FMP10

Name: ______________________

Date: ______________________

Unit 4: Linear Relations & Functions

4.0 Inequalities and Intro to Linear Relations

I will be able to:

- **express an inequality using words and a number line**

Inequality:

$<$ less than

$>$ greater than

$\leq$ less than or equal to

$\geq$ greater than or equal to

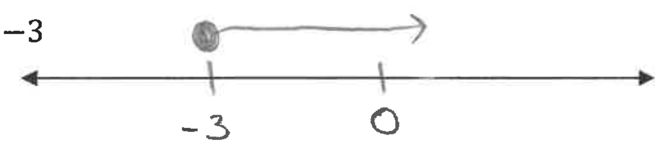
$\neq$ not equal to

We can use a number line to represent an inequality.

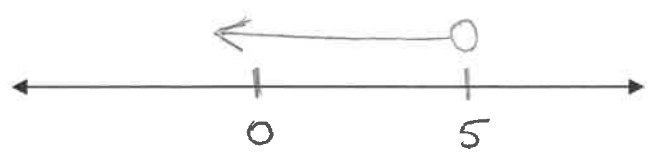
*remember $<$ and $>$ use an open circle → ○ not included

$\leq$ and $\geq$ use a closed circle → ● included/equal to

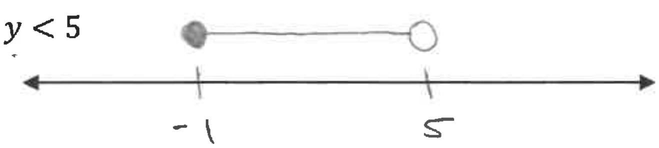
Ex: 1) $x \geq -3$



2) $x < 5$

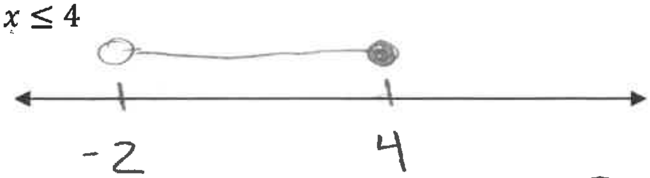


3) $-1 \leq y < 5$



y is greater than or equal to -1 and less than 5

4) $-2 < x \leq 4$



Recall: Solving Equations

$$3x - 2 = 7$$
$$+2 \quad +2$$
$$\frac{3x}{3} = \frac{9}{3}$$
$$\boxed{x = 3}$$

B
E
D
M
A
S

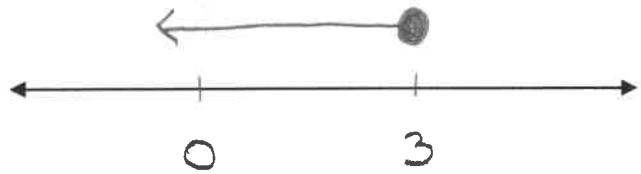
Solving Inequalities:

1. $3x + 5 \leq 14$

$-5 \quad -5$

$\frac{3x}{3} \leq \frac{9}{3}$

$x \leq 3$



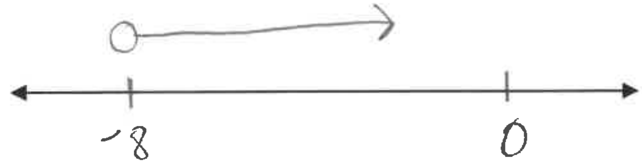
* change inequality symbol

2. $6 - 2x < 22$

$-6 \quad -6$

$\frac{-2x}{-2} < \frac{16}{-2}$

$x > -8$



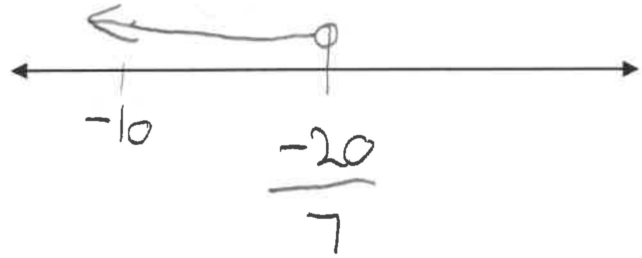
3. $17 < -7x - 3$

$+3 \quad +3$

$20 < -7x$

$\frac{20}{-7} \quad \frac{-7x}{-7}$

$\approx -2.9 \ -\frac{20}{7} > x$



Simplify the expression:

$3(a + b + c) - 2(3a + 2b - c)$

$= 3a + 3b + 3c - 6a - 4b + 2c$

$= -3a - b + 5c$

Rearrange to isolate the variable:

$2x + 3y = 8 \; for \; y$

$-2x \quad -2x$

$\frac{3y}{3} = \frac{8 - 2x}{3}$

$y = \frac{8}{3} - \frac{2}{3}x$

Solve the Equation:

$y = 5x + 3 \; for \; x = 4$

$y = 5(4) + 3$

$y = 20 + 3$

$= 23$

Solve and Check:

$\frac{m}{7} + 12 = 9$

$-12 \quad -12$

$7 \cdot \frac{m}{7} = -3 \cdot 7$

$\boxed{m = -21}$

Check

$\frac{(-21)}{7} + 12 = 9$

$-3 + 12 = 9$

$9 = 9$ ✓

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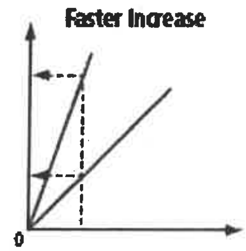
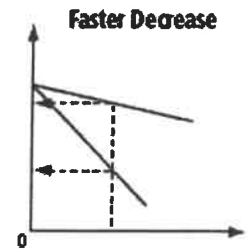
Unit 4: Linear Relations & Functions
4.1 Graphs of Relations

* Working in pairs complete the investigate activity on pg. 268 – 269 of your textbook. Record your answers on separate sheet (one sheet per pair).

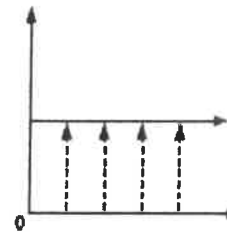
A graph is an effective way to show the relationship between two quantities. A constant rate of change is represented graphically by a straight line.
The steepness of the line indicates the rate at which one quantity is changing in relation to the other.





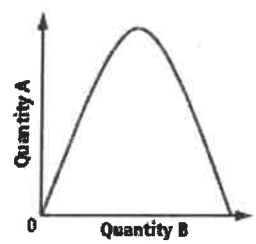
A steeper line indicates a faster rate of vertical change on the red line than on the blue line. This change may indicate an increase or a decrease.

A horizontal line means that there is no rate of change.
Every value on the horizontal axis is related to the same value on the vertical axis.



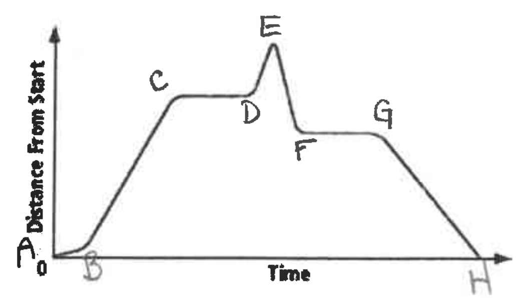
Not all relationships are represented by a straight line. A curve shows that the rate of change is not constant.

As quantity B increases, the increase in quantity A is gradual at first. It then becomes much greater.



As quantity B increases, the increase in quantity A slows until quantity A reaches a maximum value. Then, quantity A decreases.

Ex. Wakeboarding has grown to be a popular water sport. The graph shows the distance that a wakeboarder is from her starting point on Last Mountain Lake in Saskatchewan. Describe what the boarder is doing.



AB - starting slowly away from the starting point.

BC - constant increase, moving quicker

CD - stopped? fell in.

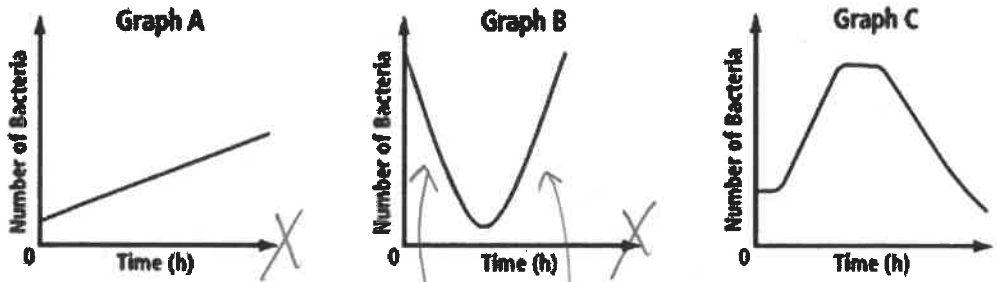
DE - moving quickly, faster than BC, still constant

EF - turned around, going towards starting point. Similar speed to DE.

FG - stopped, fell in?

GH - back to starting point constant but slower pace than EF.

Ex. Which graph best represents bacteria growth if the bacteria's food supply is limited? Explain your choice.



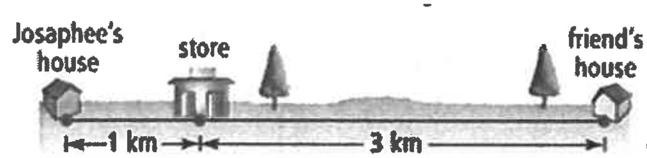
bacteria is constantly increasing

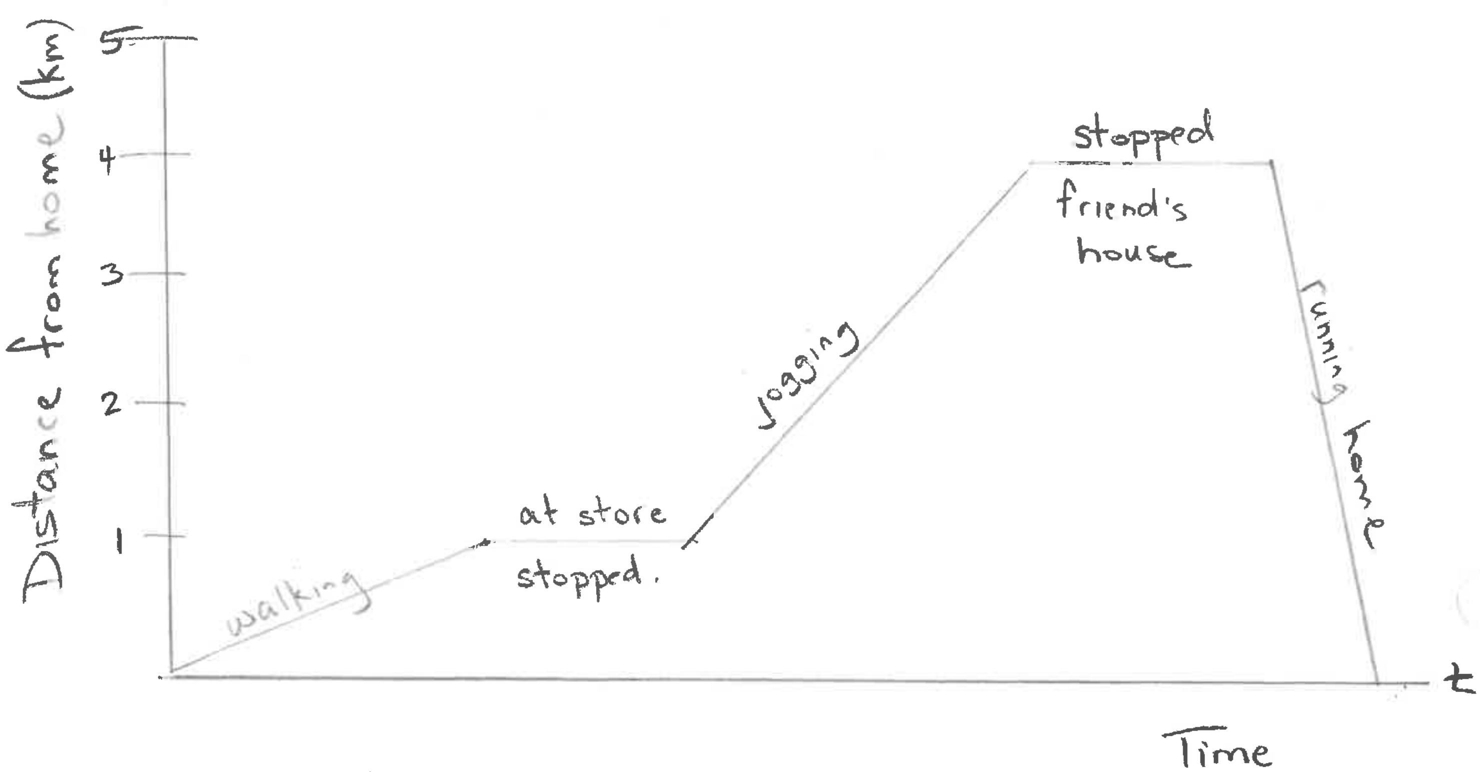
no food

surplus food

- original bacteria eat and constantly increase
- food runs out - plateau.
- bacteria start dying off

Ex. Josephine leaves her home and walks to the store. After buying a drink, she slowly jogs to her friend's house. Josephine visits with her friend for a while and then runs directly home. Using the distances shown, draw a distance-time graph that shows Josephine's distance from her house. Explain each section of your graph.





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4.2 Linear Relations

Relation: an association b/w 2 quantities

- a rule that turns input (x) values into output (y) values.

A relation can be presented in a variety of ways. For example,

Words

Three times the length of your ear, e, is equal to the length of your face, f, (from chin to hairline).

Equation

$f = 3e$

coordinates

Ordered Pairs

(0,0) (1.5, 4.5)

(0.5, 1.5) (2, 6)

(1, 3) (3, 9)

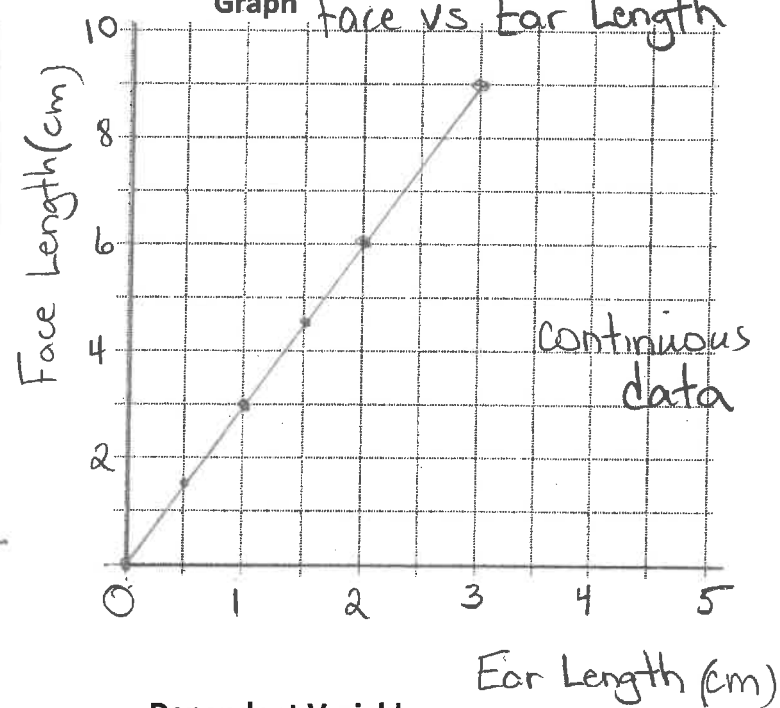
(e) x **Table of Values** y (f)

Ear Length, e (cm)	Face Length, f (cm)
0	0
0.5	1.5
1	3
1.5	4.5
2	6
3	9

x	
y	

Y vs X

Graph Face vs Ear Length



Independent Variable:

- The variable for which values are selected.
- input variable
- x-axis
- 1st column in table

Dependent Variable:

- The variable whose values depend on those of the independant variable
- output variable
- y-axis
- 2nd column in t-table

Linear Relation:

- forms a straight line when graphed
- value of y inc/dec by a constant amount as x inc/dec by a constant amount

Non-linear Relation:

- does not form a straight line when graphed.

Ex. Table of Values

Linear

x	y
2	3
7	6
12	9
17	12

$+5$ $+3$

Non-Linear

x	y
4	500
604	400
1204	350
1804	200

$+600$

Ex. Equations $D = 1$

Linear

$x = 7$

$3m + 2n = -3$

$y = -\frac{2}{5}x + 10$

$y = 4$

$D \neq 1$

Non-Linear $2x + y^2 = 6$

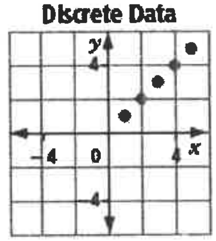
$h = k^3$

$xy = 3$

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

Discrete Data:

Discrete Data



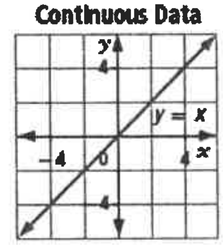
Data values that are not connected

For data that cannot have points in between

# of bar	Cost ($)
1	2
2	4
3	6

Continuous Data:

Continuous Data



Data values that are connected.

→ has infinite solutions

distance vs time

Ex. In a frog jumping championship there is a frog named George who jumps a distance of 2m in a single leap. George maintains a distance of 2m every jump; the total distance travelled is measured after every jump. Consider the relationship between the number of jumps and the total distance travelled.

a) Create a variable to represent each quantity in the relation. Which is the dependent variable? Which is the independent variable?

Let j = # of jumps ← independent variable

d = distance travelled ← dependant variable

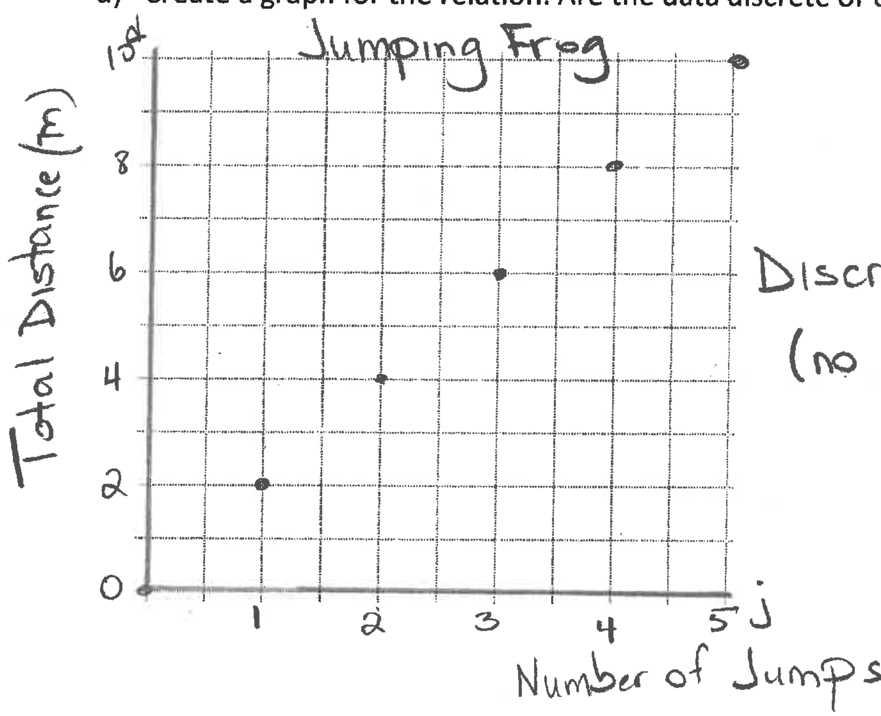
b) Create a table of values for this relation. What are appropriate values for the independent variable?

j	d (m)
0	0
1	2
2	4
3	6
4	8
5	10

c) Identify the relationship as linear or non-linear. Explain how you know.

Linear. Distance increases by 2m for every increase of 1 jump.

d) Create a graph for the relation. Are the data discrete or continuous?



Discrete data (no line)

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4.3 Domain & Range

Domain: The set of all possible x values for the independant variable in a relation
- set of all possible x (input) values.

Range: The set of all possible values for the dependant variable
- set of all possible y (output) values.

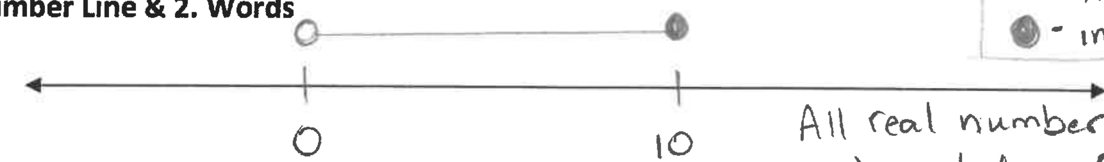
There are five ways to express domain and range of a relation.

O - not included
● - included

1. Number Line & 2. Words

$0 < x \leq 10$

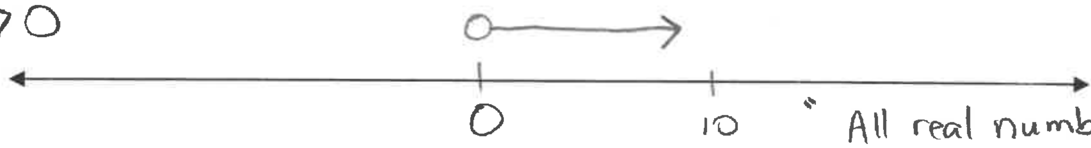
a)



All real numbers from, but not including, 0 to 10 inclusive.

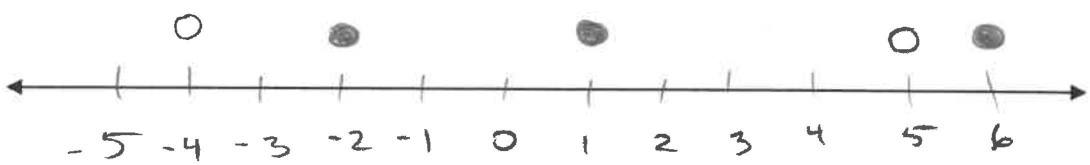
$y > 0$

b)



" All real numbers greater than 0 "

c)



Discrete list $\{-2, 1, 6\}$

3. Set Notation: Formal mathematical way to represent a set of value.

D: $\{x \mid 0 \leq x \leq 10,\ x \in \mathbb{R}\}$

"x such that, x is b/w 0 and 10 inclusive, x is an element of the real numbers,"

R: $\{y \mid y > 0,\ y \in \mathbb{R}\}$

I = integers
..., -2, -1, 0, 1, 2. . .

W = whole
0, 1, 2, 3 . . .

N = natural
1, 2, 3 . . .

$\mathbb{R}$ = real

4. Interval Notation: Uses different brackets to indicate if an interval is inclusive or exclusive

[or] end number is included ●

(or) end number is not included ○

$0 < x \leq 10$ $\quad$ $x \geq 20$ $\quad$ $y \leq -4$

$(0, 10]$ $\quad$ $[20, \infty)$ $\quad$ $(-\infty, -4]$

5. List:

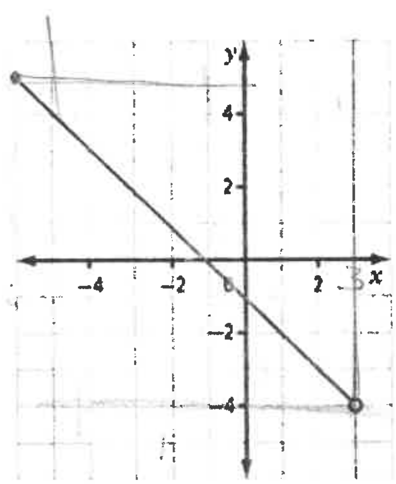
For discrete data

The relation $(0,0)$ $(1,5)$ $(3,7)$ $(5,7)$

Domain(x) $\{0, 1, 3, 5\}$ Range $\{0, 5, 7\}$

Ex. Determine domain and range from a graph: For each graph, give the domain and range. Use words, a number line, interval notation, and set notation.

a)



Words

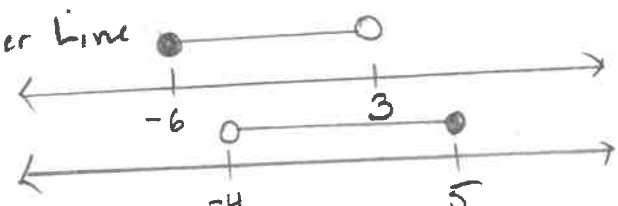
D: All #s b/w −6, included, and 3, not included.

R: All #s b/w −4, not included, and 5, included.

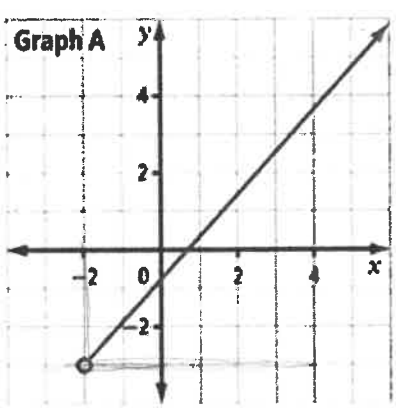
Number Line

D:

R:



b)



Interval

D $(-2, \infty)$ $\quad$ R $(-3, \infty)$

Set notation

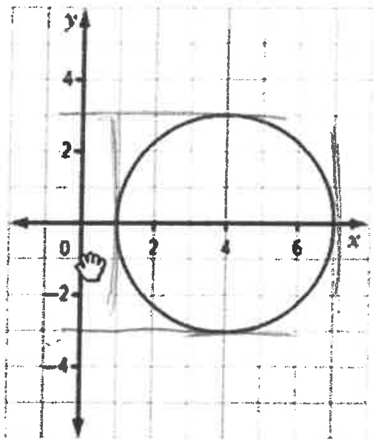
$x > -2$

D: $\{x \mid -2 < x < \infty, x \in \mathbb{R}\}$

$y > -3$

R: $\{y \mid -3 < y < \infty, y \in \mathbb{R}\}$

c)



Interval

D $[1,7]$ R $[-3,3]$

Set

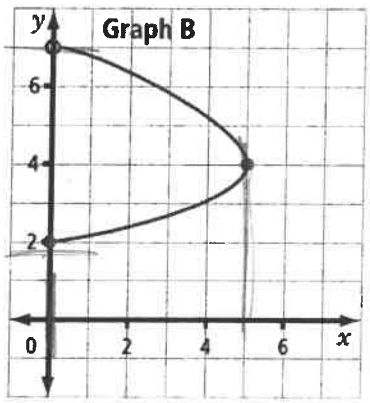
D: $\{x \mid 1 \le x \le 7, x \in \mathbb{R}\}$

R: $\{y \mid -3 \le y \le 3, y \in \mathbb{R}\}$

d)

D $[0,5]$

R $[2,7)$

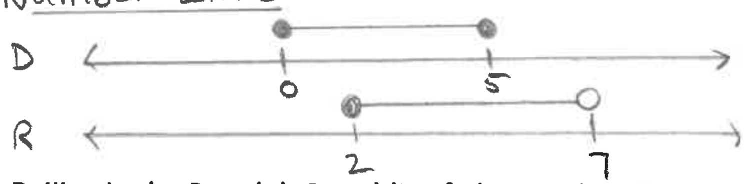


Words

D: all real #s b/w 0 and 5 all included

R: all real #s b/w 2, included and 7 not included.

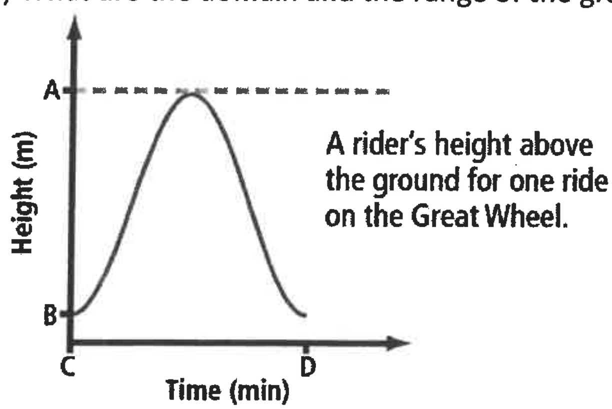
Number Lines



Ex. The Great Wheel is being built in Beijing in the People's Republic of China. When finished, it will be the largest Ferris wheel in the world. The wheel will have a diameter of 193 m and will reach a maximum height of 208 m. The graph shows a rider's height relative to the ground for a 20 minute ride through one rotation.

a) What are the values of the points A, B, C, and D and what do they represent?

b) What are the domain and the range of the graph?



a) A = 208m max height

B = 208 - 193 = 15m starting point

C = 0 min starting time

D = 20 min end time

Set

D: $\{x \mid 0 \le x \le 20, x \in \mathbb{R}\}$

$\{y \mid 15 \le y \le 208, y \in \mathbb{R}\}$

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4.4 Functions

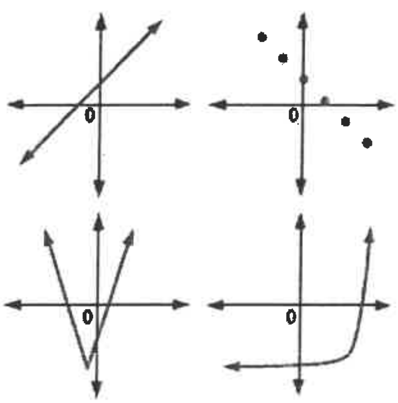
These 8 relations are functions.

x	y
5	10
6	15
7	20

x	y
11	3
21	3
31	3

{(−2, −5), (0, 4), (2, 13), (4, 22)}

{(10, 10), (12, 10), (14, 12), (16, 12)}



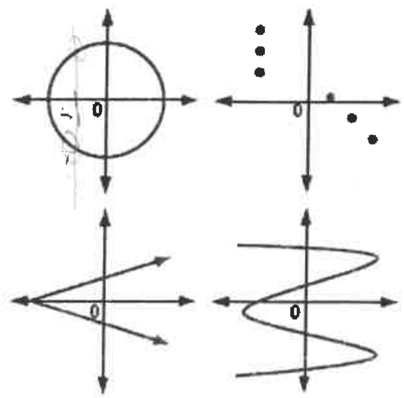
These 8 relations are not functions.

x	y
6	10
6	15
7	20

x	y
3	11
3	21
3	31

{(10, 10), (12, 10), (12, 14), (12, 16)}

{(7, 5), (7, 8), (9, 11), (11, 14)}



Function: A relation in which each value of the independant variable (x) is associated with exactly one value of the dependant variable (y)

→ only 1 output for every input.

For every value in the domain, there is a unique value in the range.

Function Notation: * All functions are relations, but NOT all relations are functions

Symbolic notation used when writing a function.

$y = 3x + 1$ we write $f(x) = 3x + 1$ → "f of x" "f at x"

input

name of function

Area of circle

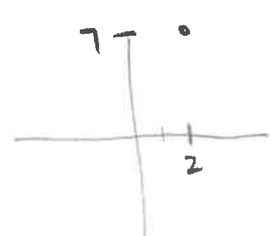
$A = \pi r^2$

$A(r) = \pi r^2$

Ex $f(x) = 2x + 3$ $\boxed{x = 2}$

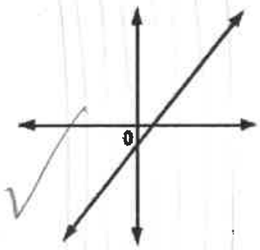
$f(2) = 2(2) + 3$

$= 7$ ← output

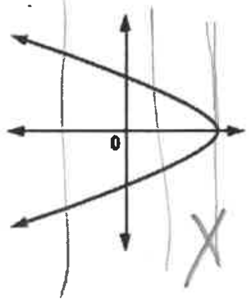


Ex. For each pair of relations, decide which relation is a function and which is not a function. Explain your choice.

a) A



B



Vertical line Test

If any vertical line intersects a graph at more than one point, the relation is NOT a function.

→ a vertical line intersects a function no more than once

b) C

x	y
2	5
2	7
4	9
6	11

X

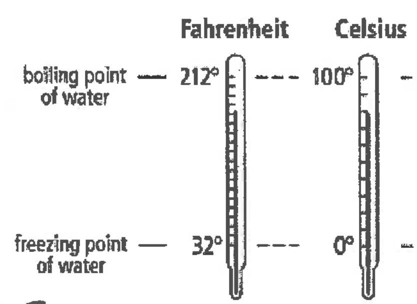
D

x	y
−3	3
−2	4
−1	3
0	4

✓

c) E {(1, 1), (2, 2), (3, 3), (4, 4)} ✓
F {(1, 1), (1, 2), (1, 3), (1, 4)} X

Ex. The function $F(C) = 1.8C + 32$ is used to convert a temperature in degrees Celsius (°C) to a temperature in degrees Fahrenheit (°F).



input

a) Determine F(25). Explain your answer.

$F(25) = 1.8(25) + 32$

$F(25) = 77°F$

$25°C = 77°F$

input output

b) Determine C so that F(C) = 100. Explain your answer.

$F(C) = 1.8C + 32$

$100 = 1.8C + 32$

$-32 \qquad -32$

$\frac{68}{1.8} = \frac{1.8C}{1.8}$

$37.8°C = C$

$37.8°C = 100°F$

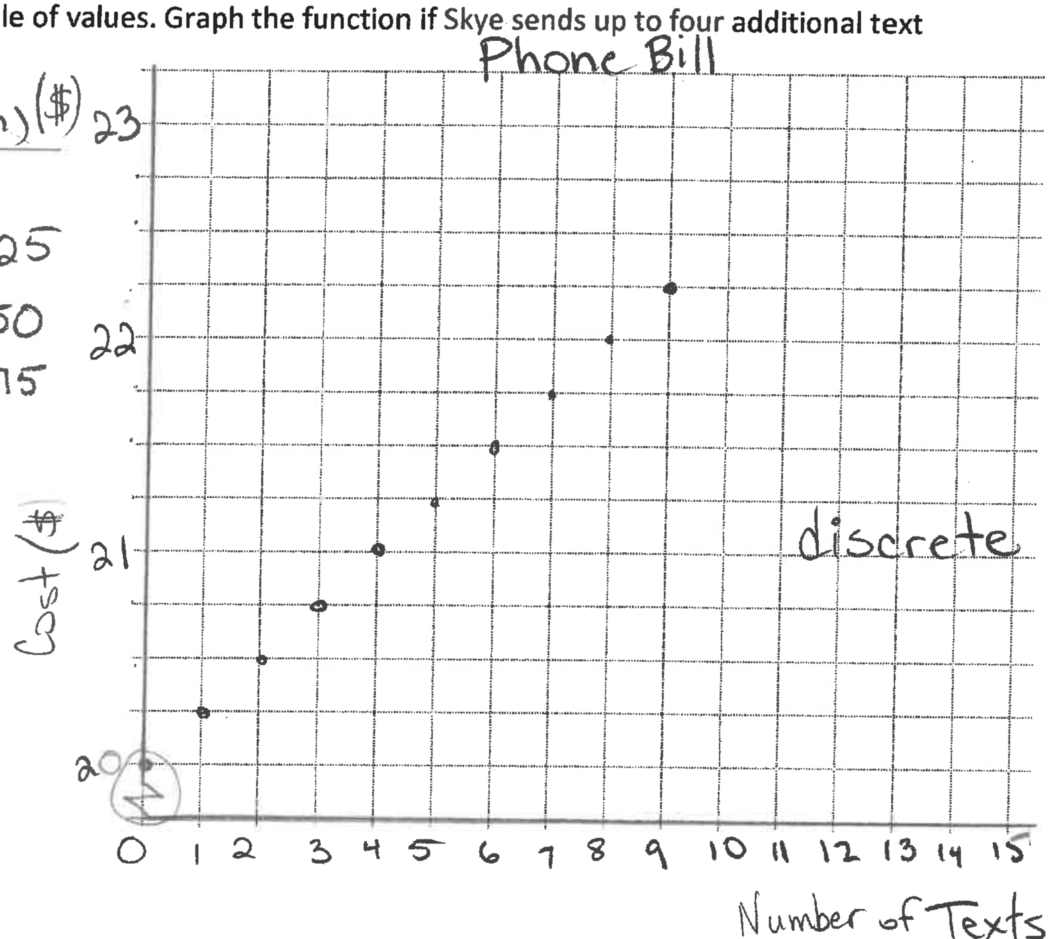
Ex. Skye has a cell phone plan for a monthly fee of \$20 plus 25¢ for each text message to or from a number not on a list of favourites.

a) Write the relation modeling the monthly bill in function notation using C as the name of the function & n as the number of additional text messages.

$C(n) = 0.25n + 20$

b) Make a table of values. Graph the function if Skye sends up to four additional text messages.

n	C(n) (\$)
0	20
1	20.25
2	20.50
3	20.75
4	21



c) If Skye's cell phone bill for a certain month is \$22.25, how many additional text message charges are there?

Interpolate - read off graph

Extrapolate - beyond the graph

9 additional texts

Calculate soln

$C(n) = 0.25n + 20$

$22.25 = 0.25n + 20$

$\frac{2.25}{0.25} = \frac{0.25n}{0.25}$

$\boxed{9 = n}$

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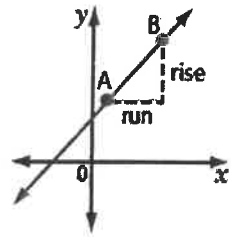
4.5: Slope

Slope: The ratio of vertical change, or rise, to the horizontal change, or run, of a line or line segment.

$$\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} \quad \text{or} \quad m = \frac{\text{rise}}{\text{run}} \quad \text{or} \quad m = \frac{\Delta y}{\Delta x}$$

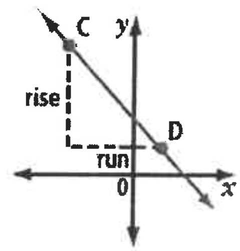
delta Δ "change in"

A positive change in both the vertical and horizontal values leads to a positive slope.



A negative change in both the vertical and horizontal values leads to a positive slope.

A negative change in one and a positive change in the other leads to a negative slope.



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

Ex. Classify the slope of each line segment as positive, negative or neither. Then, calculate each slope.

$m_{AB} = \frac{7}{5} = \frac{-7}{-5}$

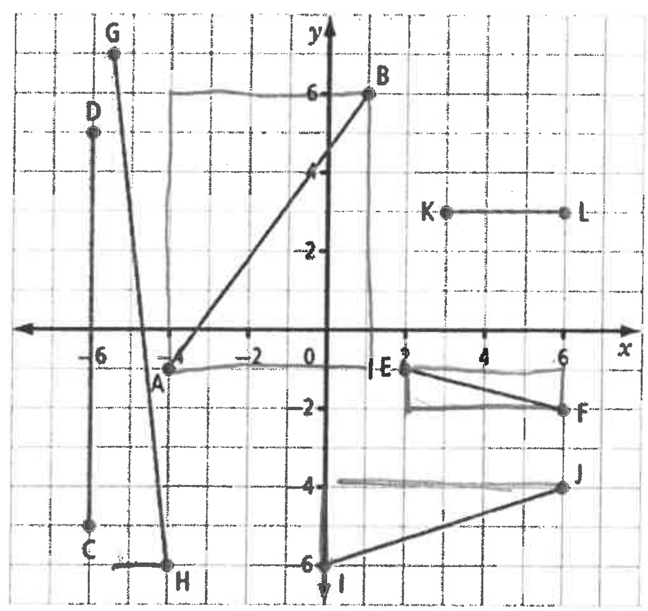
* $m_{CD} = \frac{10}{0}$ undefined (vertical line)

$m_{EF} = \frac{-1}{4} = \frac{1}{-4}$

$m_{GH} = \frac{-13 \times 2}{1.5 \times 2} = \frac{-26}{3}$

$m_{IJ} = \frac{2}{6} = \frac{1}{3}$

* $m_{KL} = \frac{0}{3} = 0$ (horizontal)



Slope formula: Given 2 points

$(x_1, y_1)\ (x_2, y_2)$

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

Ex. What is the slope, m, of each line segment with the given endpoints?

a) S(-3, 6) and T(5, 2)

$x_1\ y_1 \quad x_2\ y_2$

$m = \frac{2-6}{5-^-3}$

$= \frac{-4}{8} = \frac{-1}{2}$

b) H(4, 3) and K(4, 8)

$x_1\ y_1 \quad x_2\ y_2$

$m = \frac{8-3}{4-4}$

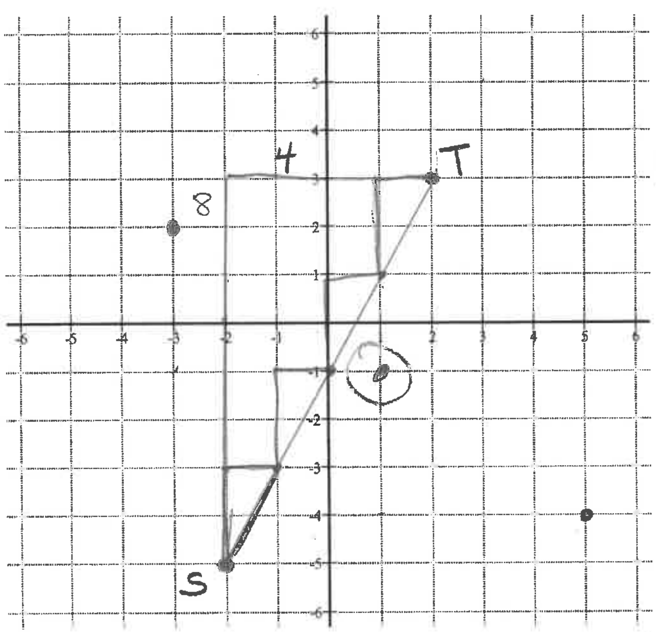
$= \frac{5}{0}$ undefined

c) M(-9, -7) and N(-1, -7)

$m = \frac{-7-^-7}{-1-^-9}$

$= \frac{0}{8} = 0$

Ex. Using a graph find the slope, m, of the line segment with end points S(-2,-5) and T(2,3). Check using the slope formula.



$m = \frac{8}{4}$

$\boxed{m = 2}$

$m = \frac{3-^-5}{2-^-2}$

$= \frac{8}{4} = \frac{2}{1}$

$\boxed{m = 2}$

Ex. The point (-3,2) is on a line that has a slope of $\frac{-3}{4}$. List three other points on the line.

$m = \frac{-3 \text{ rise } (y)}{4 \text{ run } (x)}$

$(-3, 2)$ $+4\ \ -3$ → $(1, -1)$

$(1, -1)$ $+4\ \ -3$ → $(5, -4)$

$(5, -4)$ $+4\ \ -3$ → $(9, -7)$

Ex. The point (-6,1) is on a line that has a slope of $\frac{1}{3}$. List three other points on the line.

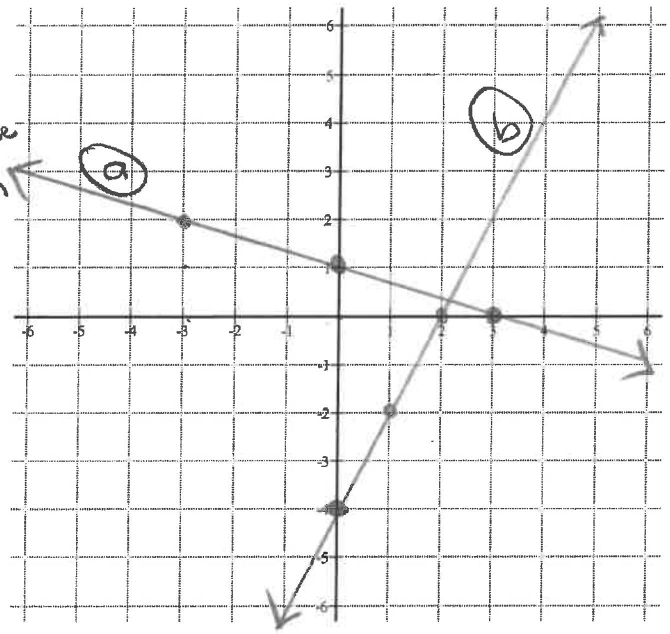
Ex. Graph the line with given point and slope:

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

b) $(0, -4), m = 2$

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

$= \frac{-1 \text{ rise}}{3 \text{ run}}$



Steps

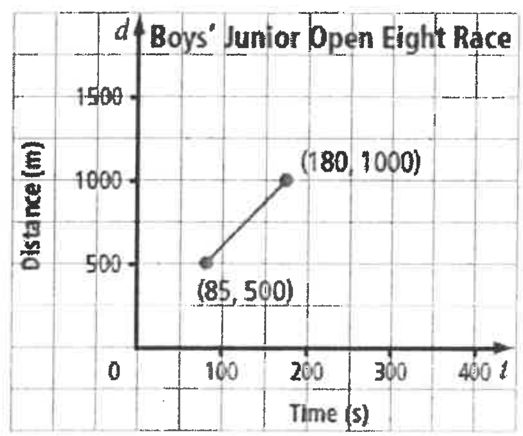
① Plot point

② use slope and plot 2 more points

③ extend line!

$m = \frac{2 \text{ rise}}{1 \text{ run}}$

Ex. The Brentwood Regatta in Mill Bay, BC, is the largest junior rowing regatta hosted by a single school in North America. The races are all 1500 m in length. The graph shows the approximate times at the 500 m mark and the 1000 m mark for one of the boys' races. Determine the average rate of change for this portion of the race.



slope

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

$$= \frac{1000 - 500}{180 - 85}$$

$$= \frac{500}{95} \doteq \boxed{5.26 \text{ m/s}}$$

FMP10 Name: ______________________

Date: ______________________

4.6 Arithmetic Sequences

A ***sequence*** is an ordered list of objects. The terms of a sequence are labelled according to their position in the sequence.

- the ***first term*** is t_1
- the ***number of terms*** is n # of terms
- the ***general term*** is t_n and is dependent on value of n.

A ***finite sequence*** has a finite number of terms (sequence stops).

e.g. 3, 8, 13, 18, 23

An ***infinite sequence*** has infinite number of terms (sequence continues forever).

e.g. −5, 2, 9, 16, ...

An ***arithmetic sequence*** is an ordered list in which the difference b/w consecutive terms is constant. This constant is called the common difference (d).

The formula for the ***general term*** helps you find the terms of the sequence.

e.g.

numeric $d = 17$	algebraic
$t_1 = 5$	$t_1 = t_1$
$t_2 = 5 + 17 = 22$	$t_2 = t_1 + d$
$t_3 = 5 + 17 + 17 = 39$	$t_3 = t_1 + d + d$
$t_4 = 5 + 17 + 17 + 17$ $= 56$	$t_4 = t_1 + d + d + d$
	$\boxed{t_n = t_1 + (n-1)d}$

The ***general term*** of an arithmetic sequence is

where t_1 = first term

n = number of terms

d = common difference

t_n = general term or nth term.

ex. Write the first four terms for: $t_1 = 7$ *and* $d = 3$

7, 10, 13, 16

ex. A visual and performing arts group wants to hire a community events leader. The person will be paid $12 for the first hour of work, $19 for two hours of work, $26 for three hours of work, and so on.

hours	1	2	3	4	5
Pay($)	12	19	26		

$d = 7 \quad t_1 = 12$

a) Find the general term

$t_n = t_1 + (n-1)d$

$t_n = 12 + (n-1)7$

$= 12 + 7n - 7$

$\boxed{t_n = 7n + 5}$

t

b) What will the person get paid for 6 h? 10 h?

$t_6 = 7(6) + 5$

$= 42 + 5$

$= 47$

$t_{10} = 7(10) + 5$

$= 75$

ex. For the general term sequence $t_n = 2n - 3$. What is t_3 and t_{16} ?

$t_3 = 2(3) - 3$

$= 6 - 3$

$= 3$

$t_{16} = 2(16) - 3$

$= 32 - 3$

$= 29$

$$t_n = t_1 + (n-1)d$$

ex. In 1955 the Banks Island musk-ox population was 9250. If the population increases by 1650 each year, how long would it take to reach 100 000?

ly

$t_1 = 9250 \qquad d = 1650$

$t_n = 100\,000 \qquad n = ?$

$$100\,000 = 9250 + (n-1)1650$$
$$100000 = 9250 + 1650n - 1650$$
$$100000 = 7600 + 1650n$$
$$-7600 \qquad -7600$$
$$\frac{92\,400}{1650} = \frac{1650n}{1650}$$
$$\boxed{56 \text{ years} = n}$$

$$100000 = 9250 + (n-1)1650$$
$$-9250 \qquad -9250$$
$$\frac{90750}{1650} = \frac{(n-1)1650}{1650}$$
$$55 = n - 1$$
$$+1 \qquad +1$$
$$\boxed{56 = n}$$

ex. -22 is the ______th term of 2, 1.7, 1.4, 1.1, ...

$t_n = -22 \qquad t_1 = 2$

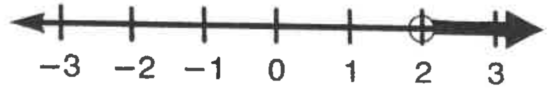
$d = -0.3 \qquad n = ?$

$$t_n = t_1 + (n-1)d$$
$$-22 = 2 + (n-1)(-0.3)$$
$$-2 \qquad -2$$
$$\frac{-24}{-0.3} = \frac{(n-1)\cancel{(-0.3)}}{\cancel{(-0.3)}}$$
$$80 = n - 1$$
$$\boxed{81 = n}$$

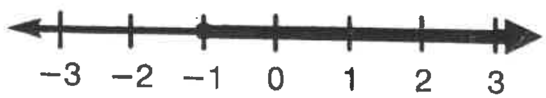
What Happened When the Crossword Puzzle Champion Died?

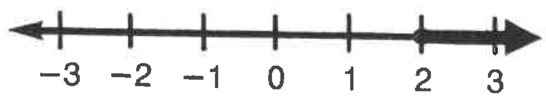
Find the graph of the solution set of each inequality below in the corresponding column of graphs. Notice the letter next to it. Write this letter in each box containing the number of that exercise. Keep working and you will find out about this grave event.

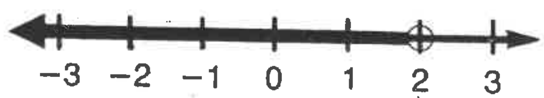
T (1) $x < 2$
(2) $x \leq 2$
(3) $x > 2$
(4) $x \geq 2$ T
(5) $x \neq 1$
(6) $x < -1$
N (7) $x > -1$
(8) $x \leq -1$
(9) $x \geq -1$

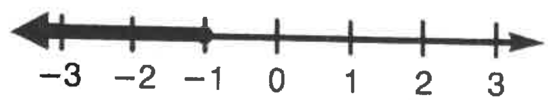
(O) 

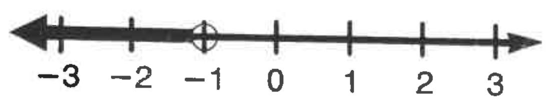
(X) 

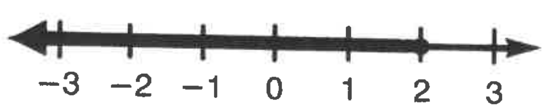
(G) 

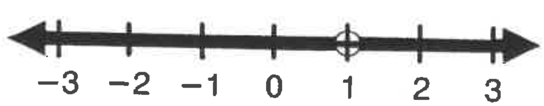
(A) 

4 (T) 

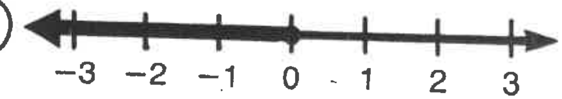
(H) 

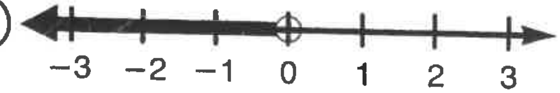
(E) 

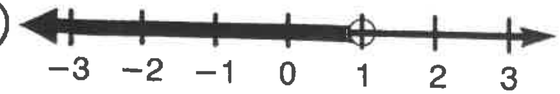
(W) 

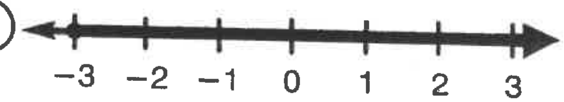
(U) 

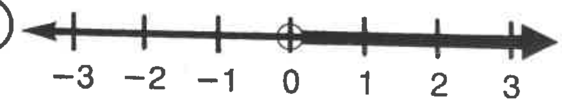
(10) $x < 1$
(11) $1 < x$
(12) $-3 \leq x$
(13) $x > -3$
(14) $x \neq -1$
(15) $0 \geq x$
(16) $0 \leq x$
(17) $0 > x$
(18) $0 < x$

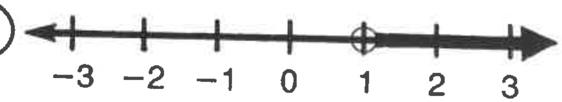
(I) 

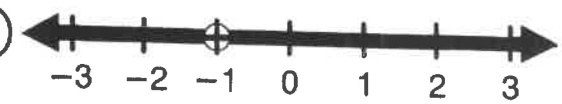
(D) 

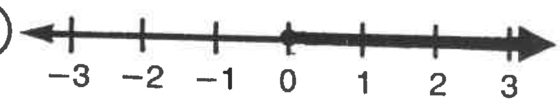
(M) 

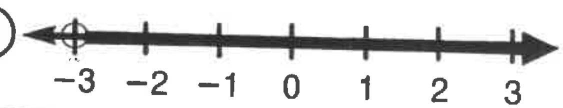
(C) 

(S) 

(Y) 

(R) 

(B) 

7 (N) 

1	8	6	11	16	5	14	15	6	17	8	15	10	18	15	7	17	3	2	13	4	13	17	6	15	9	8	1	4	12	14	3	18	18
															N					T								T					

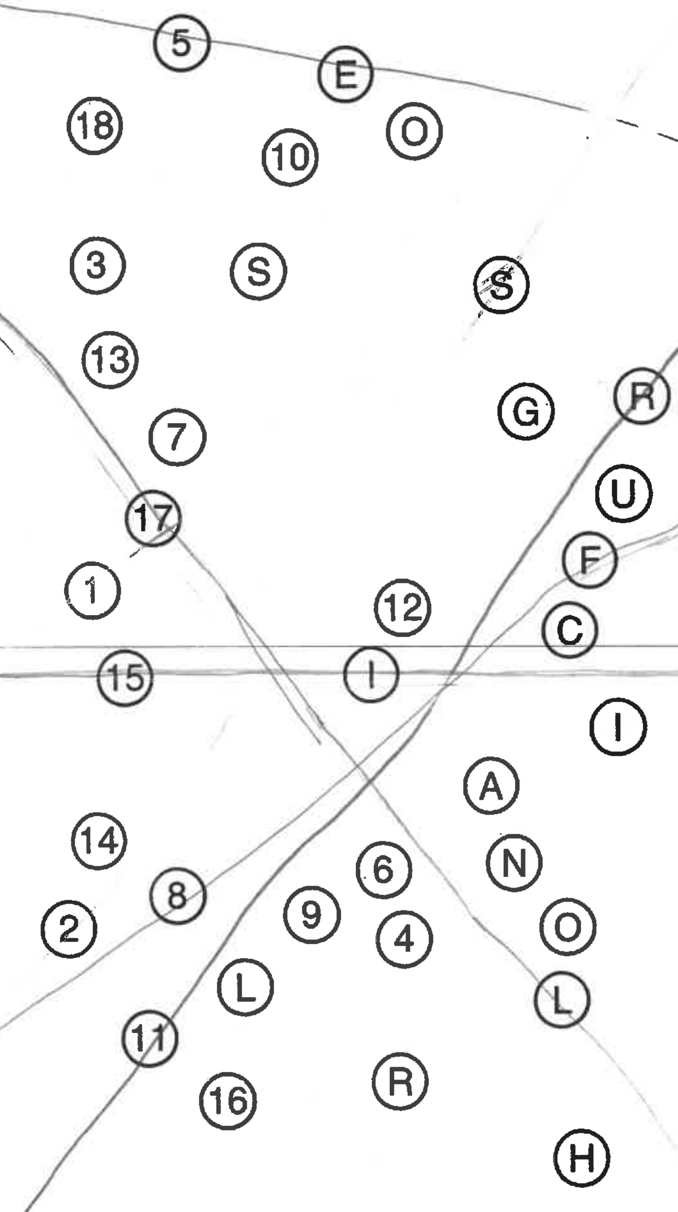
OBJECTIVE 2–a: To identify the graph of the solution set of an inequality.

1, 5, 10, 15

In Music, What Does "Allegro" Mean?

Solve each inequality below. Draw a straight line connecting it to the inequality that describes the solution set. The line will cross a number and a letter. Write the letter in the matching numbered box at the bottom of the page.

1. $4x - 7 > 17$		$x > 2$
2. $2x + 36 < 4$		$x \geq -4$
3. $10 - 8x > 26$		$x > 6$
4. $-6x - 1 \leq 23$		$x \leq -10$
5. $6 + 11x > -60$		$x < -6$
6. $-9x + 5 \geq -58$		$x < -16$
7. $32 - 15x < 2$		$x > -1$
8. $42 > 3x + 3$		$x < 2$
9. $-26 < 4 - 5x$		$x \leq 7$
10. $26 \leq -7x - 2$		$x \leq -4$
11. $10x + 18 \geq -72$		$x \leq 38$
12. $12 > -14x - 2$		$x < -2$
13. $4x - 68 > -4$		$x < 13$
14. $37 \leq 17 - 2x$		$x \geq -9$
15. $-3 - 7x > -17$		$x > -4$
16. $14 < 5x + 34$		$x > 16$
17. $58 - x \geq 20$		$x > -6$
18. $6x - 4 < -40$		$x < 6$



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	S			E						R				I		L	

OBJECTIVE 2–b: To solve inequalities of the form $ax + b > c$, where a is an integer.

FMP10

Name: ______________________________ Date: ____________________

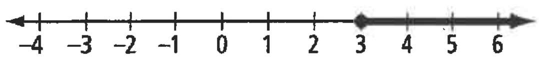
Section 4.3 Extra Practice

Answer on sheet.

1. Describe the set of numbers indicated by each number line using words or symbols and interval notation.

a)

b)



c

d)

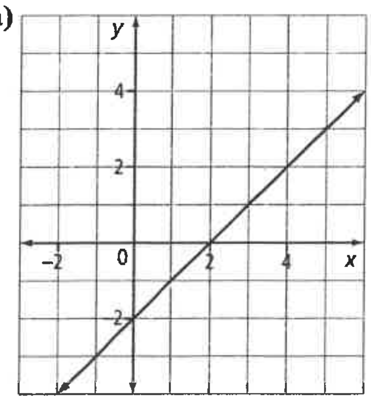
2. Represent the set of numbers indicated using a number line.

a) all real numbers less than 5 but greater than or equal to 0

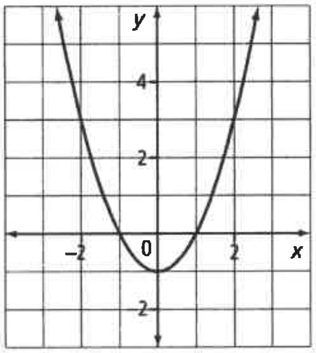
b) (–4, 7]

3. Give the domain and range of each graph using words, a number line, interval notation, and set notation.

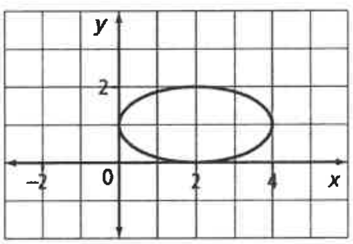
a)



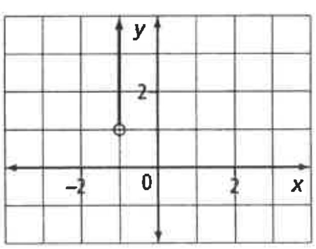
b)



c)

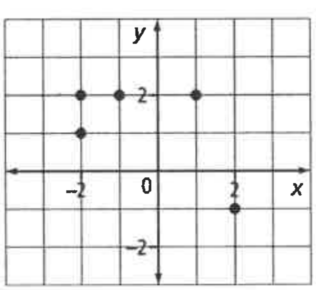


d)



4. List the domain and range of each relation.

a)



b)

x	y
7	3
5	2
3	1
1	0

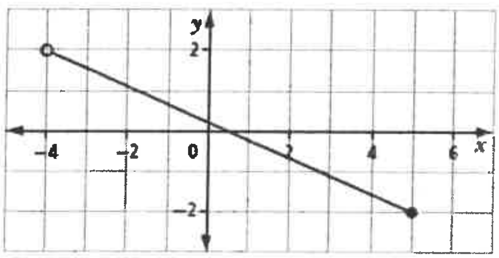
c) (10, 5), (8, 4), (6, 3), (4, 2), (2, 1)

5. A relation is given by the formula $y = 3.5x + 5$. If the domain of the relation is $[-10, 10]$, what is the range?

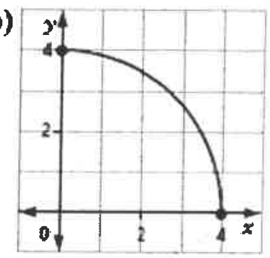
6. A relation consists of integers, where the second number is one more than the square of the first number. Write five ordered pairs for this relation.

7. Give the domain and range of each graph. Use both set notation and interval notation.

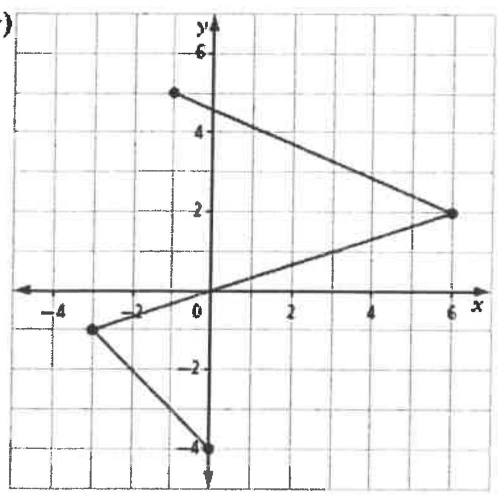
a)



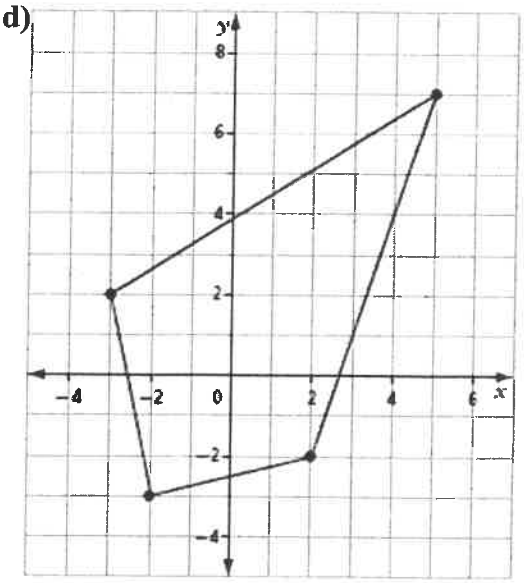
b)



c)



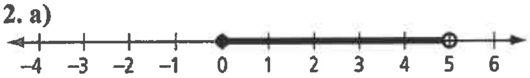
d)



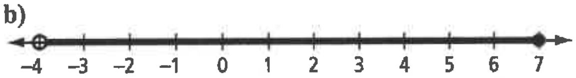
KEY:

1. a) all real numbers greater than –4 and less than or equal to 3, (–4, 3]
b) all real numbers greater than or equal to 3, [3, ∞)
c) all real numbers less than or equal to 2, (–∞, 2]
d) all real numbers less than or equal to –1 as well as all real numbers greater than 4, (–∞, –1] or (4, ∞)

2. a)



b)

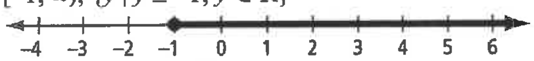


3. a) domain: all real numbers, (–∞, ∞), $\{x \in \mathrm{R}\}$

range: real numbers, (–∞, ∞), $\{y \in \mathrm{R}\}$

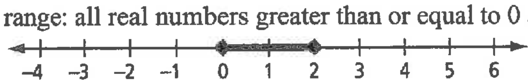
b) domain: all real numbers, (–∞, ∞), $\{x \in \mathrm{R}\}$

range: all real numbers greater than or equal to –1,
[–1, ∞), $\{y \mid y \geq -1, y \in \mathrm{R}\}$

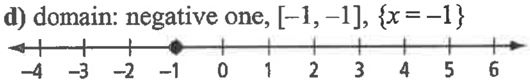


c) domain: all real numbers greater than or equal to 0 and less than or equal to 4, [0, 4],
$\{x \mid 0 \leq x \leq 4, x \in \mathrm{R}\}$

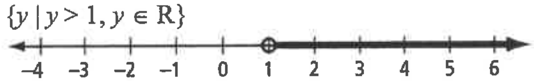
range: all real numbers greater than or equal to 0 and less than or equal to 2, [0, 2], $\{y \mid 0 \leq y \leq 2, y \in \mathrm{R}\}$



d) domain: negative one, [–1, –1], $\{x = -1\}$



range: all real numbers greater than 1, (1, ∞),
$\{y \mid y > 1, y \in \mathrm{R}\}$



4. a) domain: {–2, –1, 1, 2}, range: {–1, 1, 2}
b) domain: {7, 5, 3, 1}, range: {3, 2, 1, 0}
c) domain: {10, 8, 6, 4, 2}, range: {5, 4, 3, 2, 1}
5. [–30, 40]
6. Example: (0, 1), (1, 2), (2, 5), (3, 10), (4, 17)

7. a) $D = \{x \mid -4 < x \leq 5, x \in R\}$ or (– 4, 5]
$R = \{y \mid -2 \leq y < 2, y \in R\}$ or [–2, 2)

b) $D = \{x \mid 0 \leq x \leq 4, x \in R\}$ or [0, 4]
$R = \{y \mid 0 \leq y \leq 4, y \in R\}$ or [0, 4]

c) $D = \{x \mid -3 \leq x \leq 6, x \in R\}$ or [–3, 6]
$R = \{y \mid -4 \leq y \leq 5, y \in R\}$ or [– 4, 5]

d) $D = \{x \mid -3 \leq x \leq 5, x \in R\}$ or [–3, 5]
$R = \{y \mid -3 \leq y \leq 7, y \in R\}$ or [–3, 7]