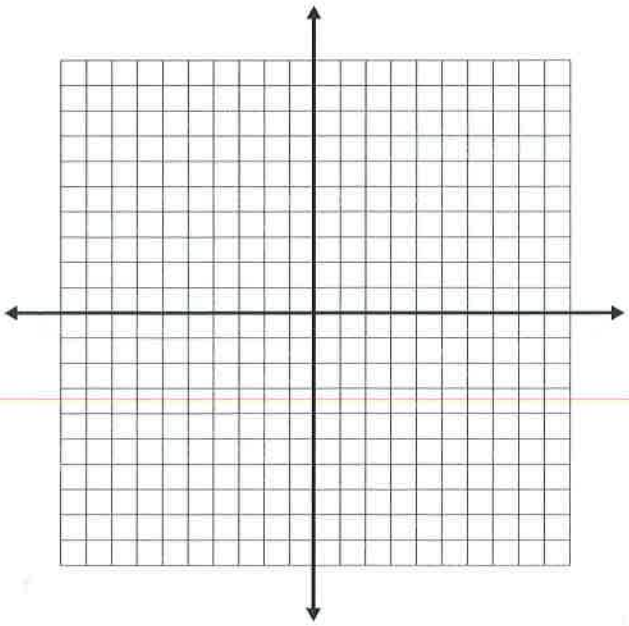
$\frac{3}{4}x - \frac{3}{2}y - 6 = 0$

$3x - 6y - 24 = 0 \quad -3x - 24$

$-3x \qquad -24$

$\frac{-6y}{-6} = \frac{-3x - 24}{-6}$

$y = +\frac{1}{2}x + 4$

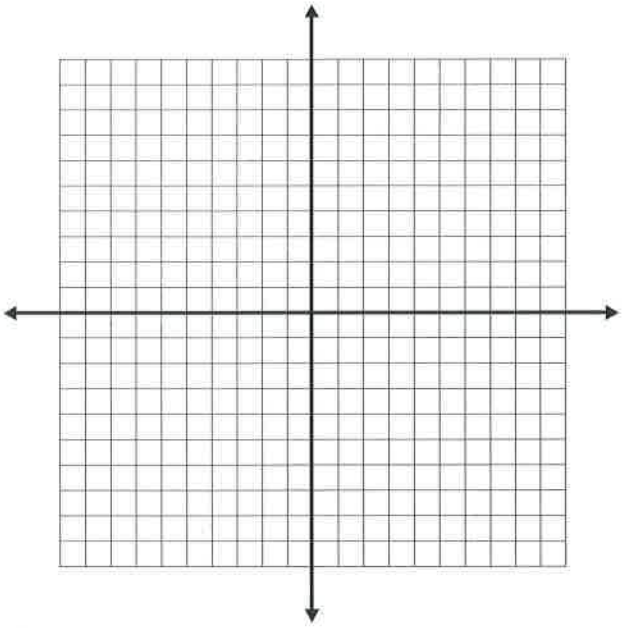


$Ax + By + C = 0$

Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

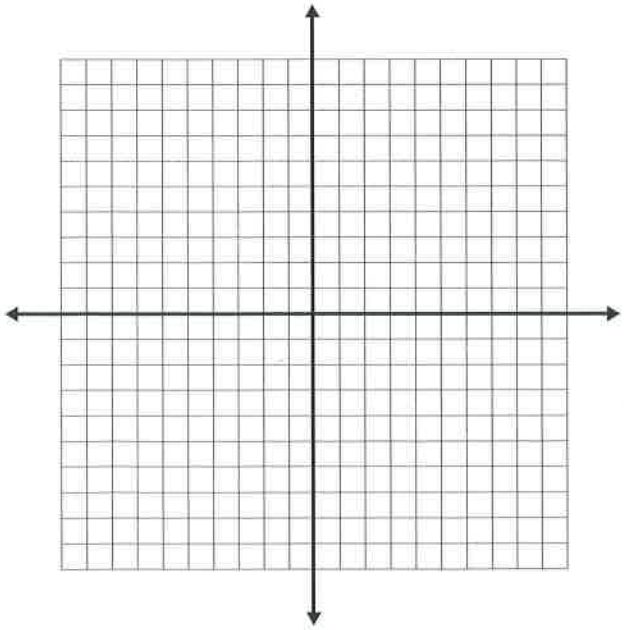
Example 2 Graph each equation using x & y intercepts.

a) $7x - 8y - 56 = 0$



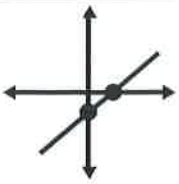
b) $\frac{1}{5}x - \frac{1}{2}y - 1 = 0$

* get rid of fractions by multiplying by LCM



Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

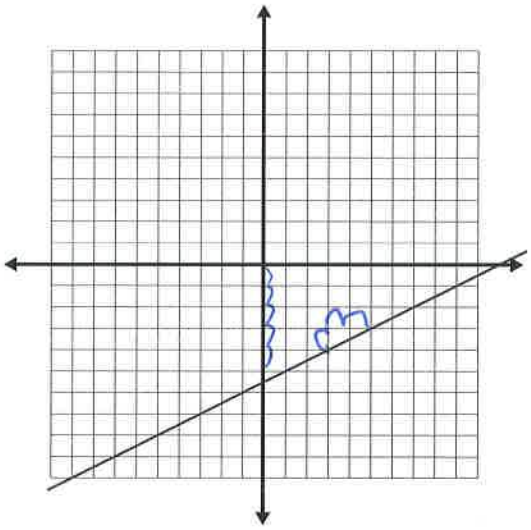
$Ax + By + C = 0$



Example 3 Determine the general form equation of each line shown below.

*Start in $y = mx + b$ then Convert.

a)



$y = mx + b$

$m = \frac{2}{1}$

$b = -5.5$

$-y \quad -y$

$y = 2x - 5.5$

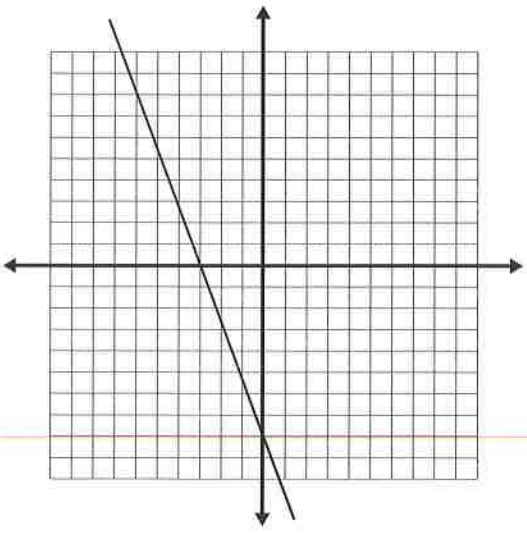
$+x^2 \quad +x^2 \quad +x^2 \quad +x^2$

$2x - y - 5.5 = 0$

(no decimal)

$4x - 2y - 11 = 0$

b)



Ax + By + C = 0

Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

Example 4 Two positive real numbers, a and b, have a sum of 5.

a) Use a table to generate data for a and b.

a	b	sum
1	4	5
2	3	5
4	1	5
~~3~~ 3.1	1.9	5
1.9	3.1	5

b) Write an equation that relates the variables. State the dependent and independent variables.

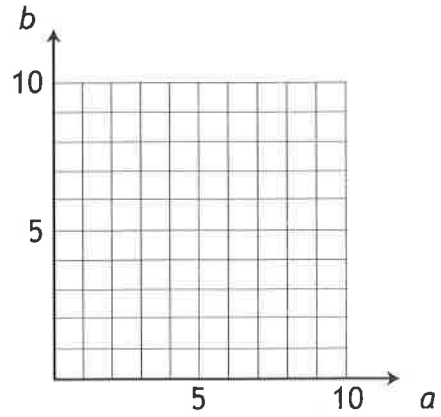
$x + y = 5$ or $A + B = 5$

c) Graph the relation in two ways:

i) b V.S. a

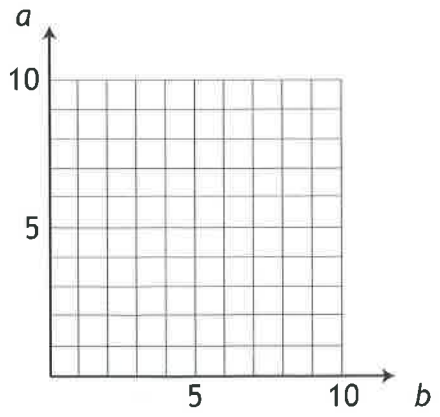
Equation

Use data from above.



ii) a V.S. b

Equation



Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

$Ax + By + C = 0$

Example 5

A small appliance store is having a sale on fans and lamps. A fan costs $10, and a lamp costs $20. At the end of the day, the revenue from these items is $120.

a) Find the intercepts of this relation.

fans ($10)	lamps ($20)	revenue
0	6	120
12	0	120

b) Write an equation that relates the variables. State the dependent and independent variables.

$10x + 20y = 120$

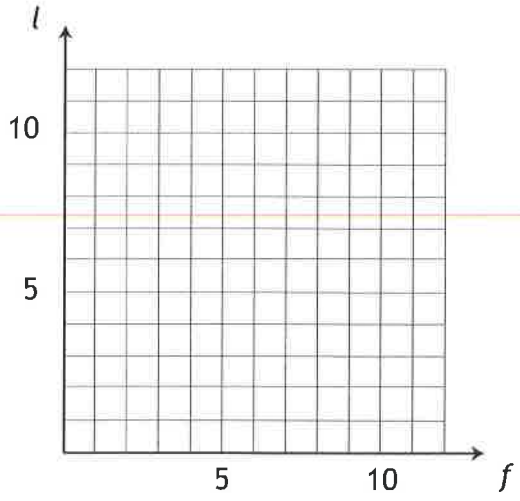
Fans, lamps, Revenue

c) Graph the relation in two ways:

i) *lamps* V.S. *fans*

Equation
$y = \frac{10}{20}x + \frac{120}{20}$

$y = \frac{1}{2}x + 6$

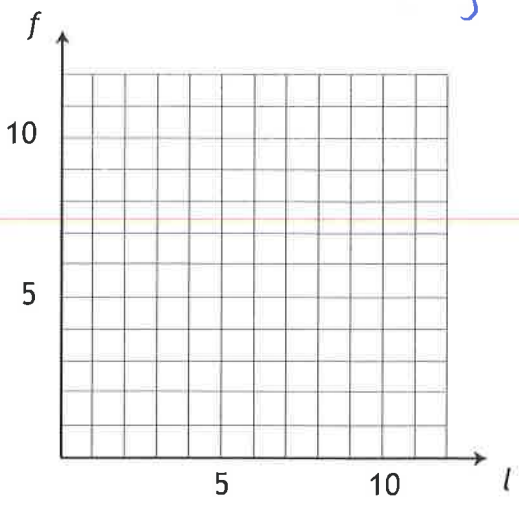


ii) *fans* V.S. *lamps*

Equation
$x = \frac{20}{10}y + \frac{120}{10}$

or

$x = 2y + 12$

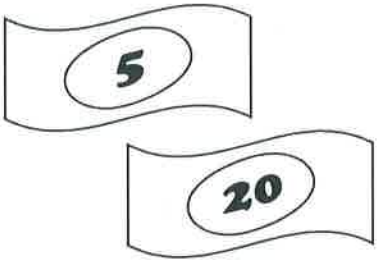


Ax + By + C = 0

Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

Example 6

A stack of bills contains only \$5 and \$20 denominations. The total value is \$140.



a) Find the intercepts of this relation.

fives (\$5)	twenties (\$20)	total amount
0	7	140
28	0	140

b) Write an equation that relates the variables. State the dependent and independent variables.

$5x + 20y = 140$

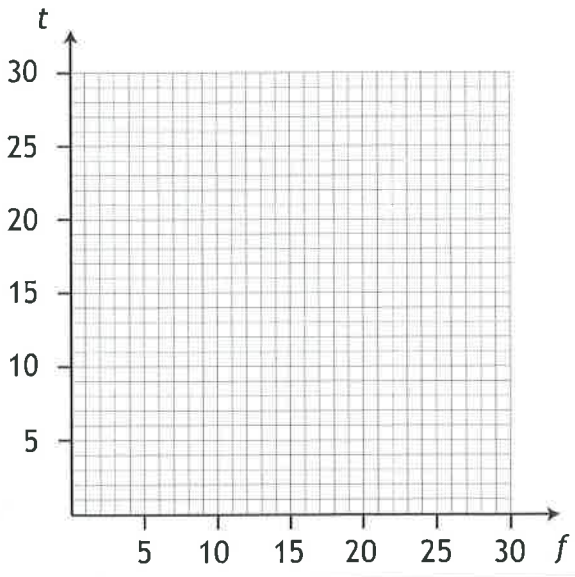
c) Graph the relation in two ways:

i) *twenties* V.S. *fives*

Equation
$y = \frac{5}{20}x + \frac{140}{20}$

or

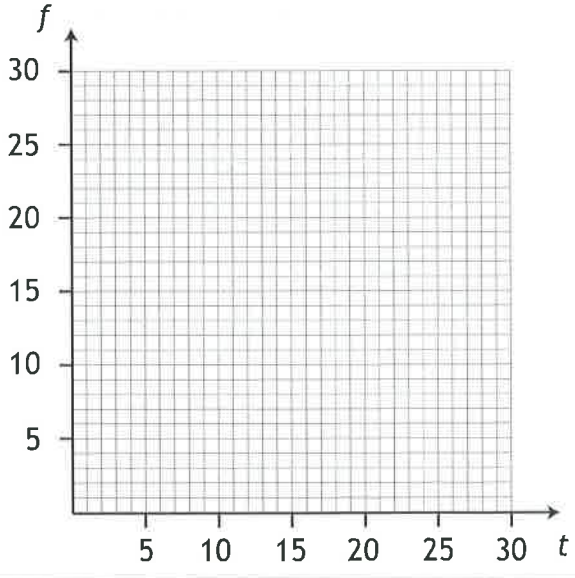
$y = \frac{1}{4}x + 7$

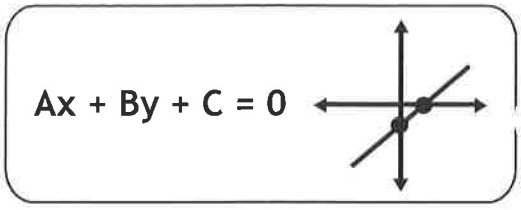


ii) *fives* V.S. *twenties*

Equation
$x = \frac{20}{5}y + \frac{140}{5}$

$x = 4y + 28$

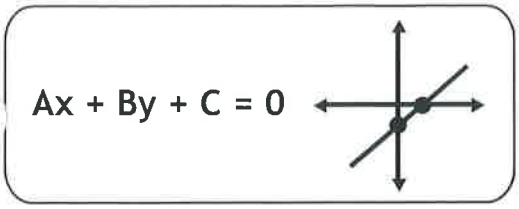




d) Using the equation, determine if it's possible to have twelve $5 bills and four $20 bills.

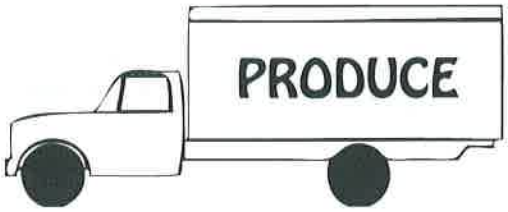
e) Using the equation, determine if it's possible to have eighteen $5 bills and six $20 bills.

f) Use the equation to find the number of $5 bills if there are five $20 bills.



Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

Example 7



A truck is transporting beets and potatoes. The density of beets is 720 kg/m^3, and the density of potatoes is 760 kg/m^3. The total mass of the beets and potatoes is 12000 kg.

The density formula is $d = \frac{m}{V}$, where d is the density, m is the mass, and V is the volume.

a) If the volume of the beets is b, and the volume of the potatoes is p, write an equation that relates the variables.

Need mass of beets + potatoes $720B + 760P = 12000$ kg

b) Find the intercepts of this relation.

volume of beets	volume of potatoes
0	15.78
16.6	0

Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

$Ax + By + C = 0$

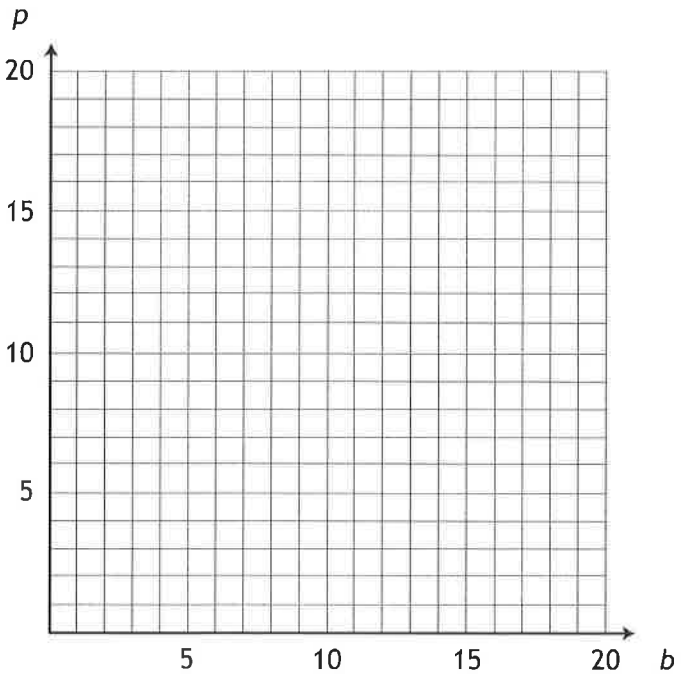
c) Graph the relation in two ways:

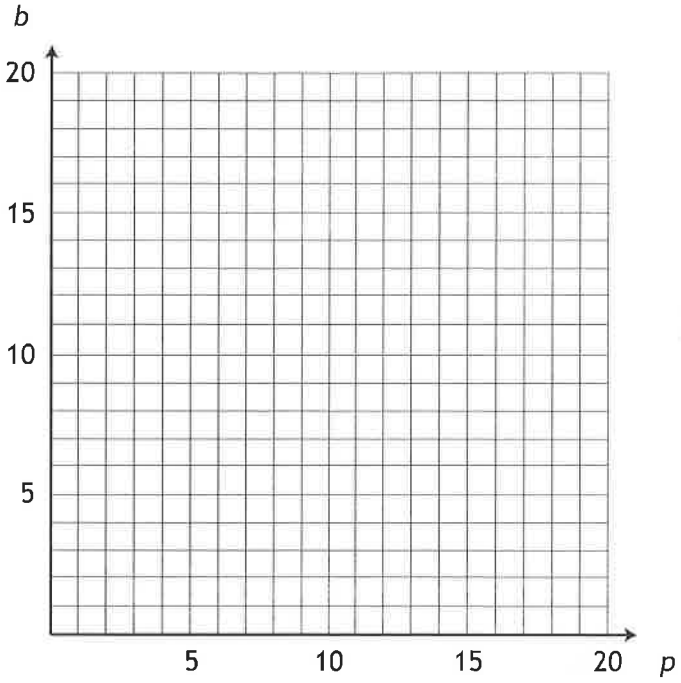
i) volume of potatoes V.S. volume of beets

Equation

ii) volume of beets V.S. volume of potatoes.

Equation



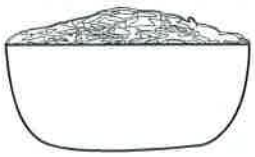


d) If the volume of the potatoes is 7.3 m^3, what is the volume of the beets?

Ax + By + C = 0

Linear Functions
LESSON FOUR - *General Form*
Lesson Notes

Example 8



There are 400 Calories in one bowl of dry cereal.

a) Write an equation that relates the amount of Calories to the number of bowls. State the dependent and independent variables.

Calories = 400x

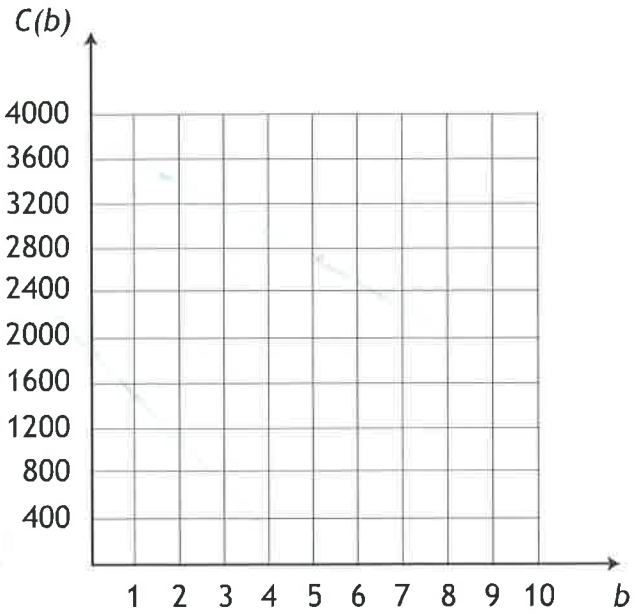
x = # of Bowls.

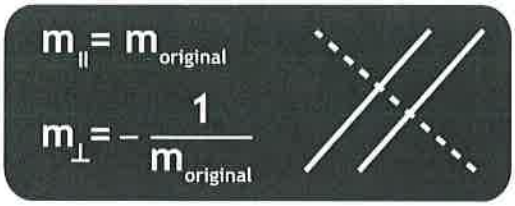
indepen: # of bowls
depen: Calories

b) Why is this relation a function? Write the relation using function notation.

Input Output.

c) Graph the relation. Why can it only be graphed as *C* vs *b*?





Linear Functions

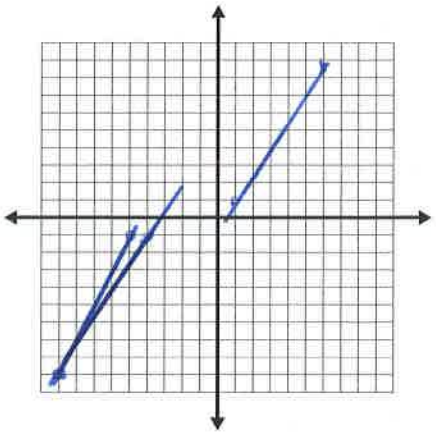
LESSON FIVE - *Parallel and Perpendicular Lines*

Lesson Notes

Introduction

Graph each pair of lines and calculate the slope of each line.
State if the pair of lines is parallel, perpendicular, or neither.

a) Points on Line 1: (-9, -9) & (-4, -1)
Points on Line 2: (1, 1) & (6, 9)

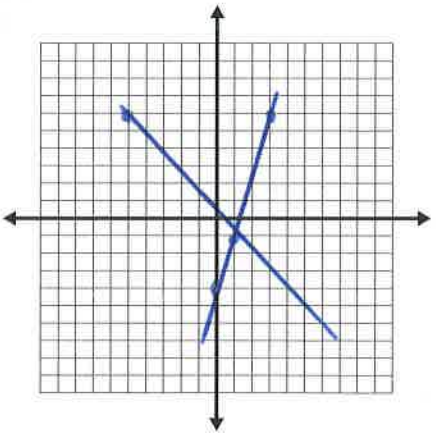


Use Slope to check. 1) $\frac{-1-(-9)}{-4-(-9)} = \frac{8}{5}$

2) $\frac{9-1}{6-1} = \frac{8}{5}$ Yes

b) Points on Line 1: (-5, 6) & (1, -1)
Points on Line 2: (-4, 0) & (3, 6)

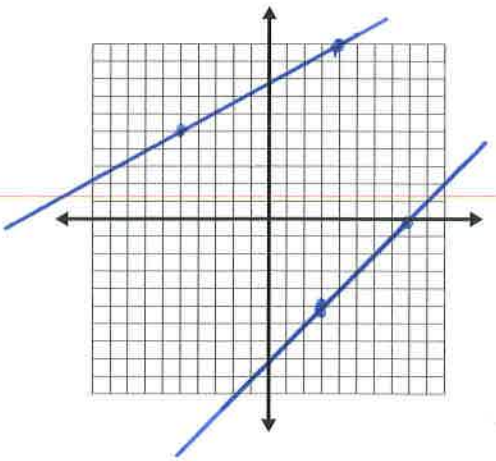
NO



1) $\frac{-1-6}{1-(-5)} = \frac{-7}{4}$

2) $\frac{6-0}{3-(-4)} = \frac{6}{7}$

c) Points on Line 1: (-5, -5) & (4, 10)
Points on Line 2: (4, -5) & (8, 0)



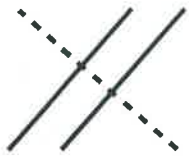
1) $\frac{10-(-5)}{4-(-5)} \quad \frac{15}{9}$

2) $\frac{0-(-5)}{8-4} \quad \frac{5}{9}$ NO

Linear Functions
LESSON FIVE - *Parallel and Perpendicular Lines*
Lesson Notes

$m_{\parallel} = m_{original}$

$m_{\perp} = -\frac{1}{m_{original}}$



Example 1 For each pair of slopes, find the value of a.

i) if the slopes are parallel to each other
ii) if the slopes are perpendicular to each other

a) $\frac{5}{4}, \frac{a}{8}$

parallel	perpendicular
$\frac{5}{4} \times 2 = \frac{10}{8}$	$-\frac{8}{10}$

b) $-\frac{2}{a}, 3$

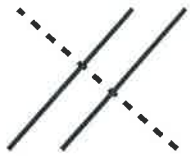
parallel	perpendicular
$\times -1.5$ $-\frac{2}{a} = \frac{3}{1}$ $\times -1.5$ $a = -1.5$	$a \quad \frac{-2}{-1.5} = \frac{-4}{-3} = \frac{4}{3} = \frac{-3}{4}$

c) undefined, a

parallel	perpendicular
Undefined	$\emptyset$

$m_{\parallel} = m_{original}$

$m_{\perp} = -\frac{1}{m_{original}}$



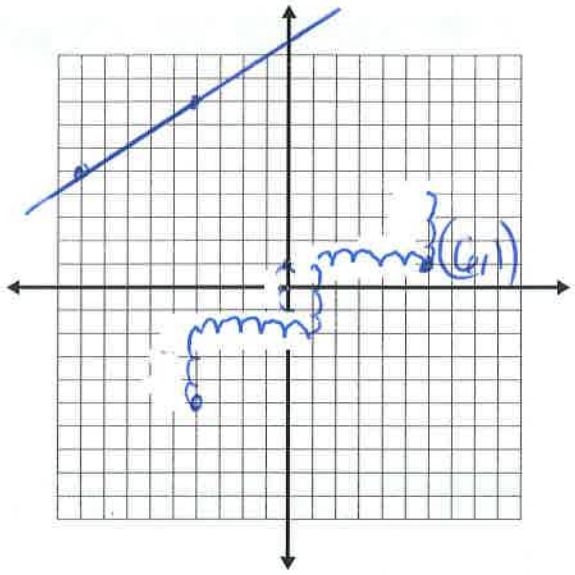
Linear Functions

LESSON FIVE - *Parallel and Perpendicular Lines*

Lesson Notes

Example 2

a) A line with points at (-9, 5) and (-4, 8) is parallel to a line with points at (-4, -5) and (a, 1). Determine the value of a using a graphical approach first, then use an algebraic approach.



Doesn't matter how.

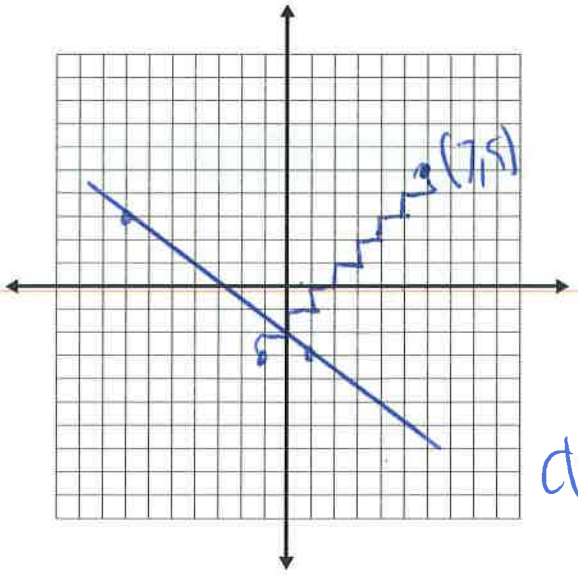
// means slopes are =

$\frac{8-5}{-4-(a)} = \frac{3}{5}$ $a = 6$

(6, 1)

Check $\frac{1-(-5)}{6-(-4)} = \frac{6}{10} = \frac{3}{5}$ ✓

b) A line with points at (-7, 3) and (1, -3) is perpendicular to a line with points at (-1, -3) and (a, 5). Determine the value of a using a graphical approach first, then use an algebraic approach.



Perp means meets @ 90°

So Slope = $-\frac{1}{\text{Slope}}$

1) $\frac{-3-3}{1-(-7)} = \frac{-6}{6} = -\frac{1}{1}$ So $\frac{1}{1}$

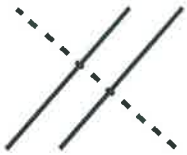
$a = 7$

Check (7,5) (-1,-3) $\frac{-3-5}{-1-7} = \frac{-8}{-8} = \frac{1}{1}$ ✓

Linear Functions
LESSON FIVE - *Parallel and Perpendicular Lines*
Lesson Notes

$m_{\parallel} = m_{original}$

$m_{\perp} = -\frac{1}{m_{original}}$



Example 3

a) Given the equation 6x - 2y + 10 = 0, find the slope-intercept equation of a parallel line passing through (-2, -7). Graph the original line and the parallel line on the same coordinate grid.

Original: $6x - 2y + 10 = 0$

$-2y \quad -2y$

$\frac{6x + 10 = 2y}{2 \quad 2 \quad 2}$

$3x + 5 = y$

Parallel! Needs same slope so $m = \frac{3}{1}$

point $= (\overset{x}{-2}, \overset{y}{-7})$

$y = mx + b$

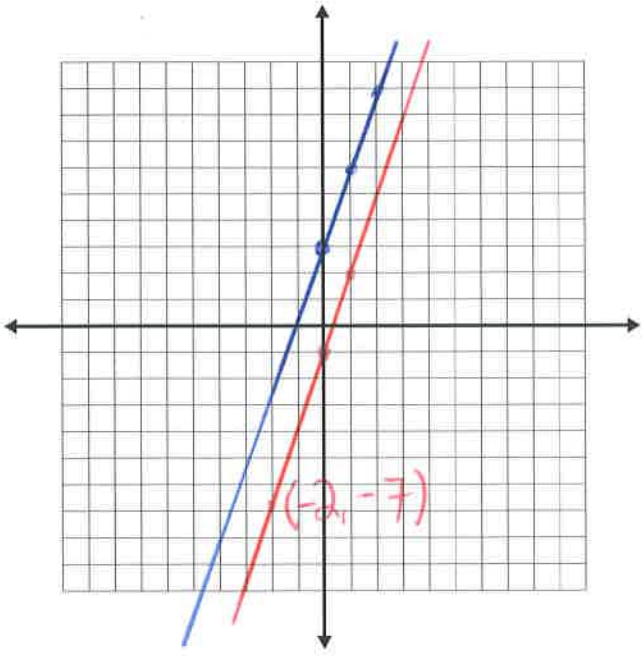
$-7 = 3(-2) + b$

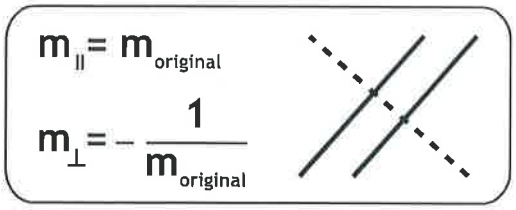
$-7 = -6 + b$

$+6 \quad +6$

$-1 = b$

$y = 3x - 1$





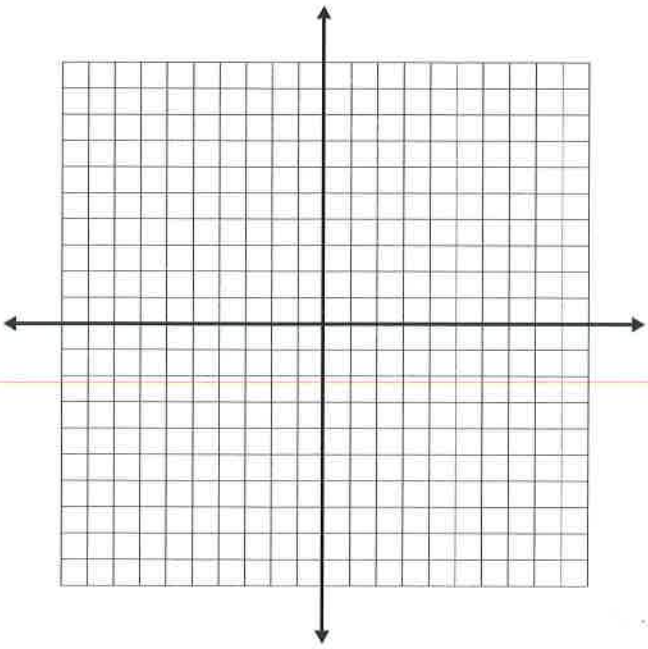
Linear Functions

LESSON FIVE - *Parallel and Perpendicular Lines*

Lesson Notes

b) Given the equation x + 6y - 18 = 0, find the slope-intercept equation of a perpendicular line passing through (4, -1). Graph the original line and the perpendicular line on the same coordinate grid.

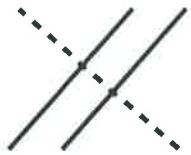
Same as before but slope is opposite reverse



Linear Functions
LESSON FIVE - *Parallel and Perpendicular Lines*
Lesson Notes

$$m_{\parallel} = m_{original}$$

$$m_{\perp} = -\frac{1}{m_{original}}$$



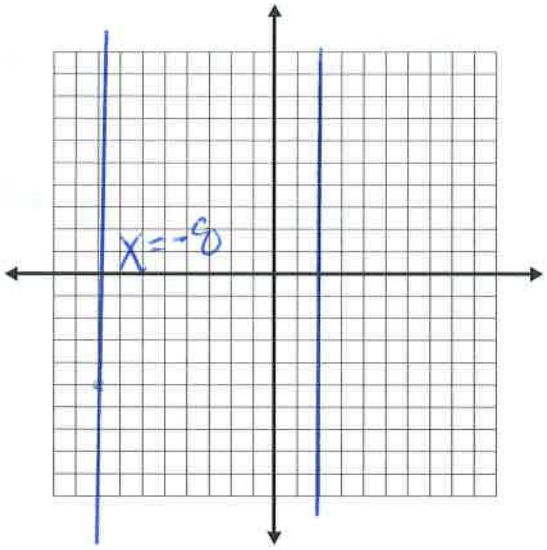
Example 4

a) Given the equation x - 2 = 0, find the equation of a parallel line passing through the point (-8, -5). Graph the original line and the parallel line on the same coordinate grid.

$x-2=0 \rightarrow x=2$

parallel needs a undefined slope

So $x=-8$ or $x+8=0$



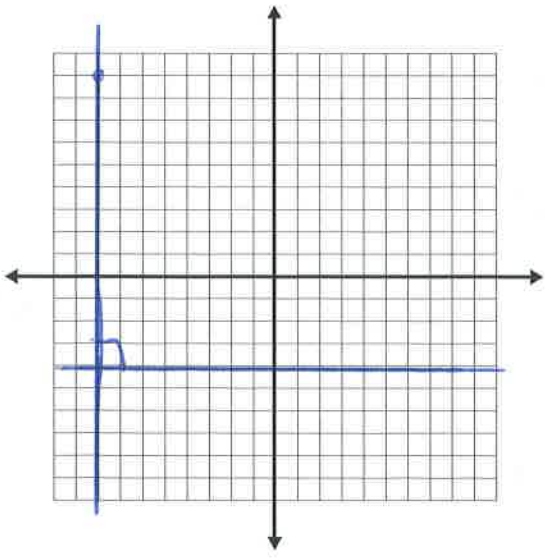
b) Given the equation y + 4 = 0, find the equation of a perpendicular line passing through the point (-8, 9). Graph the original line and the perpendicular line on the same coordinate grid.

$y+4=0 \rightarrow y=-4$

$\perp$ means its opposite inverse

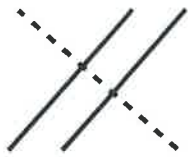
So need to be undefined.

So $x=-8$ or $x+8=0$



$m_{\parallel} = m_{original}$

$m_{\perp} = -\frac{1}{m_{original}}$



Linear Functions

LESSON FIVE - *Parallel and Perpendicular Lines*

Lesson Notes

Example 5

Two perpendicular lines intersect on the x-axis. The equation of one of the lines is x - 2y - 2 = 0. Find the equation of the other line. Graph the original line and the perpendicular line on the same coordinate grid.

Intersect on x-axis means $y=0$

need slope of eqt #1 : $x - 2y - 2 = 0$

$+2y \quad +2y$

$\frac{x-2}{2} = \frac{2y}{2}$ $\quad y = \frac{1}{2}x - 1$

Slope $= \frac{1}{2}$

$\perp$ = opp. inverse $\frac{1}{2} \rightarrow -\frac{1}{2} \rightarrow \frac{2}{-1}$

needs @ $(2, 0)$

$y = mx + b$

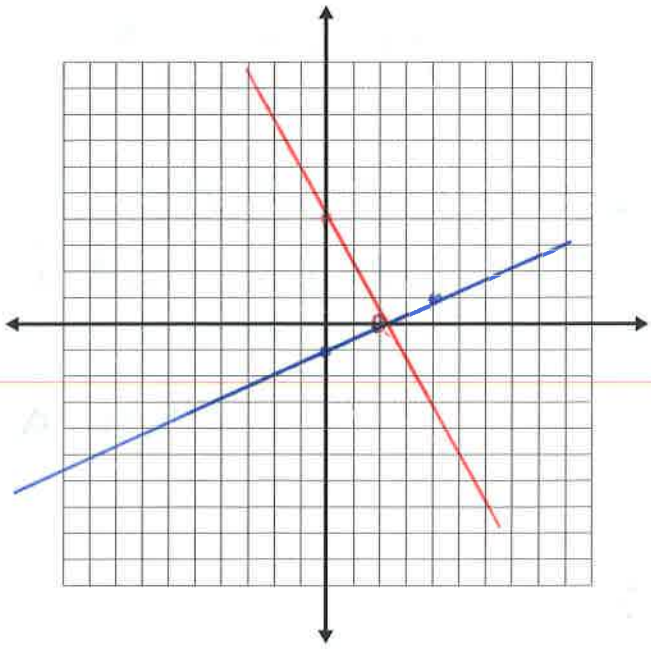
$0 = 2\left(\frac{2}{-1}\right) + b$

$0 = -4 + b$

$+4 \quad +4$

$b = 4$

$y = \frac{-2}{1}x + 4$



Linear Functions
LESSON FIVE - *Parallel and Perpendicular Lines*
Lesson Notes

$m_{\parallel} = m_{original}$

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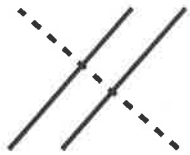
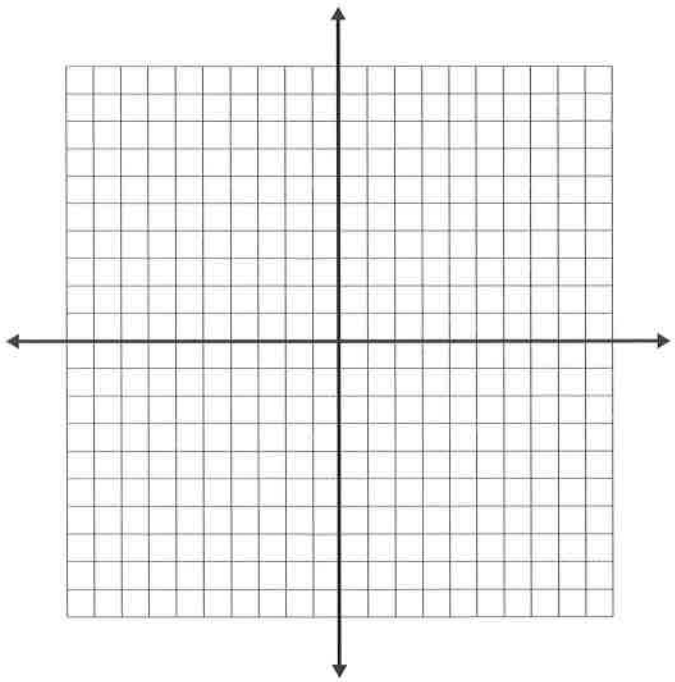


Example 6

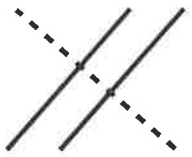
Given the equation $2x - y + 5 = 0$, find the slope-intercept equation of a perpendicular line with the same x-intercept as $3x - 4y - 24 = 0$. Graph the original line and the perpendicular line on the same coordinate grid.

Same as #5



$m_{\parallel} = m_{original}$

$m_{\perp} = -\frac{1}{m_{original}}$



Linear Functions

LESSON FIVE - *Parallel and Perpendicular Lines*

Lesson Notes

Example 7

The line $4x - 5y + 27 = 0$ comes into contact with a circle at the point (-3, 3). The centre of the circle is at the point $(a, -2)$. Find the value of a.