

Name: _____

Unit 3 Test: Linear Relationships

Knowledge/Understanding: #1-3 and multiple choice #1-12

Application: #4

TIPS: #7

Communication: all short/long answer



60
60

Multiple Choice: Carefully transfer your multiple choice answers to the space provided. [12 marks]

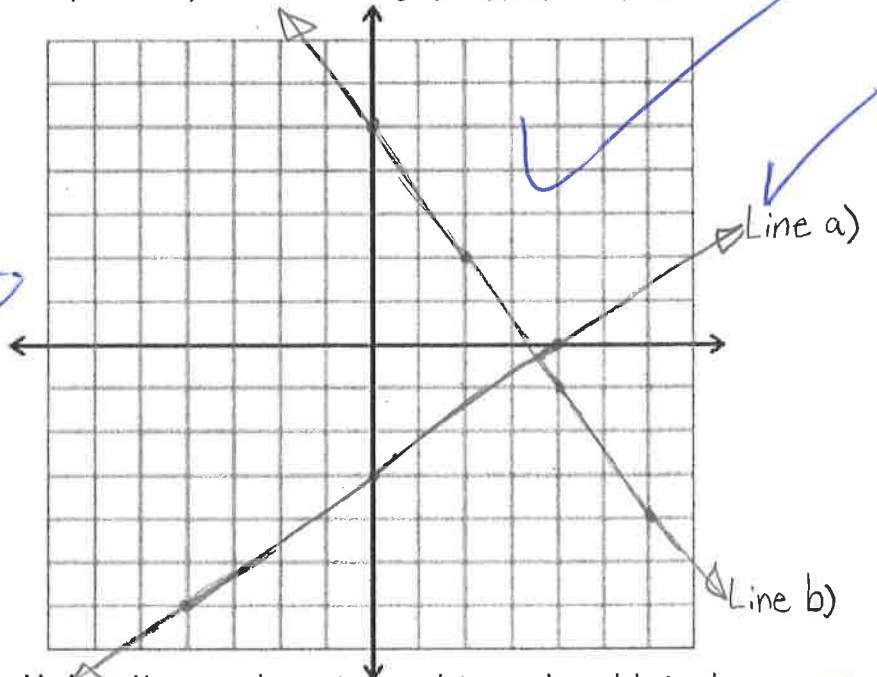
1. d) ✓ 2. d) ✓ 3. c) ✓ 4. c) ✓ 5. b) ✓ 6. b) ✓
 7. b) ✓ 8. d) ✓ 9. c) ✓ 10. d) ✓ 11. c) ✓ 12. b) ✓

1. Graph each line using the slope and y-intercept. Label your lines on the graph appropriately. [6 marks]

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

b) $2y + 3x = 10$

$2y = -3x + 10$
 $y = -\frac{3}{2}x + 5$



2. Find the equation for each line described below. You may choose to complete rough work but only your final answer will be marked in this question. [5 marks]

Description	Equation
Line with a slope of $\frac{3}{4}$ and a y-intercept of 5.	$y = \frac{3}{4}x + 5$ ✓
Line <u>parallel</u> to the <u>x-axis</u> going through the point (5, 7). <i>horizontal</i> <i>slope = 0</i>	$y = 7$ ✓
Line <u>perpendicular</u> to the line $y = \frac{2}{3}x - 3$ and having a y-intercept of 1. <i>2 flip</i> <i>slope = -3/2</i> <i>b = 1</i>	$y = -\frac{3}{2}x + 1$ ✓
Line that is <u>parallel</u> to $y = \frac{2}{3}x + 5$ and has the same y-intercept as $y = 2x - 2$. <i>slope = 2/3</i> <i>b = -2</i>	$y = \frac{2}{3}x - 2$ ✓
A line that is <u>vertical</u> and goes through the point (2, -3). <i>slope = undefined</i>	$x = 2$ ✓

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3. A line is described in each scenario below. Determine the equation of the line that fits each description. [20 marks]

a) The line has a slope of -3 and goes through the point $(1, -5)$.

$$y = -3x + b$$

$$-5 = -3(1) + b$$

$$-5 = -3 + b$$

$$-2 = b$$

$$y = -3x - 2$$

b) The line goes through the points $(2, 3)$ and $(-6, 7)$.

$$m = \frac{7-3}{-6-2}$$

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

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

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

$$3 = -\frac{1}{2}(2) + b$$

$$3 = -1 + b$$

$$4 = b$$

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

c) The line is perpendicular to the line given by the equation $y = \frac{1}{3}x - 4$ and has an x-intercept of 8.

$$m = -3$$

$$y = -3x + b$$

$$0 = -3(8) + b$$

$$0 = -24 + b$$

$$24 = b$$

$$y = -3x + 24$$

d) The line is parallel to the line $3x - 4y = 12$ and has the same y-intercept as the line $x - 2y - 12 = 0$

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

$$b = -6$$

$$-4y = -3x + 12$$

$$y = \frac{3}{4}x - 3$$

$$-2y = x + 12$$

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

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

e) The line has the table of values shown below

x	y
9	-6
12	-18
16	-34
20	-50

$$m = \frac{-18 - (-6)}{12 - 9}$$

$$m = \frac{-12}{3}$$

$$m = -4$$

$$y = -4x + b$$

$$-6 = -4(9) + b$$

$$-6 = -36 + b$$

$$30 = b$$

$$y = -4x + 30$$

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4. Information about the linear relationship between the total cost to rent an apartment while on holiday and the number of nights it is rented is given for two companies.

[10 marks]

Holiday Apartments

\$360 for 3 nights
or
\$720 for 6 nights

Vacation Apartments

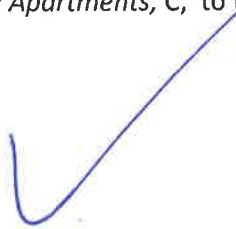
Number of nights	Cost (\$)
3	\$390
5	\$550
7	\$710

- a) Find an equation that relates to cost of *Holiday Apartments*, C , to the number of nights, n .

$$m = \frac{720 - 360}{6 - 3} = \frac{360}{3} = 120$$

$$y = 120x + b$$

$$C = 120n$$



- b) Find an equation that relates to cost of *Vacation Apartments*, C , to the number of nights, n .

$$m = \frac{550 - 390}{5 - 3} = \frac{160}{2} = 80$$

$$y = 80x + b$$

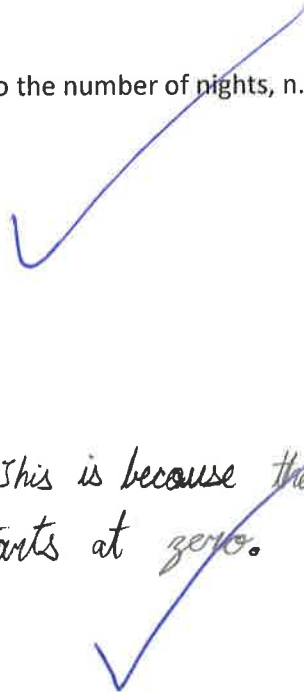
$$390 = 80(3) + b$$

$$390 = 240 + b$$

$$150 = b$$

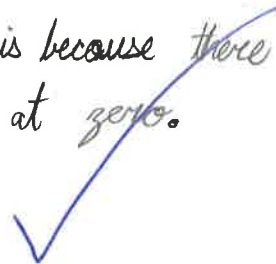
$$C = 80n + 150$$

$$C = 80n + 150$$



- c) Is Holiday Apartments a direct or partial variation? Explain.

Holiday Apartments is a direct variation. This is because there is no initial cost (b), meaning the cost starts at zero.



- d) Use your equations to determine the cost of staying 12 nights at each vacation apartment. Show your work.

H.A.

$$C = 120n$$

$$C = 120(12)$$

$$C = 1440$$

VA.

$$C = 80n + 150$$

$$C = 80(12) + 150$$

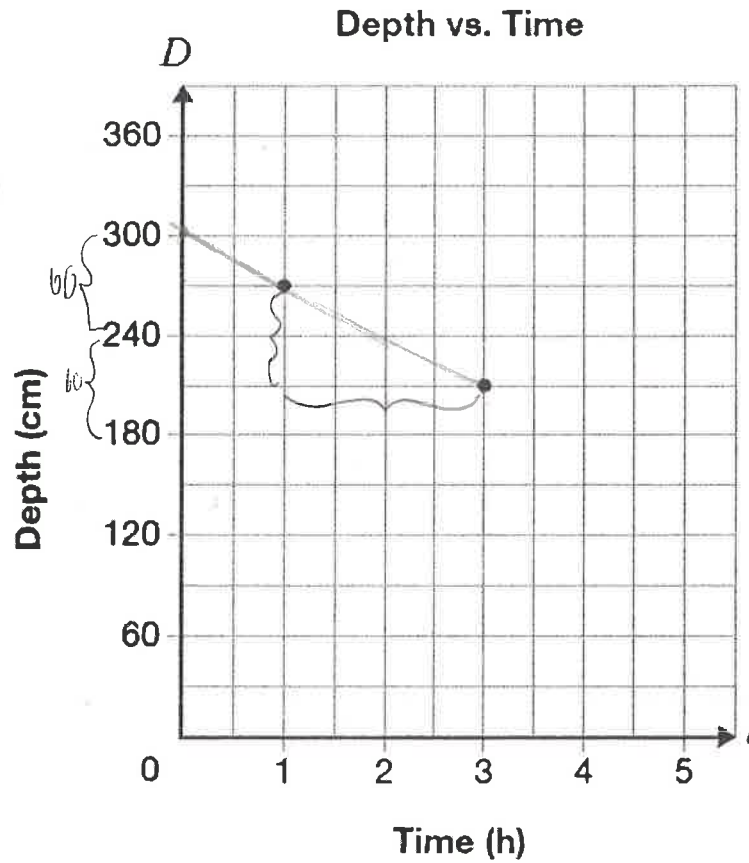
$$C = 960 + 150$$

$$C = 1110$$



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5. Water in a swimming pool is draining at a constant rate. The water depth at certain times is shown in the graph below. [7 marks]



- a) Find the rate of change in this situation (include units).

$$\text{slope} = \frac{-60\text{cm}}{2\text{h}}$$

$$= -30\text{cm/h}$$

- b) Find an equation for the relationship shown on the graph.

$$b=300$$

$$m=-30$$

$$D = -30t + 300$$

- c) When will the pool have a depth of 0 cm?

$$D = -30t + 300$$

$$0 = -30t + 300$$

$$\frac{-300}{-30} = \frac{-30t}{-30}$$

$$10 = t$$

∴ the pool will have a depth of 0cm after 10 hours.