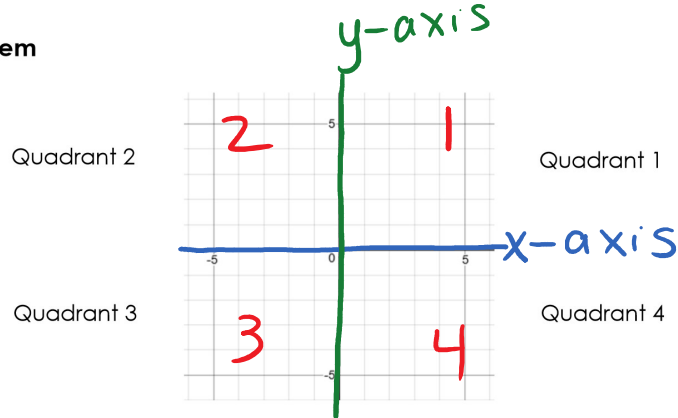


4.1 Characteristics of Relations

Wednesday, January 4, 2023 1:46 PM

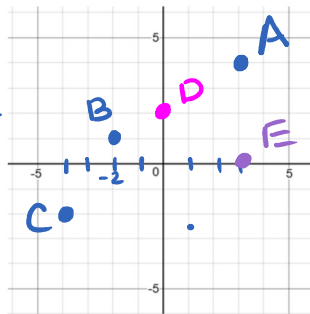
4.1 Characteristics of Relations

A. The coordinate system



Example 1 : Plot the ordered pairs

$A(3,4)$ $x=3$ $y=4$
 $B(-2,1)$ $x=-2$ $y=1$
 $C(-4,-2)$ $x=-4$ $y=-2$
 $D(0,2)$ $x=0$ $y=2$
 $E(3,0)$ $x=3$ $y=0$



ordered pair
(x, y)

B. Relations

- A relationship is a set of ordered pairs.
- The values of x represent the domain of a relation. The values of y represent range of the relation.
- To find solutions to a relation, choose values of x from the set of real numbers. The independent variable is the x variable. We choose values of x, then we can calculate the values of y. The dependent variable is the y variable.

input x	Relation $y = 2x + 1$	Output y
-1	$y = 2(-1) + 1 = -2 + 1$	-1
0	$y = 2(0) + 1 = 0 + 1$	1
2	$y = 2(2) + 1 = 4 + 1$	5

There are several ways to represent a relation:

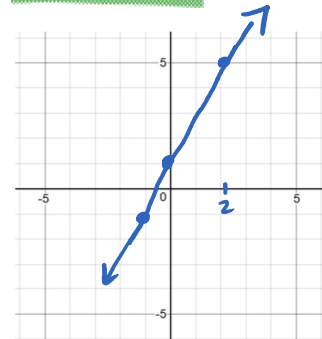
i) table of values

ii) ordered pairs

iii) graphically

x	y
-1	-1
0	1
2	5

$$\{(-1, -1), (0, 1), (2, 5)\}$$



Example 2 : Determine the domain and range of the relation

(3, 4)

(-2, 3)

(1, 3)

(8, -5)

Domain : $\{-2, 1, 3, 8\}$
x-values

Range : $\{-5, 3, 4\}$
y-values

only write it down once

Example 3 : Represent the relation as a table of values, ordered pairs, and graphically.

$$y = -3x + 2$$

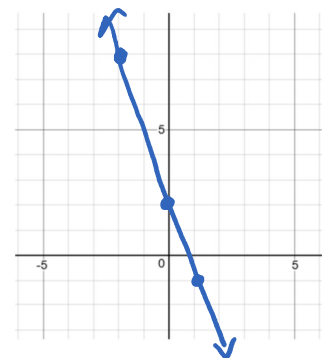
i) table of values

ii) ordered pairs

iii) graphically

x	y
-2	8
0	2
1	-1

$$\{(-2, 8), (0, 2), (1, -1)\}$$



$$\begin{aligned} x &= -2 \\ y &= -3(-2) + 2 \\ y &= 6 + 2 \\ y &= 8 \\ x &= 0 \\ y &= -3(0) + 2 \\ y &= 0 + 2 \\ y &= 2 \end{aligned}$$

$$\begin{aligned} x &= 1 \\ y &= -3(1) + 2 \\ y &= -3 + 2 \\ y &= -1 \end{aligned}$$

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C. Linear Relations

x and y or just or just y

i. A linear relation is composed of one or two variables with singular exponents.

Example 4 : Indicate which relations are linear

a) $x = 3$ Linear b) $y = x^2$ Not c) $2x + 3y = 7$ Linear

d) $y = \sqrt[3]{x}$ Not e) $y = \frac{1}{x}$ Not

$y = x^{1/2}$

$y = x^{-1}$

ii. In each linear relation, the variables (dependent and independent) change by constant variations.

Example 5 : Which table of values represents a linear relation ?

a)

C	Variation of C	F	Variation of F
0		32	
5	$5-0=5$	41	$41-32=9$
10	$10-5=5$	50	$50-41=9$
15	$15-10=5$	59	$59-50=9$
20	$20-15=5$	68	$68-59=9$

Linear constant change in variation

b)

I	P
0	0
5	75
10	300
15	675
20	1200

$5-0=5$
 $10-5=5$
 $15-10=5$
 $20-15=5$

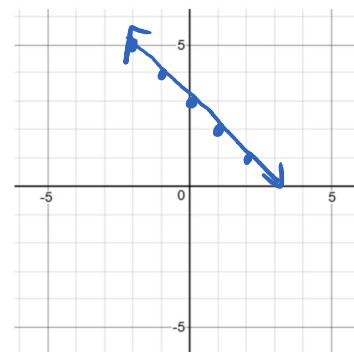
$75-0=75$
 $300-75=225$

*Not Linear
 Change in variation with P is Not constant*

iii) A linear relation is a relation whose graphical representation has the shape of a line.

Example 6 : Completes the value table and sketches the graph.

x	$y = -x + 3$	Ordered pair
-2	$y = -(-2) + 3 = 2 + 3 = 5$	$(-2, 5)$
-1	$y = -(-1) + 3 = 1 + 3 = 4$	$(-1, 4)$
0	$y = -(0) + 3 = 3$	$(0, 3)$
1	$y = -(1) + 3 = -1 + 3 = 2$	$(1, 2)$
2	$y = -(2) + 3 = -2 + 3 = 1$	$(2, 1)$



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