Math 10C

KEY

L26 – 6.2 Linear Relations

Part 1 – Definitions

Relation – An association between two quantities. Can be presented in words, as an equation, as ordered pairs, as a table of values or as a graph.

Linear Relation – A relation that forms a straight line when the data are plotted on a graph.

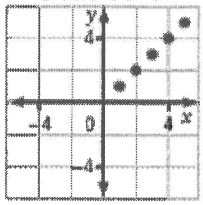
Discrete Data – Data values on a graph that are not connected.

Continuous Data – Data values on a graph that are connected.

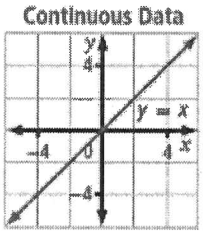
Independent Variable – The variable for which values are selected.

Dependent Variable – The variable whose values depend on those of the independent variable.

Discrete Data



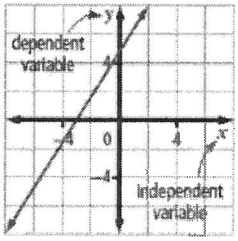
Continuous Data



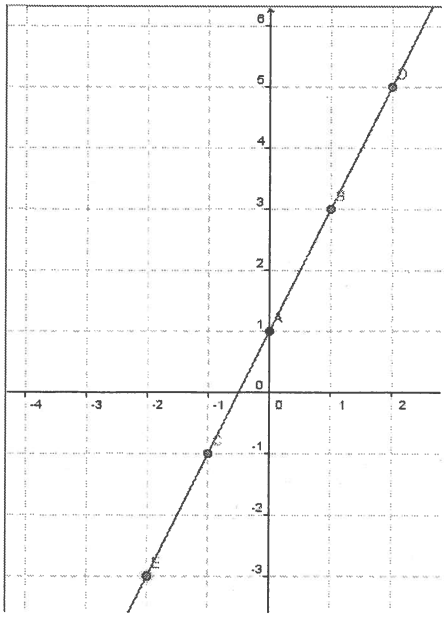
x	y = 3x + 5
−1	2
0	5
1	8
2	11

Choices for independent variable

Corresponding values of dependent variable



Part 2 – Examining Linear Relations using a Variety of Methods



Q1: Write down the coordinate pairs (x,y) for the graph.

(-2,-3), (-1,-1), (0, 1), (1,3), (2,5)

+1, +1, +2, +2

Constant rate of change.

Q2: Complete the table for the graph

X	Y
-2	-3
-1	-1
0	1
1	3
2	5

+1, +2, +1, +2

Constant rate of change.

Q3: Without looking at the graph, how could you use the coordinate pairs or the table to determine whether the relationship is linear?

In red

NOTE: Easier to look at in table format.

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Part 3 – Using Tables to Identify Linear Relations

Q4: Do the following tables represent a linear relationship? Explain.

x	y
1	1
2	1
3	2
4	3
5	5

+1, +1, +1, +1 / +0, +1, +1, +2

No!

Not a constant rate of change.

x	y
1	5
2	3
3	1
4	-1
5	-3

+2, +1, +1, +1 / -4, -2, -2

Yes!

Constant rate of change.

x	y
1	2
2	4
3	8
4	16
5	32

+1, +1, +1, +1 / +2, +4, +8, +16

No!

x	y
10	20
12	17
14	14
16	11
18	8

+2, +2, +2, +2 / -3, -3, -3, -3

Yes!

Part 4 – Using Ordered Pairs to Identify Linear Relations

Q5: Do the following ordered pairs represent a linear relationship? Explain.

(1,1) , (2,1) , (3,2) , (4,3) , (5,5)

+1, +1, +1, +1 / +0, +1, +1, +2

No!

(Same as Q4)

(1,5) , (3,1) , (4,-1) , (5,-3)

+2, +1, +1 / -4, -2, -2

Yes!

(Same as Q4)

(4,6) , (5,8) , (6,9) , (7,10)

I prefer tables

x	y
4	6
5	8
6	9
7	10

+1, +1, +1 / +2, +1, +1

Not lines!

Q6: For what value of ***k*** is the following ordered pairs linear?

(5,7) , (8, ***k***), (11, 5)

x	y
5	7
8	k
11	5

+3, +3 / -1, -1

$k = 6$

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Part 5 – Using Equations to Identify Linear Relations

When a linear relation is written as an equation, it will contain one or two variables and its degree will be 1.

Linear Relations	Non-Linear Relations
$x = 7$	$2x + y^2 = 6$
$3m + 2n = -12$	$h = k^3$
$y = -\frac{2}{3}x + 5$	$xy = 3$

Q7: Which of the following equations represent a linear relation?

$y = 2x - 3$ ✓ $\quad 5x - 2y + 10 = 0$ ✓ $\quad y = x^2 + 4x + 3$ ✗ $\quad y = 100(0.5)^{\frac{x}{5}}$ ✗

Q8: For the linear relationship $y = 2x + 5$, build a table of values and graph.

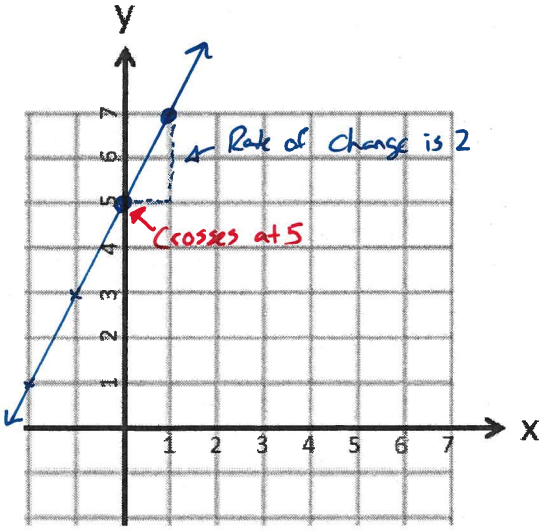
x	y
0	5
1	7
2	9
3	11
4	13
5	15

+2, +2

For $x=0$ $\quad y = 2(0)+5 = 5$

For $x=1$ $\quad y = 2(1)+5 = 7$

For $x=2$ $\quad y = 2(2)+5 = 9$



Remember from Gr 9.

$y = \underbrace{5}_{\text{const}} + \underbrace{2}_{\text{rate}}x$

5: Starting point, when $x=0$

2: Rate of change

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Part 6 – Word Problems

Q9: A white-tailed deer can sprint up to 48 km/h. One is walking at 8 km/h. Consider the relationship between the total distance, in kilometers, travelled by this deer and time, in hours.

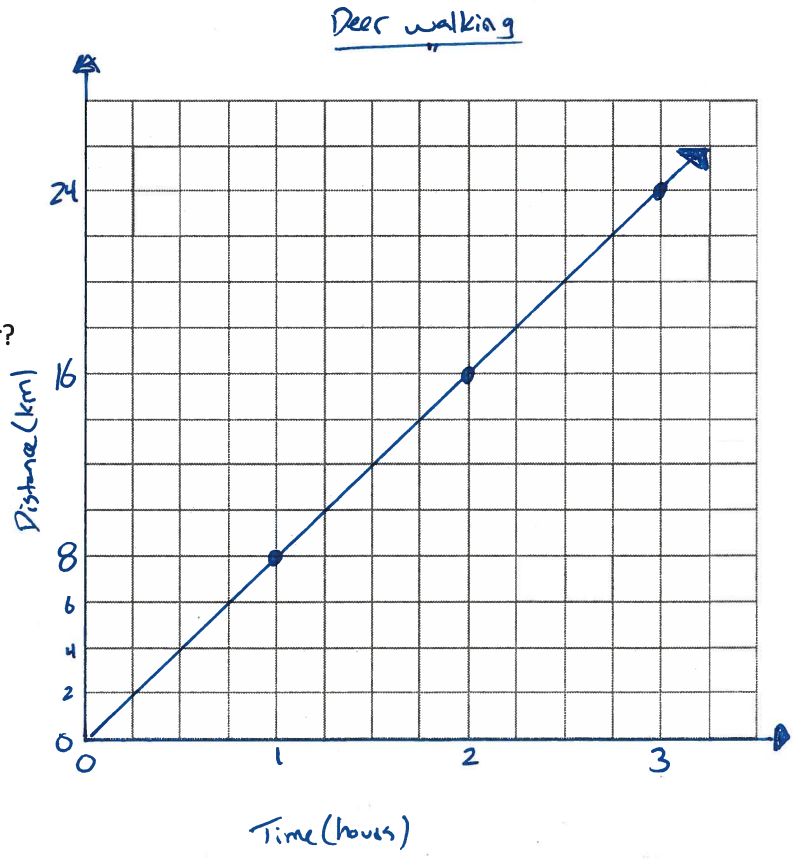
a. Assign a variable to represent each quantity in the relation. Identify the dependent variable and the independent variable.

Let t = time
d = distance

b. Assume the deer walks for 3 hours without stopping. Create a table of values for this relation.

t	d
0	0
1	8
2	16
3	24

c. Graph the relation.



d. Is the relation linear or non-linear? Explain.

Linear.
- Straight line.
- Constant rate of change.

e. Is the relation continuous or discrete? Explain.

Continuous.
- Deer can be at intermediate points.

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Q10: A movie theatre charges $12 per ticket.

a. Is this a linear or non-linear relationship? Explain how you know.

Linear. Constant increase in earnings of $12 per person.

b. Assign a variable to represent each quantity in the relation. Which variable is the dependent variable and which is the independent variable?

Let x = Number of people.
Let y = Earnings ($)

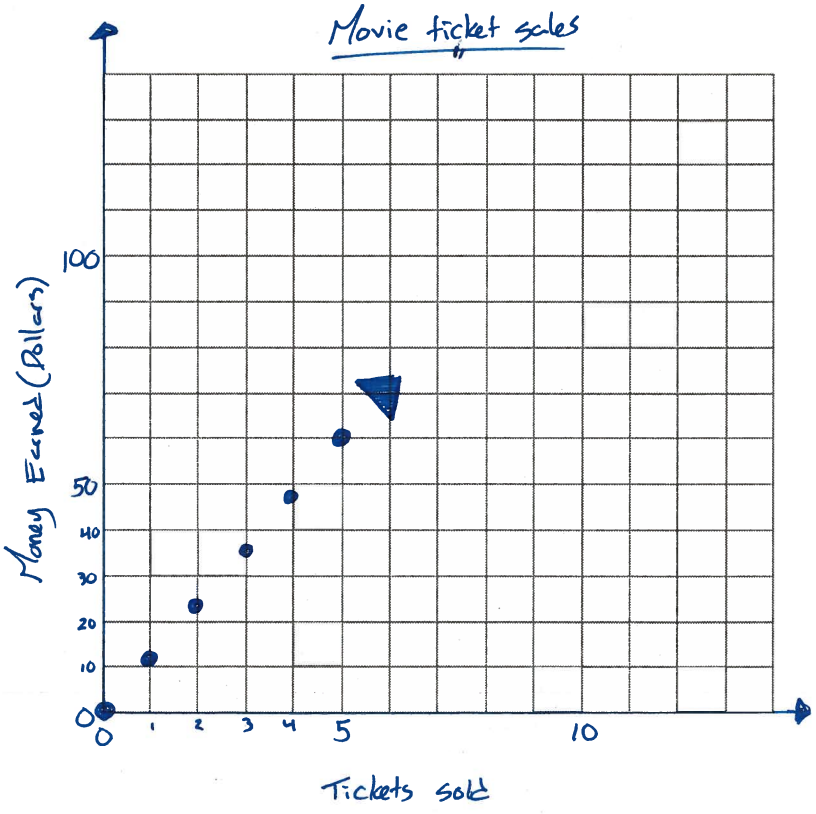
c. Create a table of values for the scenario.

x	y
0	0
1	12
2	24
3	36
4	48
5	60

d. Are the data discrete or continuous? Explain how you know.

Discrete. Can't have 3.5 people attending

e. Graph the data.



Part 7 – Textbook Practice

Pg. 287 #1,2,3,4
Pg 288 #5,8,9