Ch. 4.1 - Patterns

Take the pattern:

$3, 9, 15, 21, 27, \ldots$

What is the next number? $\boxed{33}$

the next? $\boxed{39}$

the 100th number? <u>YIKES!</u>

In order to make such determinations, a <u>LINEAR EQUATION</u> is required.

- such an equation would serve to represent <u>all</u> values of a pattern.

Take the pattern above again:

$$\left.\begin{array}{lll} 1^{st} \text{ number} = 3 & = & 3 + 0(6) \\ 2^{nd} \text{ number} = 9 & = & 3 + 1(6) \\ 3^{rd} \text{ number} = 15 & = & 3 + 2(6) \end{array}\right\}$$

Common difference of $\underline{\underline{\boxed{6}}}$

(common difference $= \underline{d}$)

100th number? $\boxed{3 + 99(6) = 597}$

General: nth number: $3 + (n-1)(6)$

$= 6n - 6 + 3 = \boxed{6n - 3}$

Try another way:

3, 9, 15, ...

1st number : $6(1) - 3 = 3$

2nd : $6(2) - 3 = 9$

3rd : $6(3) - 3 = 15$

100th : $6(100) - 3 = 597$

nth : $6n - 3$

same!

eg1: Find the 100th number in the pattern 5, 9, 13, 17, ... and provide a linear equation for the nth term.

common difference $(d) = 4$

1st number : $5 = 5 + 0(4)$

2nd : $9 = 5 + 1(4)$

3rd : $13 = 5 + 2(4)$

100th : $5 + 99(4) = \boxed{401}$

nth : $5 + (n-1)4$

$5 + 4n - 4 = \boxed{4n+1}$

or

1^{st} : $4(1) + 1 = 5$

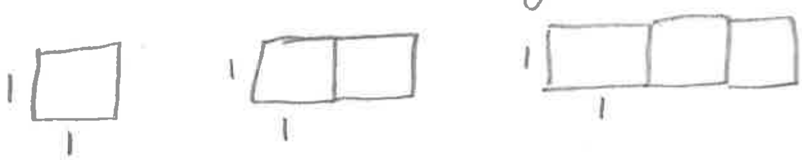
2^{nd} : $4(2) + 1 = 9$

3^{rd} : $4(3) + 1 = 13$

100^{th} : $4(100) + 1 = \boxed{401}$

n^{th} : $\boxed{4n + 1}$

eg2: Determine the perimeter of the 10^{th} set of blocks, given:



Set 1 : 4
Set 2 : 6
Set 3 : 8

$d = 2$

$4 + 0(2)$ OR $1(2) + 2$

$4 + 1(2)$ OR $2(2) + 2$

$4 + 2(2)$ OR $3(2) + 2$

10^{th} set : $4 + 9(2)$ $10(2) + 2$

$\boxed{= 22} \longleftrightarrow \boxed{= 22}$

General? n^{th} set : $4 + (n-1)2$ or $n(2) + 2$

$= 4 + 2n - 2$ $\boxed{= 2n + 2}$

$\boxed{= 2n + 2}$

eg 3: Write an equation relating t to n:

n	0	1	2	3	4
t	4	6	8	10	12

common diff. of t

$$t = dn + b$$

As n goes up 1, t goes up 2

but starting points different.

$$t = 2n + b$$ some unknown value

$4 = 2(0) + b$

$b = 4$

$6 = 2(1) + b$

$b = 4$

etc...

so, $\boxed{t = 2n + 4}$

Note: It is possible for a pattern (sequence) to have a common difference (d) that is negative.

eg: 13, 8, 3, −2, ...

$$d = \boxed{-5}$$

eg4: Find the 100th and n^{th} term of the pattern: 7, 4, 1, −2, −5, ...

$d = -3$

n	1	2	3	4	5
t	7	4	1	−2	−5

$t = -3n + b$

$7 = -3(1) + b$ $\quad$ $4 = -3(2) + b$ $\quad$ etc ...

$b = 10$ $\quad$ $10 = b$

$\boxed{t_n = -3n + 10}$

n^{th} term

$t_{100} = -3(100) + 10 = \boxed{-290}$

(100th term)

eg1 (again): 5, 9, 13, 17

n	1	2	3	4
t	5	9	13	17

$d = \boxed{4}$

$t = 4n + b$

$5 = 4(1) + b$

$b = 1$

eg2 (again): 4, 6, 8, ...

n	1	2	3
t	4	6	8

$d = \boxed{2}$

$t = 2n + b$

$4 = 2(1) + b$

$b = 2$

eg 5: Find the 100^{th} and n^{th} term of:

n	5	10	15	20
t	-8	4	16	28

Note: Since n is NOT increasing by 1, we need to do some extra work to find d.

As n increases by 5, t increases by 12.

Therefore, $5d = 12$

$$d = \frac{12}{5}$$

$$t = \frac{12}{5}n + b$$

$$4 = \left(\frac{12}{5}\right)(10) + b$$

$$4 = \frac{120}{5} + b$$

$$4 = 24 + b$$

$$b = -20$$

so,

$$t_n = \boxed{\frac{12}{5}n - 20}$$

$$t_{100} = \frac{12}{5}(100) - 20$$

$$t_{100} = 240 - 20$$

$$= \boxed{220}$$

eg6: Rent-A-Wreck rents a car for \$30 per day, plus \$0.20 per km driven

a) Write an equation relating cost to kilometers driven per day

b) What is the cost if the car was driven 120 km for the day?

c) If \$57.40 was charged to Joe for one day, how far did Joe drive?

a) Let C = cost

Let x = # of km driven

$$\boxed{C = 30 + 0.20x}$$

b) $C = 30 + 0.20x$

$C = 30 + 0.20(120)$

$C = 54 \Rightarrow \boxed{\$54}$

c) $C = 30 + 0.20x$

$57.40 = 30 + 0.20x$

$27.40 = 0.20x$

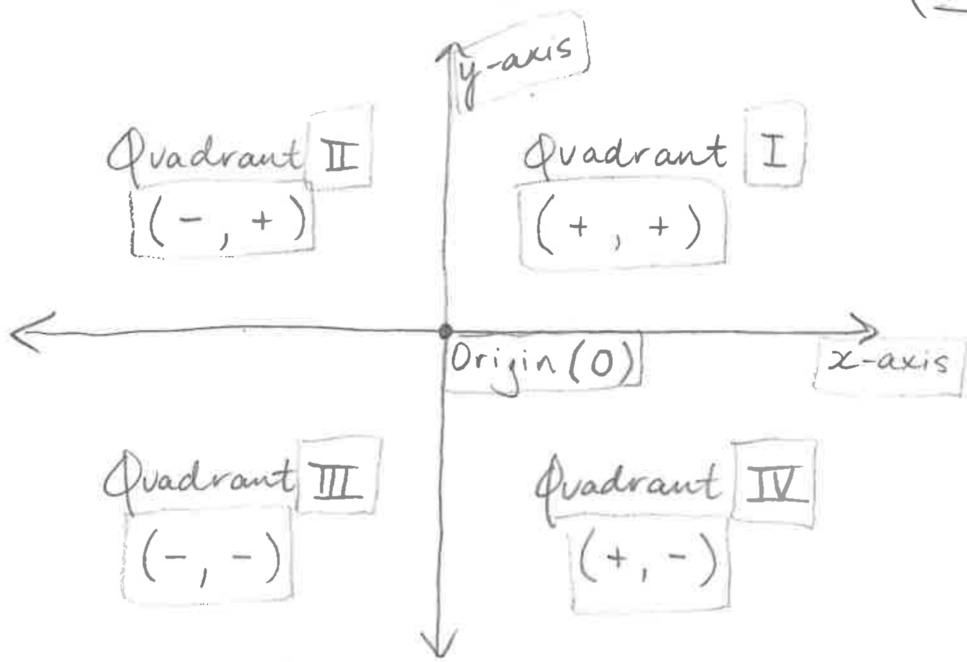
$x = 137 \Rightarrow \boxed{137 \text{ km}}$

p. 123-125
#1-10, 12

Ch. 4.2 - Linear Systems

Coordinate System (Cartesian Plane)

- recall that real numbers are able to be visually represented on a number line.
- an ORDERED PAIR can be represented as <u>points</u> in a Cartesian Plane also known as the rectangular coordinate system.
(<u>two</u>-dimensional)

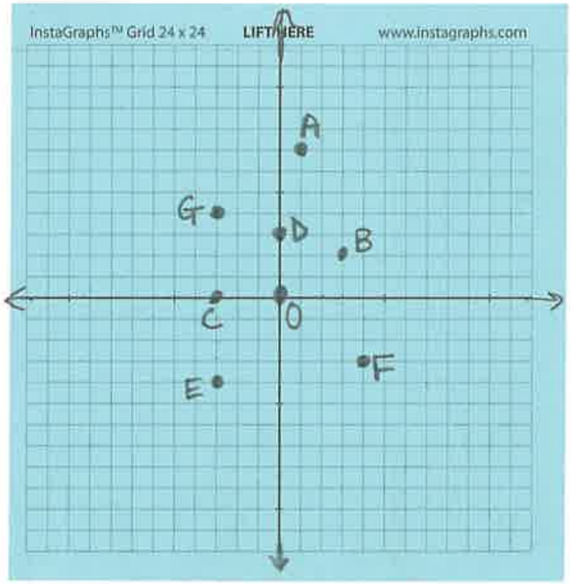


For each ordered pair, there is a unique point in the plane → $\boxed{(x, y)}$

* the plane is two-dimensional

horizontal ("run") (x)	vertical ("rise") (y)

The ordered pair (0,0) is located at the <u>ORIGIN</u> (<u>O</u>)



Plot the following points:

A (1, 7)

B (3, 2)

C (−3, 0)

D (0, 3)

E (−3, −4)

F (4, −3)

G (−3, 4)

* notice that (4, −3) and (−3, 4) plot different points.

They are called "ordered" pairs because order matters

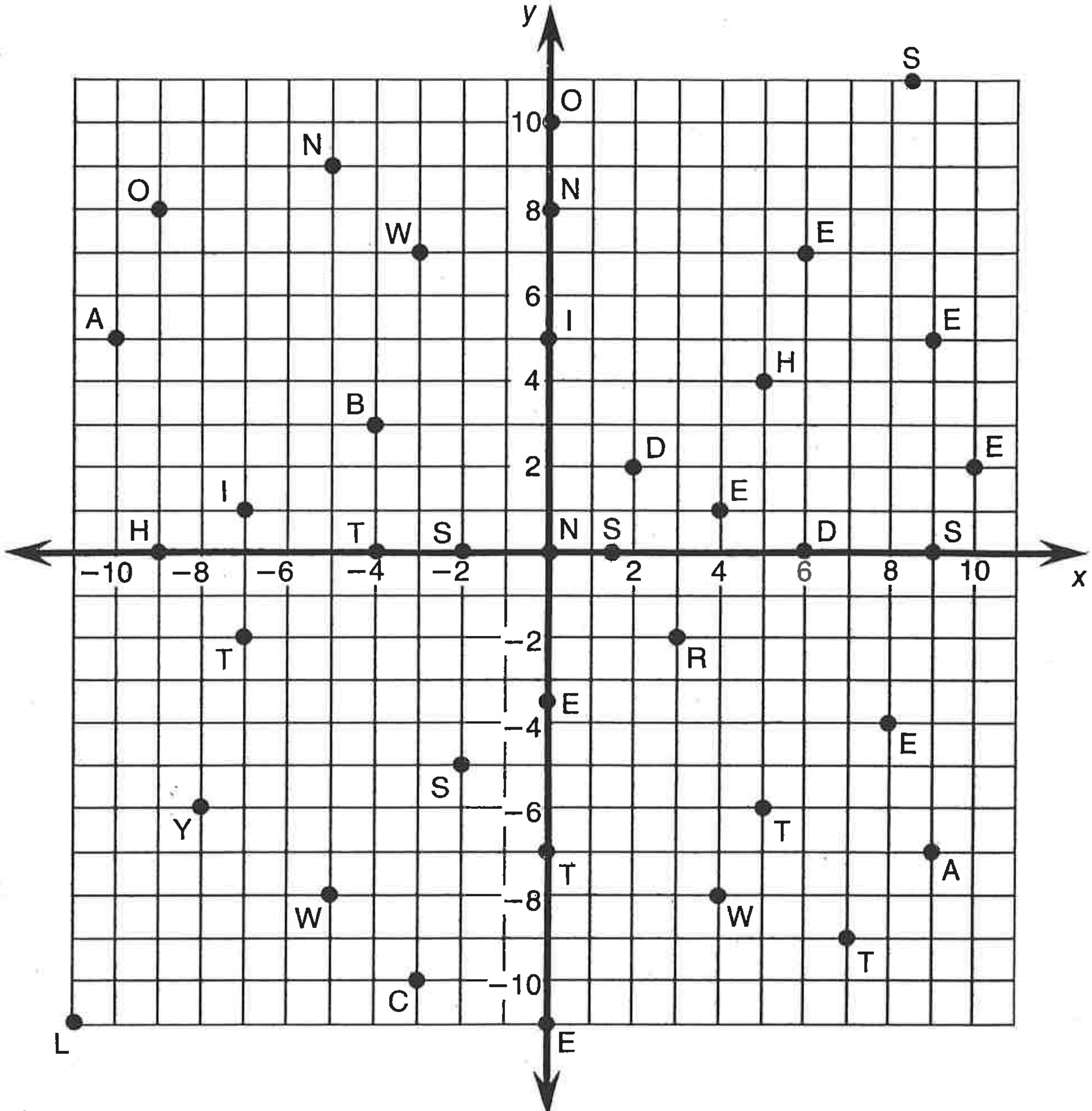
(x, y) <u>not</u> (y, x)

Linear Equations

A linear equation is an algebraic representation of a <u>STRAIGHT LINE</u> on a plane.

What Happened After a Burglar Broke Into a Tuba Factory?

Each ordered pair at the bottom of the page represents a point on the coordinates below. Above each ordered pair, write the letter that appears at that point.



H E W A S C R E D I T E D

(5, 4) (10, 2) (−3, 7) (−10, 5) (−2, −5) (−3, −10) (3, −2) (8, −4) (6, 0) (0, 5) (−4, 0) (0, −11) (2, 2)

W I T H T W E N T Y O N E

(−5, −8) (−7, 1) (7, −9) (−9, 0) (−7, −2) (4, −8) (6, 7) (−5, 9) (0, −7) (−8, −6) (0, 10) (0, 0) (9, 5)

S T O L E N B A S S E S

(9, 0) (5, −6) (−9, 8) (−11, −11) (4, 1) (0, 8) (−4, 3) (9, −7) (−2, 0) (8.5, 11) (0, −3.5) (1.5, 0)

  OBJECTIVE 5–a: To locate a point in a coordinate plane given its coordinates.

Two types of Linear Equations:

i) Slope / y-intercept form (this section)

ii) Standard form (next section)

Slope / y-intercept form:

$$y = mx + b$$

x and y represent all points (x, y) on the line.

$$m = \text{SLOPE} = \frac{\text{RISE}}{\text{RUN}} = \frac{\Delta y}{\Delta x} = \left.\frac{y_2 - y_1}{x_2 - x_1}\right\} \text{given two points on line.}$$

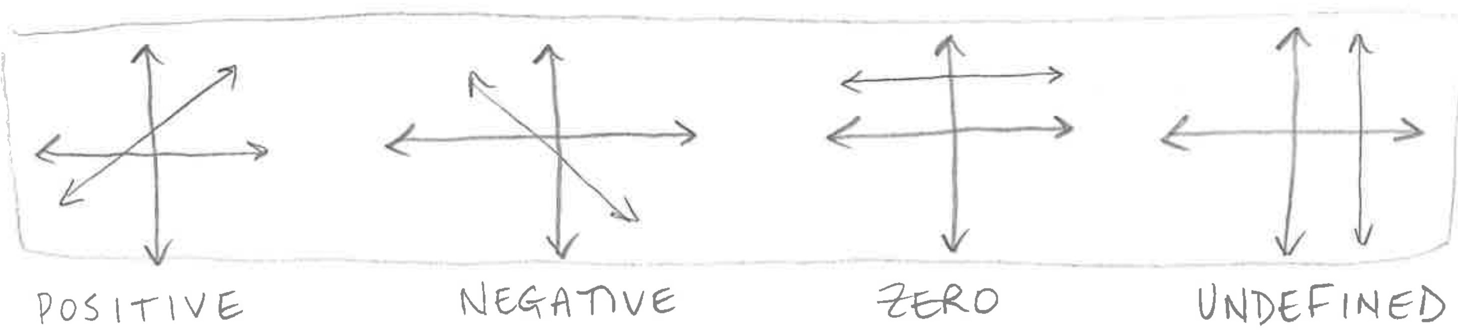
* m can be positive, negative, zero, or undefined.

b = y-intercept = where the line crosses the y-axis

* b can be positive, negative, zero, or may not exist.

Slope

There are four types of slopes (lines):



POSITIVE NEGATIVE ZERO UNDEFINED

- a positive-slope line rises from L to R
- a negative-slope line falls from L to R
- a zero-slope line is exactly HORIZONTAL (has the equation $y = \underline{b}$ (since $m = \underline{0}$))
- an undefined-slope line is exactly VERTICAL (has the equation $x = \underline{\#}$ (# is the x-int.)

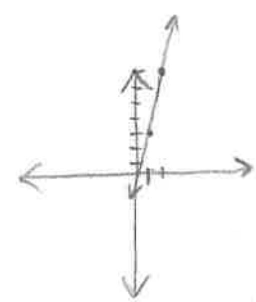
Calculating slope given two points:

eg 1: Find the slope of each of the following lines possessing the points:

a) $(1, 3)$ and $(2, 7)$

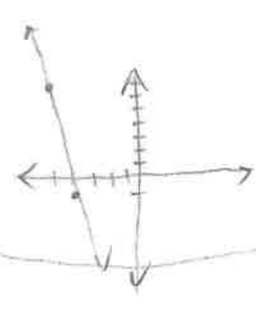
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7-3}{2-1} = \frac{4}{1} = \boxed{4}$$

$$= \frac{3-7}{1-2} = \frac{-4}{-1} = \boxed{4}$$

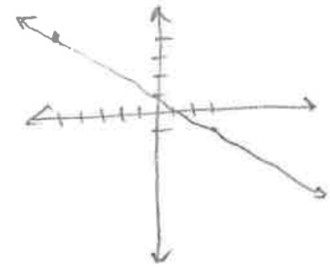


b) $(-5, 7)$ and $(-4, -1)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-7}{-4-(-5)} = \frac{-8}{1} = \boxed{-8}$$



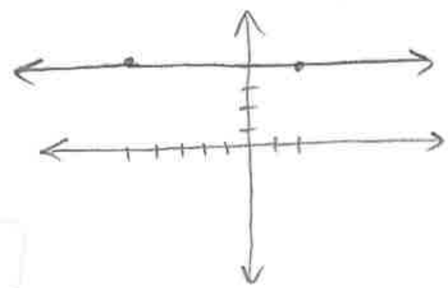
c) $(-5, 4)$ and $(3, -1)$



$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-4}{3-(-5)} = \boxed{\frac{-5}{8}}$$

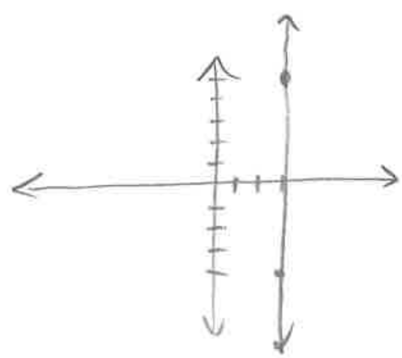
d) $(2, 4)$ and $(-5, 4)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4-4}{-5-2} = \frac{0}{-7} = \boxed{0}$$



e) $(3, 5)$ and $(3, -4)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4-5}{3-3} = \frac{-9}{0} = \boxed{\text{UNDEFINED}}$$



eg2: The slope of a line is 2. The line passes through the points (4, 8) and (−1, k). Find k.

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

$$2 = \frac{8 - k}{4 - (-1)}$$

$$2 = \frac{8 - k}{5}$$

$$10 = 8 - k$$

$$\boxed{k = -2}$$

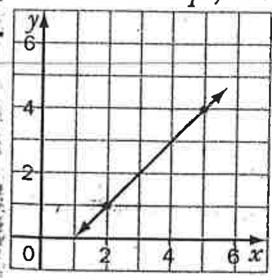
HANDOUT: # 1–6, 7–23 (odds), 24–30

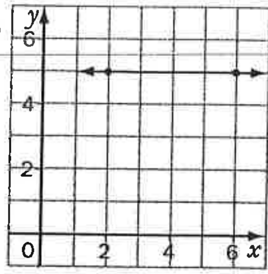
+

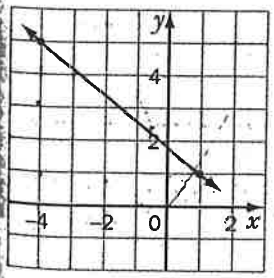
p. 129 # 1–5

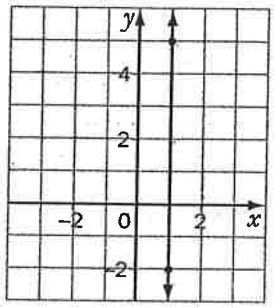
Practice

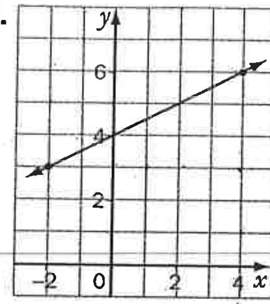
a) Without calculating the slope, state whether the slope of each line is positive, negative, zero, or undefined.
b) State the rise.
c) State the run.
d) Calculate the slope, where possible.

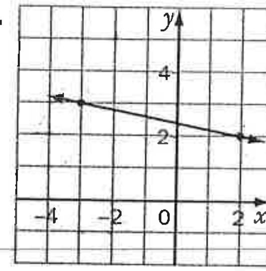
1.


2.


3.


4.


5.


6.


Find the slope of the line passing through the points.

7. (0, 0) and (2, 3) **8.** (0, 0) and (–2, –4)
9. (1, 3) and (2, 7) **10.** (–4, 5) and (6, 5)
11. (5, –2) and (–3, 4) **12.** (0, 6) and (4, 0)
13. (–5, 7) and (–4, –2) **14.** (–2, 5) and (0, 8)
15. (–6, –5) and (0, 0) **16.** (–8, –7) and (–4, –3)
17. (5, 7) and (5, –3) **18.** (–6, –1) and (–2, 5)

Find the slope of the line passing through the points.

19. (3.4, 1.6) and (5.4, 2.2)
20. (0, –1.7) and (0.3, –3.8)
21. (11.9, –2.3) and (15.4, 8.2)
22. $\left(\frac{1}{2}, 4\right)$ and (2, –6) **23.** $\left(\frac{1}{3}, 1\frac{1}{2}\right)$ and $\left(2, 3\frac{1}{2}\right)$

24. The slope of a line is 3. The line passes through (2, *k*) and (4, 1). Find the value of *k*.

25. The slope of a line is –2. The line passes through (*t*, –1) and (–4, 9). Find the value of *t*.

Write the coordinates of two points on a line that satisfies the given condition.

26. The line rises from left to right.
27. The line is horizontal.
28. The line falls from left to right.
29. The line is vertical.

Applications and Problem Solving

30. Visualization Given a point on the line and the slope, sketch the graph of the line.

a) (2, 3), $m = 2$ **b)** (–1, 1), $m = 3$
c) (0, 4), $m = -2$ **d)** (–3, 0), $m = \frac{1}{2}$
e) (–3, –2), $m = \frac{2}{3}$ **f)** (–3, 4), $m = \frac{-4}{3}$
g) (4, –1), $m = 0$ **h)** (–4, 5), m is undefined

ANSWERS

Section 6.3 pp. 267–269
Practice **1. a)** positive **b)** 3 **c)** 3 **d)** 1 **2. a)** zero **b)** 0 **c)** 4 **d)** 0 **3. a)** negative **b)** –4 **c)** 5 **d)** $-\frac{4}{5}$ **4. a)** undefined **b)** 7 **c)** 0 **d)** undefined **5. a)** positive **b)** 3 **c)** 6 **d)** $\frac{1}{2}$ **6. a)** negative **b)** –1 **c)** 5 **d)** $-\frac{1}{5}$ **7.** $\frac{3}{2}$ **8.** 2 **9.** 4 **10.** 0 **11.** $-\frac{3}{4}$ **12.** $-\frac{3}{2}$ **13.** –9 **14.** $\frac{3}{2}$ **15.** $\frac{5}{6}$ **16.** 1 **17.** undefined **18.** $\frac{3}{2}$ **19.** 0.3 **20.** –7 **21.** 3 **22.** $-\frac{20}{3}$ **23.** $\frac{6}{5}$ **24.** –5 **25.** 1 **26.** Answers may vary. (0, 0), (1, 1) **27.** Answers may vary. (0, 0), (3, 0) **28.** Answers may vary. (0, 0), (1, –1) **29.** Answers may vary. (0, 0), (0, 7)
Applications and Problem Solving **31.** Answers may vary. **a)** (3, 3) **b)** (3, 1) **c)** (3, 4) **d)** (1, 4) **e)** (4, 2) **f)** (4, 3) **g)** (2, 4) **h)** (4, 16) **i)** (1, 6) **j)** (5, 1) **k)** (4, 7)

Ch. 4.2 - continued

Graphing a Linear Equation

Given a linear equation of the form $y = mx + b$ (slope/y-intercept form), there are two methods by which to graph the line:

Method 1:

① Make sure the equation is in $y = mx + b$ form;

② Plot the y-intercept (if it exists)
$\longleftrightarrow$ b-value

* NOTE: only a vertical line other than $x = 0$ will NOT have a y-intercept (eg: $x = 3$, $x = -1$, $x = \#$)

③ Using the slope, plot a second point relative to the y-intercept. Remember, slope $= \frac{\text{RISE}}{\text{RUN}} = \frac{\Delta y}{\Delta x}$. Also remember that a negative fraction has its negative sign in the NUMERATOR.

* NOTE: only $\boxed{\text{TWO}}$ points are required to graph a line!

Method 2 :

① Make sure the equation is in $y = mx + b$ form,

② Create a table of values and let x equal two values that are divisible by the 'run' (denominator) of the slope.

* NOTE : - if slope is 0, find y-intercept and graph the horizontal line.
  - if slope is undefined, graph the vertical line.

③ Solve for y in the table of values

④ Plot the two points and draw a line through them.

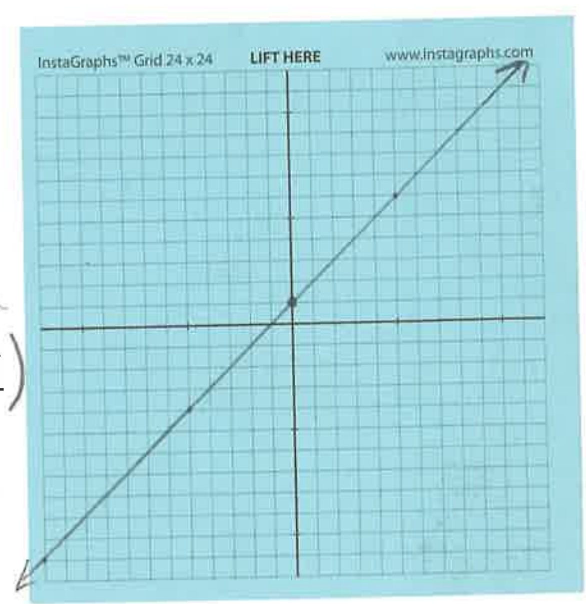
* NOTE: You may want a third point as a CHECK!

eg 1: Graph each of the following using both methods:

a) $y = x + 1$

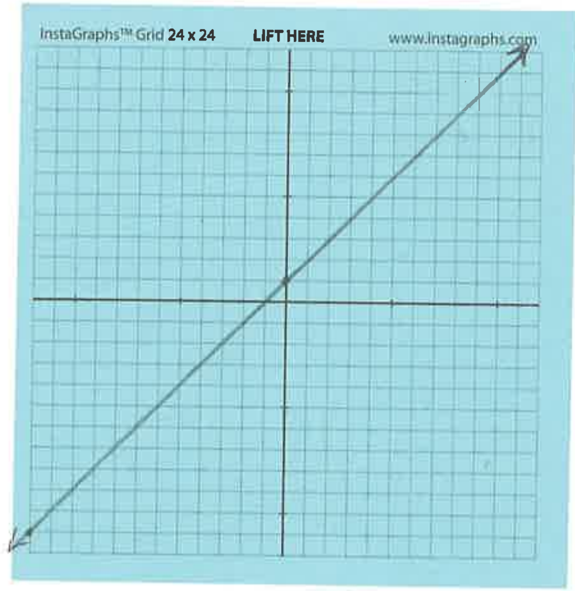
Method ①: y-intercept $= 1$

Slope $= 1 = \frac{1}{1}$ (up 1 , right 1)



Method (2):

x	y
0	1
2	3
-3	-2



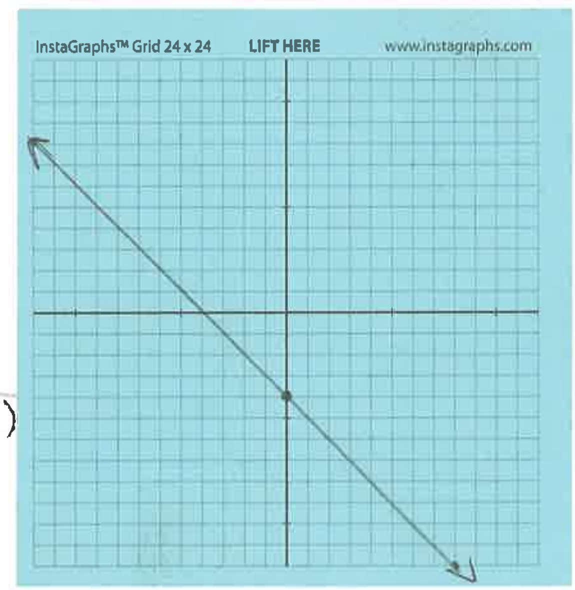
b) $y = -x - 4$

Method (1):

y-intercept $= -4$

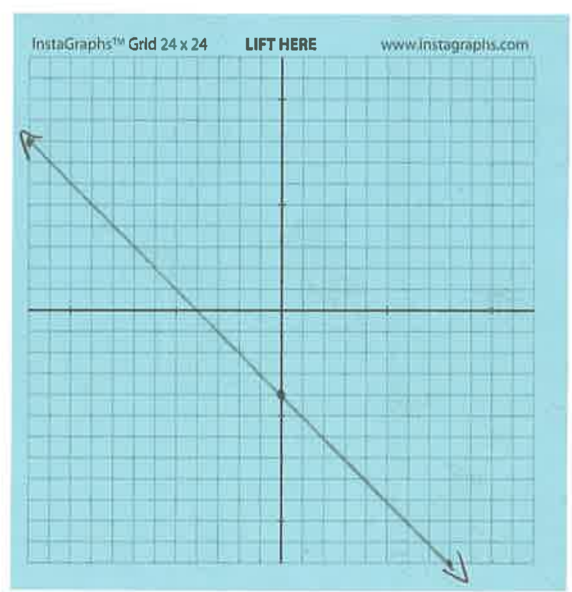
Slope $= -1 = \frac{-1}{1}$

(down 1, right 1)



Method (2):

x	y
0	-4
3	-7
-2	-2

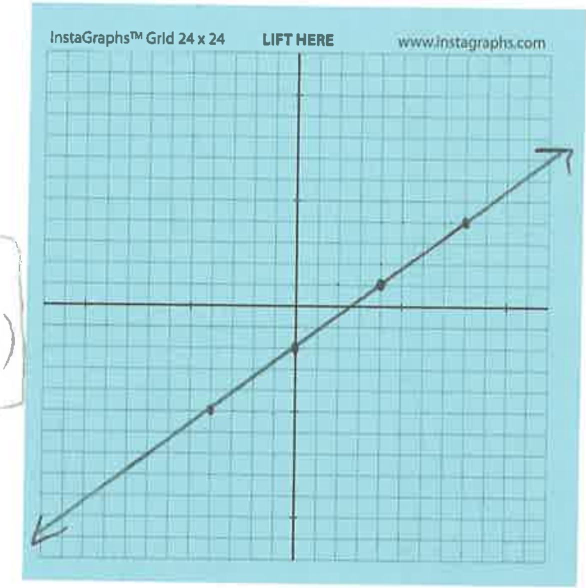


c) $y = \frac{3}{4}x - 2$

Method 1:

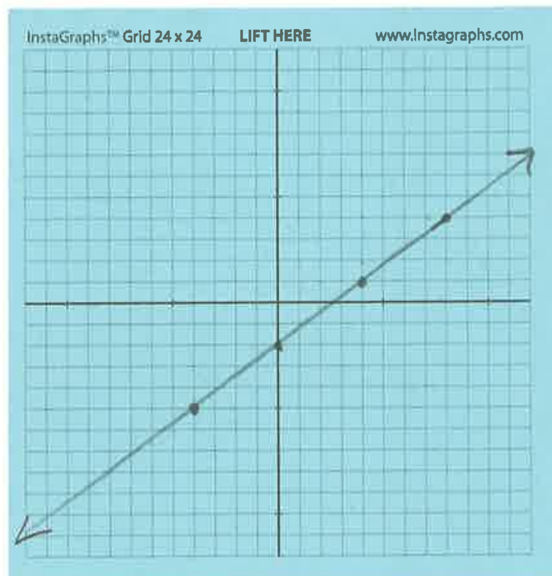
y-int. $= -2$

Slope $= \frac{3}{4}$ (up 3, right 4)



Method 2:

x	y	
0	-2	$(0, -2)$
4	1	$(4, 1)$
-4	-5	$(-4, -5)$

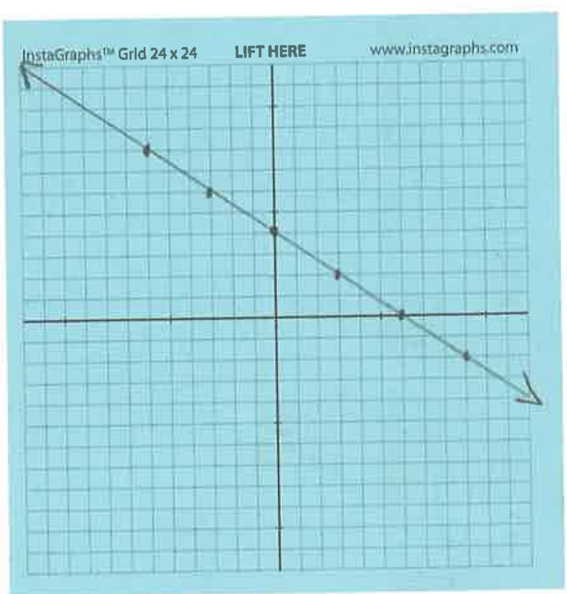


d) $y = -\frac{2}{3}x + 4$

Method 1: y-int. $= 4$

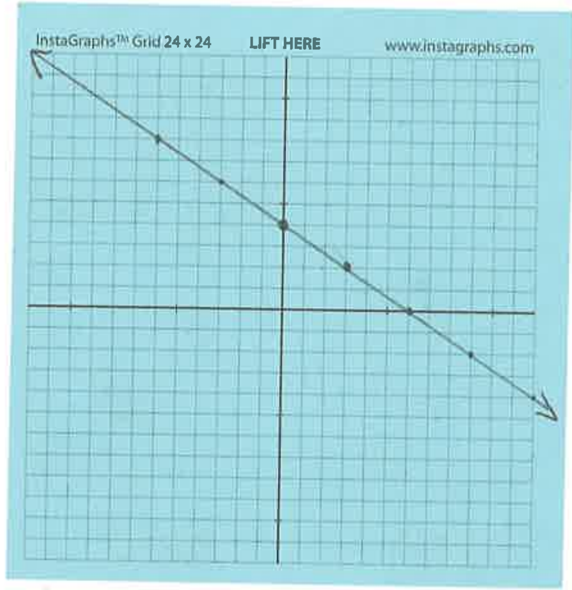
Slope $= \frac{-2}{3}$

(down 2, right 3)



Method 2:

x	y
0	4
3	2
-3	6

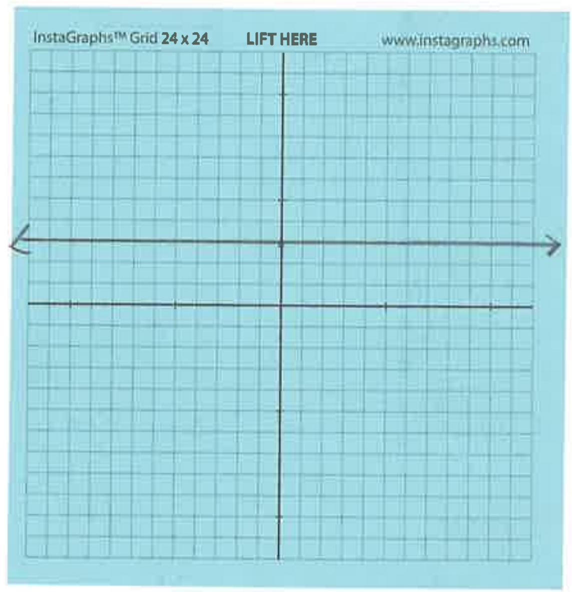


e) $y = 3$

$y = 0x + 3$

$y\text{-int.} = 3$

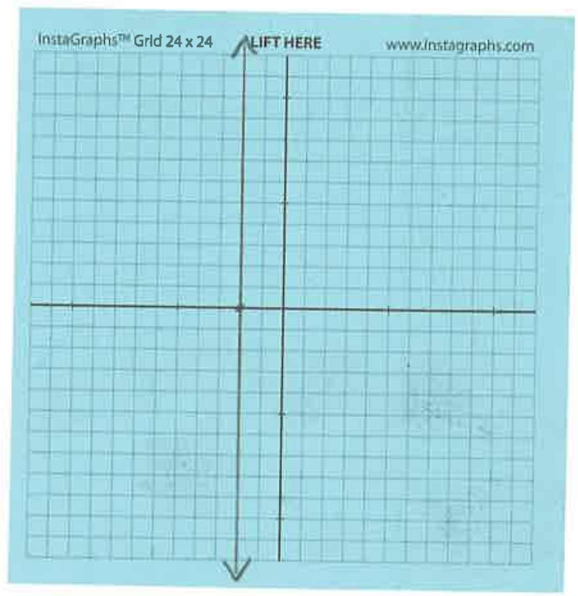
Slope = 0 (horizontal line)



f) $x = -2$

- undefined slope
- no y-int.

} vertical line



eg2: Graph $y = 2(x-3)$ using either method

$y = 2(x-3)$

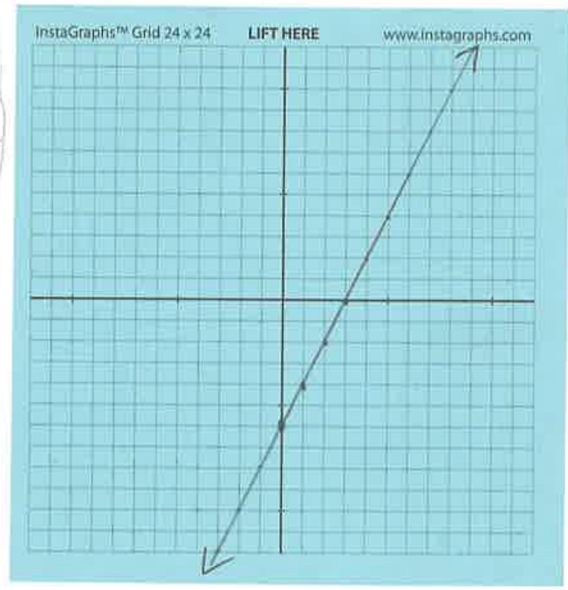
$y = 2x - 6$

①: y-int = -6

Slope = $2 = \frac{2}{1}$ = 2up, 1 right

②

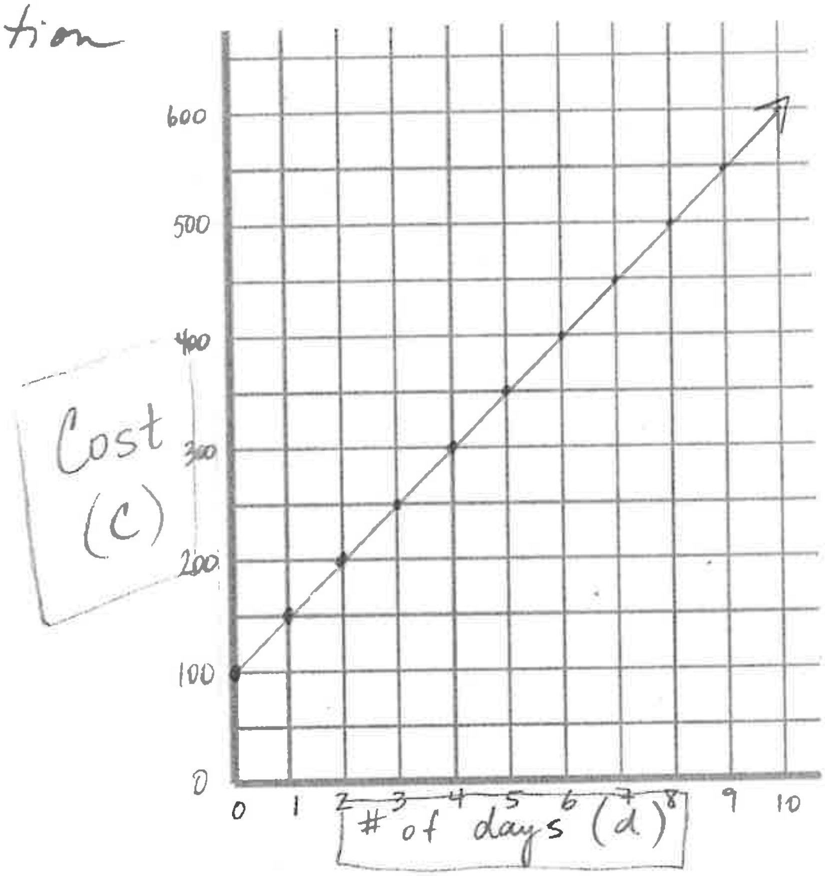
x	y
0	-6
2	-2
-2	-10



eg 3: The cost of renting a car is \$100 up front, plus an extra \$50 / day ⇒ see equation:

$$C = 50d + 100$$

a) Graph the equation



b) How much would it cost to rent a car for 6 days? 10 days?

$C = 50(6) + 100 = 300 + 100 = \boxed{\$400}$

$C = 50(10) + 100 = 500 + 100 = \boxed{\$600}$

p. 130 – 134 # 6 – 13

Ch. 4.3 - Graphing in the Form $Ax + By = C$

Two Types of Linear Equations:

i) Slope/y-intercept form: $y = mx + b$

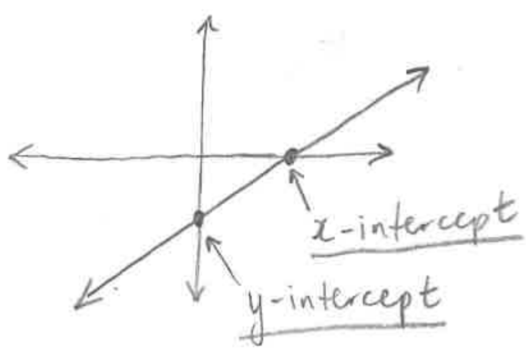
ii) Standard form $\Longrightarrow$ $Ax + By = C$

Useful terminology:

y-intercept - where a line crosses the y-axis (x-value is 0)

x-intercept - where a line crosses the x-axis (y-value is 0).

eg:



Question: i) All lines have a y-intercept except VERTICAL LINES. (excluding $x = 0$)

ii) All lines have an x-intercept except HORIZONTAL LINES. (excluding $y = 0$)

Graphing a Linear Equation in Standard Form: ($Ax + By = C$)

Step 1: a) Find the y-intercept (set $x = \underline{0}$)

b) Find the x-intercept (set $y = \underline{0}$)

* TWO points!

Step 2: Pick another x-value and solve for y to get third point.

Step 3: Draw a line through the 3 points.

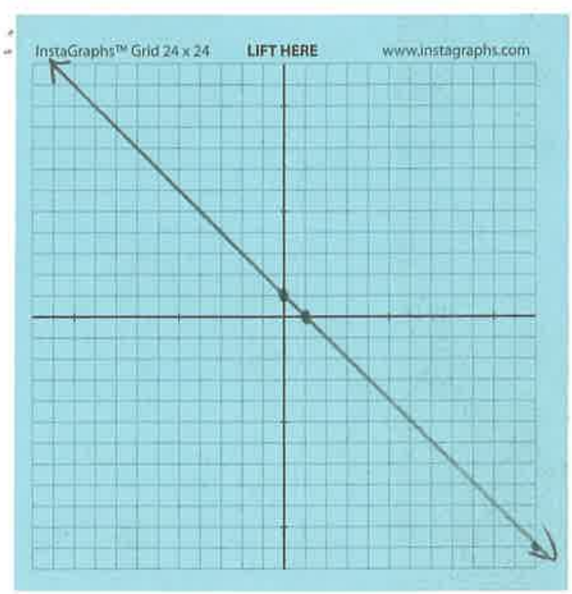
<u>OR</u>

Convert Standard form to Slope/y-int. form and graph.

eg1: Graph each of the following:

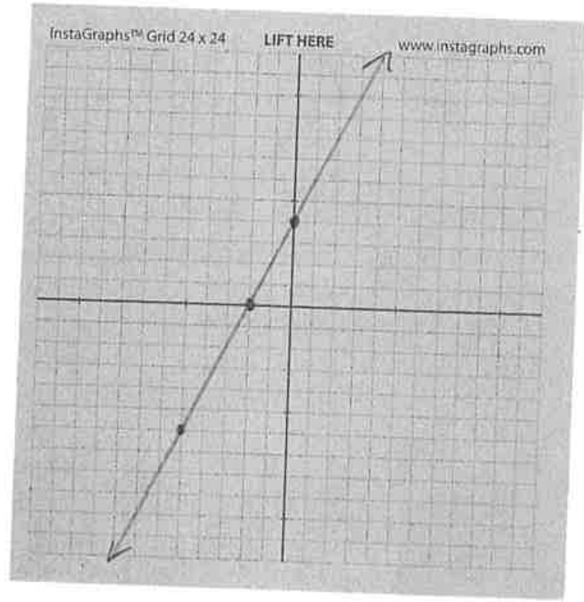
a) $x + y = 1$

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



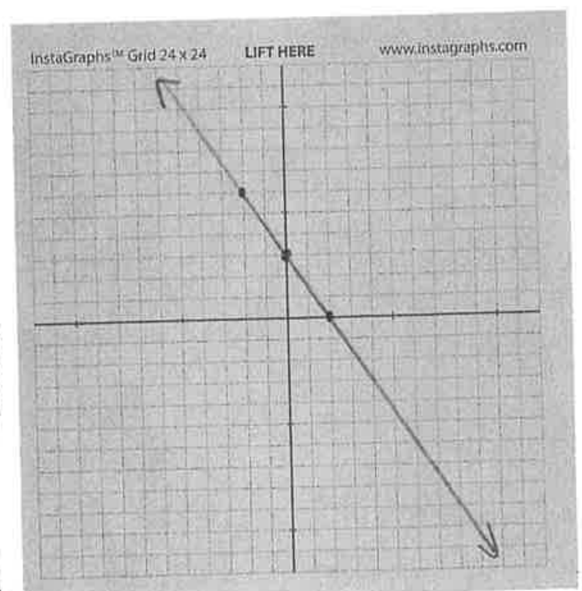
b) $2x - y = -4$

x	y	
0	4	$2(0) - y = -4$ $y = 4$
-2	0	$2x - 0 = -4$ $x = -2$
-5	-6	$2(-5) - y = -4$ $-10 - y = -4$ $-y = 6$ $y = -6$



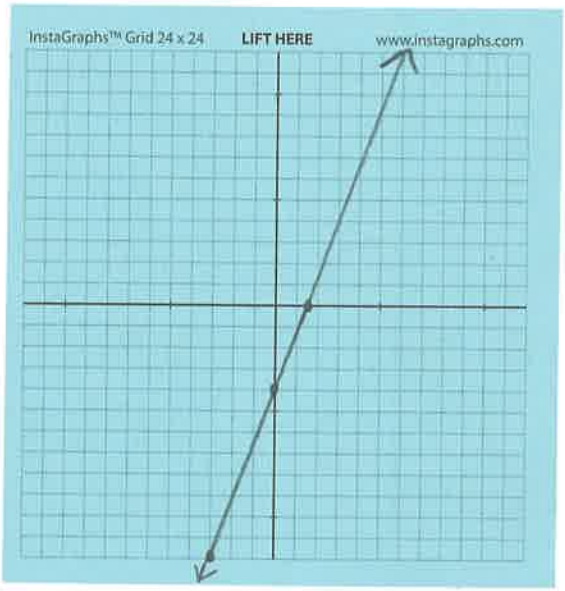
c) $3x + 2y = 6$

x	y	
0	3	$3(0) + 2y = 6$ $2y = 6$ $y = 3$
2	0	$3x + 2(0) = 6$ $3x = 6$ $x = 2$
-2	6	$3(-2) + 2y = 6$ $-6 + 2y = 6$ $2y = 12$ $y = 6$



d) $\frac{2}{3}x - \frac{1}{4}y = 1$

x	y	
0	-4	$\frac{2}{3}(0) - \frac{1}{4}y = 1$ $-\frac{1}{4}y = 1$ $y = -4$
$\frac{3}{2}$	0	$\frac{2}{3}x - \frac{1}{4}(0) = 1$ $\frac{2}{3}x = 1$ $x = \frac{3}{2}$
-3	-12	$\frac{2}{3}(-3) - \frac{1}{4}y = 1$ $-2 - \frac{1}{4}y = 1$ $-\frac{1}{4}y = 3$ $y = -12$



Horizontal and/or Vertical Lines Re-visited

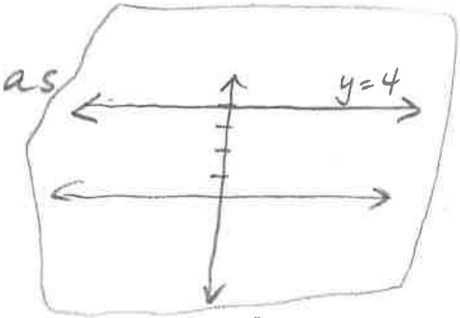
Horizontal Lines : $y = \underline{\#}$

Slope = $\underline{0}$

so... can be written as:

$$\underline{0x + y = \#}$$

eg: $y = 4$ can be written as



$\underline{0x + y = 4}$

* pick <u>any</u> value for x and the value of y will always be $\underline{4}$.

Key notes: ① The line is <u>horizontal</u>

② The line is <u>PARLLEL</u> to the x-axis

③ The y-intercept is $\underline{4} \rightarrow \underline{(0,4)}$

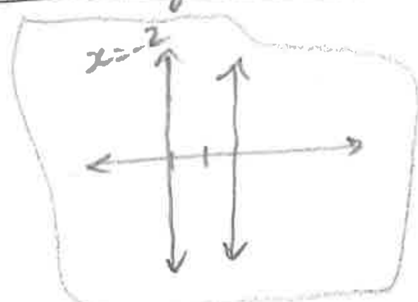
④ Any point $\underline{(x,4)}$ is a solution to the equation.

Vertical Lines : $x = \underline{\#}$

Slope = <u>UNDEFINED</u>

so... can be written as: $\underline{x + 0y = \#}$

eg: $x = -2$ can be written as



$\boxed{x + 0y = -2}$

* pick <u>any</u> value for y and the value of x will always be $\underline{-2}$.

Key notes: ① The line is <u>vertical</u>

② The line is <u>PARALLEL</u> to the y-axis

③ The x-intercept is $\underline{-2} \rightarrow \underline{(-2,0)}$

④ Any point $\underline{(-2,y)}$ is a solution to the equation

Summary:

1. The graph $y = a$ is a HORIZONTAL line with y-intercept $(0, a)$.

2. The graph $x = b$ is a VERTICAL line with x-intercept $(b, 0)$.

$\boxed{\text{p. 137–140 \# 1–5}}$

Ch. 4.4 - Matching Equations of Graphs

- equations can be matched to a particular graph by testing points that exist on the graph in the equation.
  - test at least <u>two</u> points (to be 'safe', test <u>three</u>.)

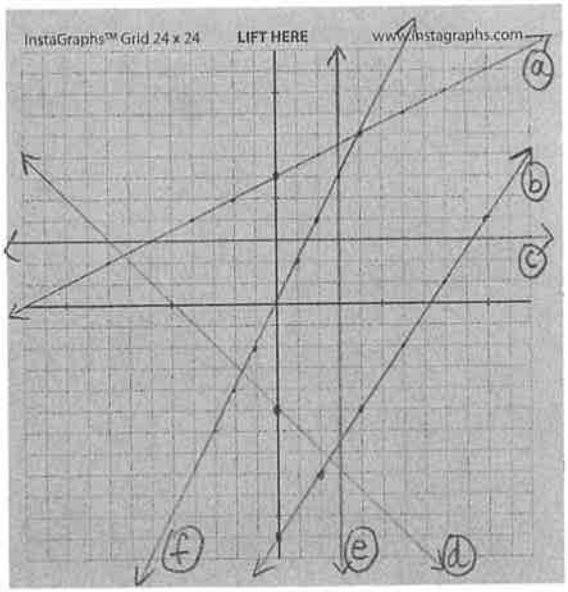
<u>Steps</u>

1. Select two points on the graph (if possible, select the x-intercept $(a, 0)$ and the y-intercept $(0, b)$ → do so if a and b are INTEGERS), then plug into the equation.
2. Pick a third point and plug in to be sure
3. To be a solution, all test points must 'work' (be TRUE).

* helpful hint (in certain situations):

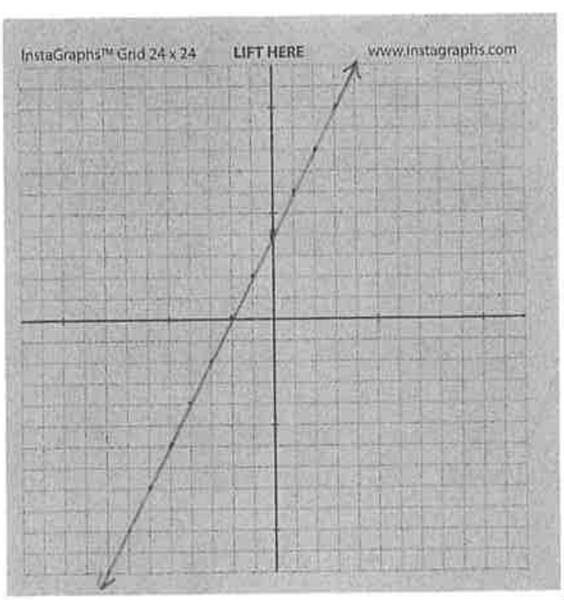
If equation(s) are in slope/y-intercept form, use <u>b-value (y-intercept)</u> as a selection criterion.

eg 1: Match each of the following graphs to its equation:



$x = 3$	e
$y = 2x$	f
$y = \frac{1}{2}x + 6$	a
$y = 3$	c
$y = -x - 5$	d
$y = \frac{3}{2}x - 11$	b

eg 2: Which one of the equations match the graph? a) $y = -2x + 4$ b) $y = 4x + 4$ c) $y = 2x + 4$



POINTS TO TEST:

$(0, 4)$	$(-2, 0)$
a) $4 = -2(0) + 4$ $4 = 4$ ✓	a) $0 = -2(-2) + 4$ $0 = 8$ ✗
b) $4 = 4(0) + 4$ $4 = 4$ ✓	b) $0 = 4(-2) + 4$ $0 = -4$ ✗
c) $4 = 2(0) + 4$ $4 = 4$ ✓	c) $0 = 2(-2) + 4$ $0 = 0$ ✓

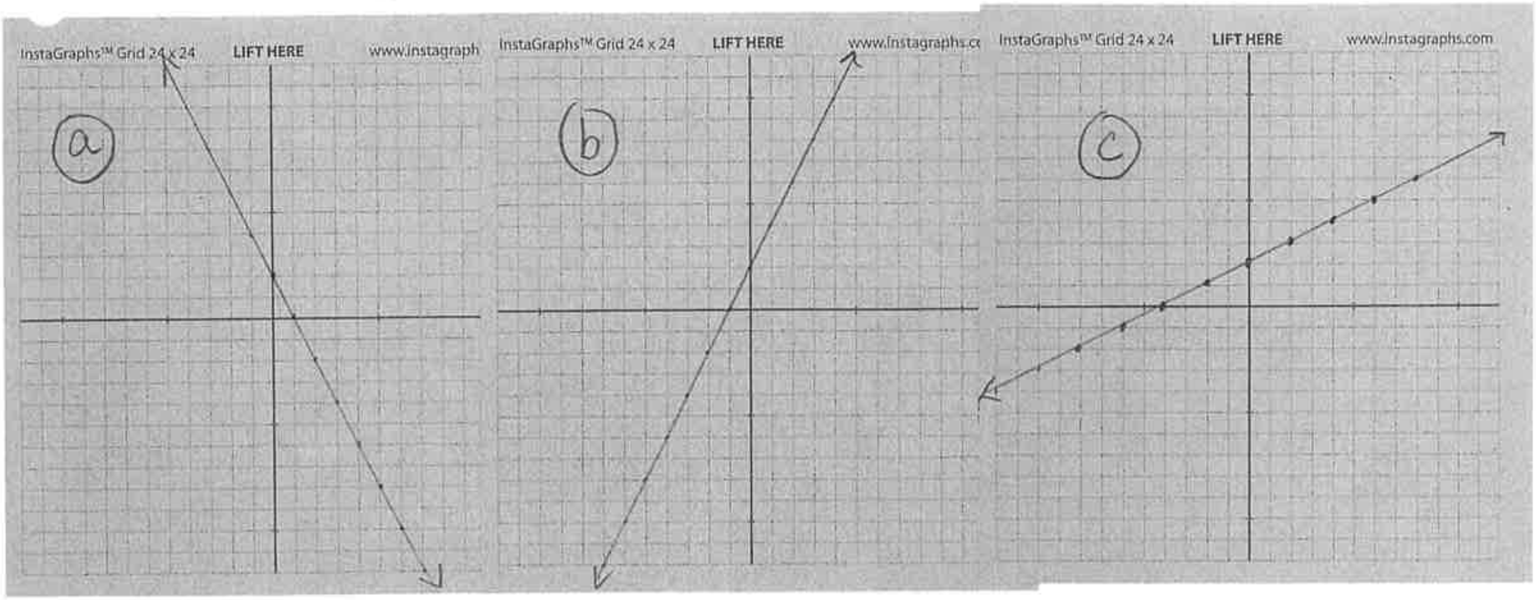
Third point for (c): $(-1, 2)$: $2 = 2(-1) + 4$

$2 = -2 + 4$

$2 = 2$ ✓

$\boxed{(c)}$

eg3: Which one of the graphs matches the equation $x - 2y = -4$?



ⓐ: $(0,2)$ $\quad$ $(1,0)$

$0 - 2(2) = -4$ $\qquad$ $1 - 2(0) = -4$

$-4 = -4$ ✓ $\qquad$ $1 = -4$ ×

ⓑ $(0,2)$ $\quad$ $(-1,0)$

$0 - 2(2) = -4$ $\qquad$ $-1 - 2(0) = -4$

$-4 = -4$ ✓ $\qquad$ $-1 = -4$ ×

ⓒ $(0,2)$ $\quad$ $(-4,0)$ $\quad$ $(2,3)$

$0 - 2(2) = -4$ $\qquad$ $-4 - 2(0) = -4$ $\qquad$ $2 - 2(3) = -4$

$-4 = -4$ ✓ $\qquad$ $-4 = -4$ ✓ $\qquad$ $2 - 6 = -4$

$-4 = -4$ ✓

or:

$-2y = -x - 4$

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

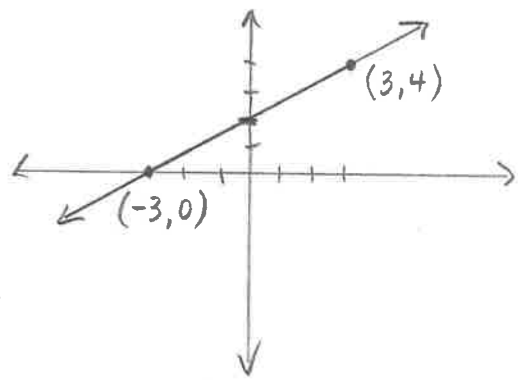
slope $\quad$ y-int!

$\boxed{c}$

Determining the Equation of a Graph

Given the graph,

find the equation of the graphed line.



$$y = mx + b$$

SLOPE (m) y-INTERCEPT (b)

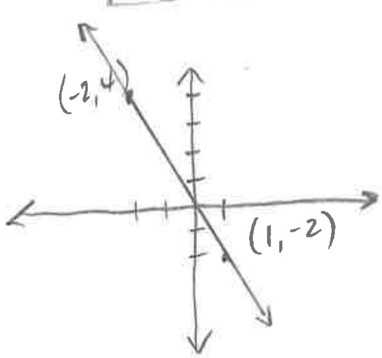
$b = 2$ (from graph)

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

$$m = \boxed{\frac{4}{6} = \frac{2}{3}}$$

$$\boxed{y = \frac{2}{3}x + 2}$$

Given:



Find equation of line.

$b = 0$ $\quad m = \boxed{\frac{-6}{3} = -2}$

$$\boxed{y = -2x}$$

p.144 – 152 # 1–10, 12 *11 for a challenge.

\+ Chapter Review! ← OMIT #5 in review

Ch. 6.6 - Applications of Linear Equations

*FIRST, do Q1 p. 235

INTERPOLATION and EXTRAPOLATION

It is common to utilize known information to estimate/deduce 'unknown' other values.

- if the unknown value is between known points, it is called INTERPOLATION.
- if the unknown value is beyond the last known point, it is called EXTRAPOLATION.

eg1: The results of math assessment tests at an elementary school are as follows:

YEAR	PERCENTAGE OF STUDENTS WHO SCORED ABOVE THE DISTRICT AVERAGE
1997	67%
2001	71%
2005	75%
2009	79%

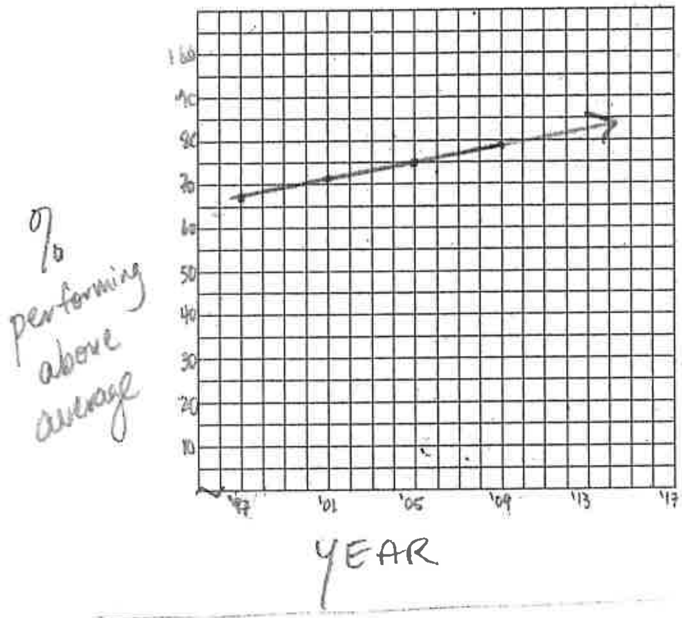
a) Graph the data

b) Assuming this rate of improvement continues, what percentage of students would you estimate to score above the district average in 2003? What is this an example of?

c) Predict the percentage of students scoring above in 2013. What is this an example of?

d) In what year will 85% of the students perform above the district average?

a)



b) 73% → Interpolation

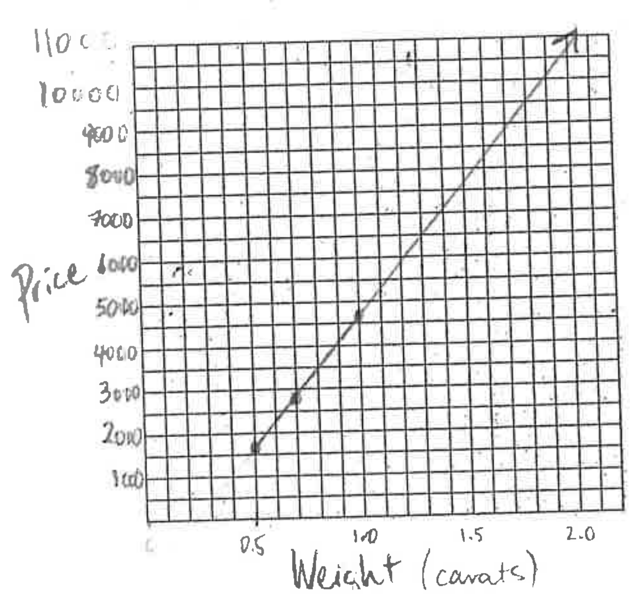
c) 83% → Extrapolation

d) 2015 → Extrapolation

eg2: Prices for emerald-cut diamonds are given by the table below:

Weight (Carats)	Price
0.5	\$1600
0.7	\$2800
1.0	\$4600

a) Graph the data



b) What should the price be for a 0.8 carat diamond?

$\sim \boxed{\$3400}$

c) What size diamond could you buy for $9200?

$\boxed{\sim 1.75 \text{ carats}}$

d) Which answers are examples of:

i) Interpolation? $\boxed{b}$

ii) Extrapolation? $\boxed{c}$

eg3: The Body Mass Index (BMI) is used to indicate human body fat based on an individual's weight and height.

The formula for calculating BMI is:

$$\frac{\text{weight in kg}}{(\text{height in m})^2}$$

BMI Range	Category.
less than 18.5	UNDERWEIGHT
18.5 - 25	NORMAL
25 - 30	OVERWEIGHT
over 30	OBESE

a) If a man is 1.88 m tall, find the range of the weight for him to be in each of the four BMI categories:

i) Underweight:

$$\frac{x}{(1.88)^2} = 18.5$$

$$x = 65.4 \text{ kg}$$

$\boxed{\text{Under } 65.4 \text{ kg}}$

ii) Normal:

$$\frac{x}{(1.88)^2} = 25$$

$$x = 88.4 \text{ kg}$$

$\boxed{\text{Between } 65.4 \text{ kg and } 88.4 \text{ kg}}$

iii) Overweight:

$$\frac{x}{(1.88)^2} = 30$$

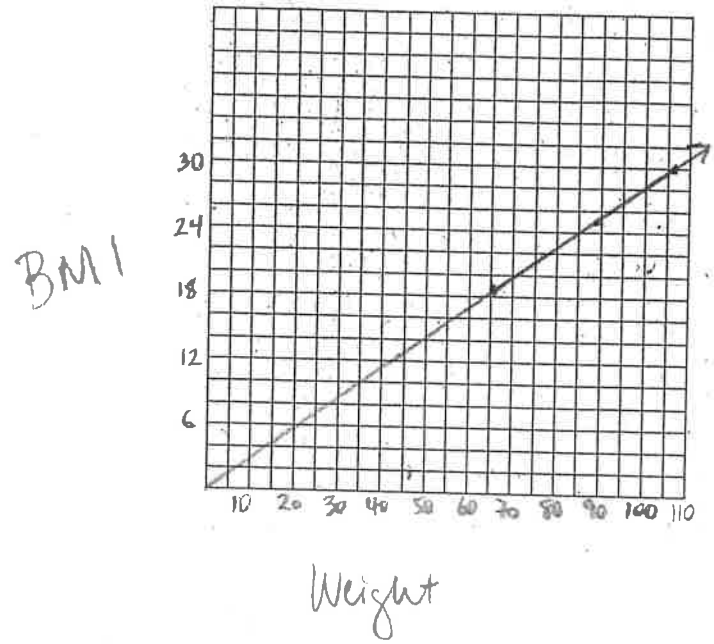
$$x = 106.0 \text{ kg}$$

$\boxed{\text{Between } 88.4 \text{ kg and } 106.0 \text{ kg}}$

iv) Obese:

$\boxed{\text{over } 106.0 \text{ kg}}$

b) Graph the values from (a):



Use the graph for each of the following:

c) What is the BMI of the man if he weighs:

Inter or Extrap.?

i) 95 kg? $\boxed{\sim 27}$ Interpolation

ii) 110 kg? $\boxed{\sim 31}$ Extrapolation

p. 235-239 # 1 - 10