Warm Up:

Given $R = 50p$, determine:

a) constant of variation 50 b) fixed value 0 c) slope of the line 50

If R represents the money raised at a fundraising event, and p represents the number of people, determine how many people came if $6500 was raised.

$50p = 6500$

$\frac{50p}{50} = \frac{6500}{50}$

$p = 130$

∴ 130 people attended the fundraising event.

Unit 5: Linear Relations I

Day 6 - Connecting and Applying

So far, we have learned how to identify a linear relation from a(n):

1. graph (straight line)
2. table of value (first differences are constant)
3. equation $y = mx$ OR $y = mx + b$ $Ax + By + C = 0$ (no exponents on x or y)

AND

- we can tell if a linear relation is direct or partial by the graph or by the form of the equation

- we can calculate slope of a line

$m = \frac{\text{rise}}{\text{run}}$ $m = \frac{\Delta y}{\Delta x}$ $m = \frac{y_2 - y_1}{x_2 - x_1}$

Now, let's tie it all together!!!

Ex. 1 The following table shows the height above the ground of a snail as it crawls up a pipe.

Time (mins)	Height (cm)	First Differences (Δy)
0	-3	
		1 + 3 = 4
3	1	
		5 − 1 = 4
6	5	
		9 − 5 = 4
9	9	
		13 − 9 = 4
12	13	

(Δx: 3, 3, 3, 3)

a) Graph this relation. Is it partial or direct variation?

partial variation [goes through (0, −3)]

b) Use first differences to confirm that the relation is linear.

First differences are all the same, Δx is constant ∴ graph is linear

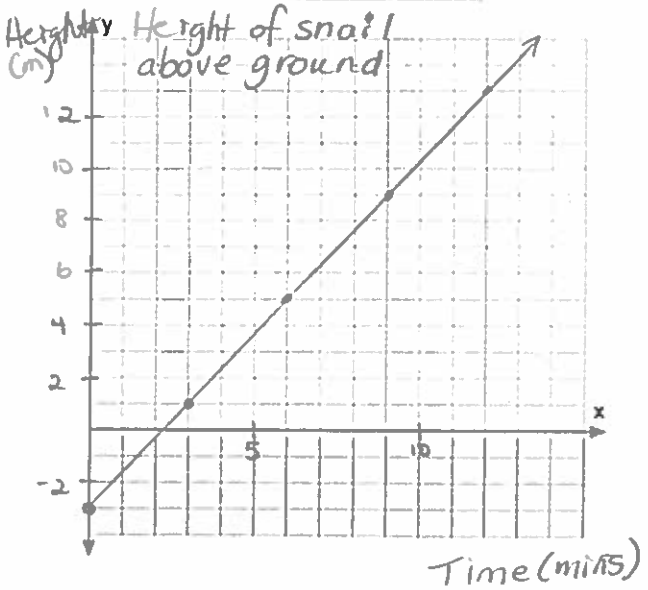
c) Calculate the slope.

$m = \frac{\text{rise}}{\text{run}} = \frac{4}{3}$ $m = \frac{\Delta y}{\Delta x} = \frac{4}{3}$

(6, 5) (9, 9)

$x_1\ y_1$ $x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{9 - 5}{9 - 6} = \frac{4}{3}$



d) What is the initial height of the snail?

3 m below the ground level

↑ the negative gets translated into a meaningful word.

e) Write the equation of the line.

$y = mx + b$

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

Ex. 2 y varies partially with x. When x = 0, y = 3 and when x = 6, y = 8.

a) Find the slope and the vertical intercept (y intercept) of the line.

Given (0, 3) so b = 3

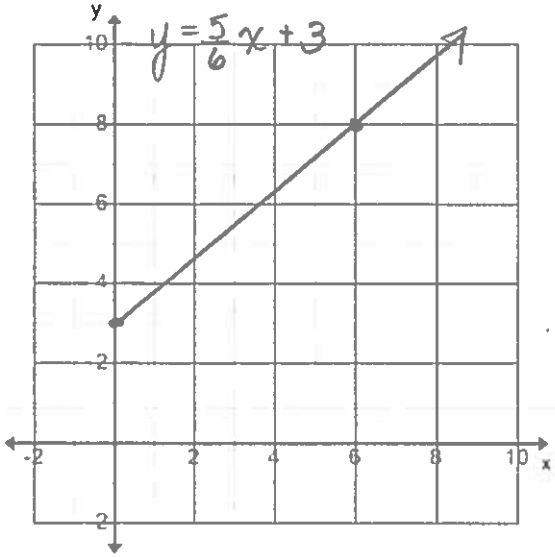
∴ vertical intercept is 3.

(0, 3) (6, 8)
x_1, y_1 x_2, y_2

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8-3}{6-0} = \frac{5}{6}$$

∴ slope is $\frac{5}{6}$

b) Graph the relation.



c) Write an equation to represent this partial variation.

$y = mx + b$, $m = \frac{5}{6}$, $b = 3$ so,

$$\boxed{y = \frac{5}{6}x + 3}$$

Ex. 3 A company tests heavy duty elastic bands by measuring how much they stretch when supporting various masses.

	Δx		2		2		2		2
x	Mass (kg)	0		2		4		6		8
y	Length (cm)	6.2		9.6		13.0		16.4		19.8
	First Differences (Δy)		3.4		3.4		3.4		3.4	

a) Determine if this relation is linear.

Δx is constant, first differences are all the same so the relation is linear.

b) What does the point (0, 6.2) represent?

↳ initial value since 'x' = 0

The elastic band is 6.2 cm long with no mass attached.

c) Calculate the slope. What does it represent?

$$m = \frac{\Delta y}{\Delta x} = \frac{3.4}{2} = 1.7 \text{ cm/kg}$$

∴ for every 1 kg that is attached, the elastic stretches 1.7 cm.

d) Write an equation in the form of y = mx + b. $m = 1.7$, $b = 6.2$

$$y = 1.7x + 6.2$$

e) Predict how long the elastic band would be when it is supporting 10 kg.

↳ mass = 10 kg so, x = 10

$y = 1.7(10) + 6.2$
$y = 17 + 6.2$
$y = 23.2$

∴ the elastic would be 23.2 cm long.