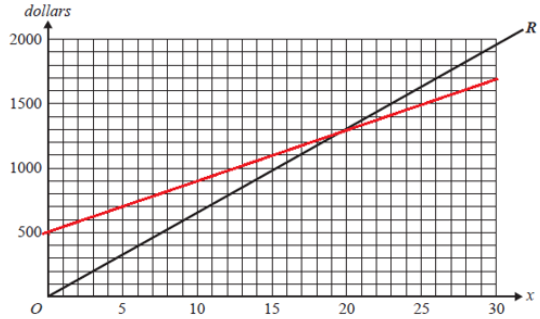
Engage Education End of Year Revision Lectures
Further Maths Graphs and Relations Solutions

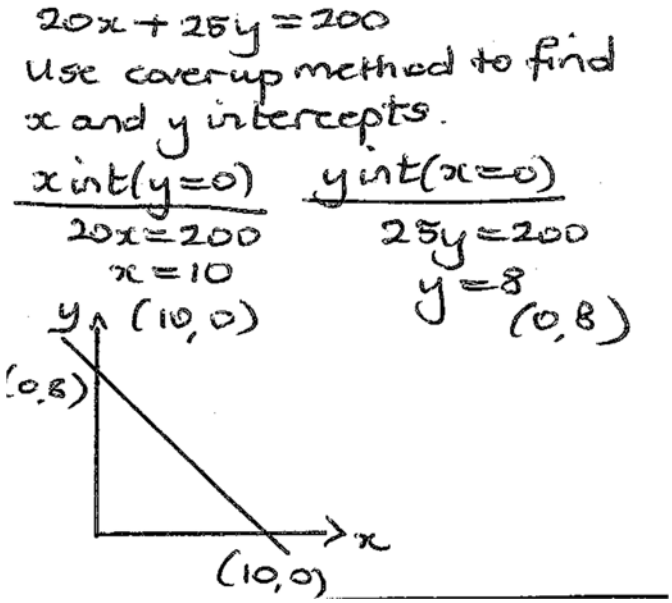
1) D – ½ - m = rise/run = ½
2) A – V= 5000 – 2t

   Start with 500 litres
   Water is flowing <u>out</u> of tank, therefore rate is negative
   -2litres/min

3) a. Start at 50 L fuel. After 160km there are 30 litres left. The rate is negative, as 20 litres of fuel has been used over 160km
   rate = -20/160 = -1/8
   F = -1/8 D + 50
4) D – y=2; horizontal line passes through (1,2)
5) C – 2x + 2y = 0; use the substitution method to see which option satisfies the equation with (2, -2)
6) E - x – 2y = 8; check that both (10,1) and (4, -2) fit the equation
7) Plot two points from the equation – (0, 500) and (30, 1700) found from the equation, then join the line.



8) See below.



9) B – 2x – y = 1, 4x – 2y = 3
When would 2 equations have no simultaneous solution? A: If they are parallel. Look for equations with the same gradient.

10) D - $4.55

$4x + 6y = 14.70 \qquad x = 1.05$

$3x + 5y = 11.90 \qquad y = 1.75$

$1\ donut + 2\ buns$
$= 1.05 + 2(1.75)$

$= \$4.55$

11) a. R = 35x
b. C = 50625 + 12.5x
c. i. Break even when R = C -> 50625 + 12.5x = 35x -> 22.5x = 50625 -> x = 2250 participants
ii. Profit = R – C; when x = 8670, R = 303450 and C = 159000
303450 – 159000 = $144450

12) C – 80 mugs at $7.50 each – found through the process of substitution

A. 60 mugs $9 @

$R = 60 \times 9 = 540$

$C = 150 + 6(60) = \$510\ C < R$

C.

80 mugs $7.50 @
$R = 80 \times 7.50 = \$600$
$C = 150 + 6(80) = \$630\ C > R$
$\therefore Loss$

c. C – 4.5 hours. The graph becomes flat after it runs out of gas.

d. A

Find equation 1st section

(0,332.5) $\qquad m = \frac{(220-332.5)}{(4.5-0)} = \frac{112.5}{4.5}$

(4.5,220) $\qquad m = -25$

$y = mx + c$

$c = 332.5\ from\ graph$

$M = 332.5 - 25t$

$0 \leq t \leq 4.5$

Find equation from second section

Horizontal line joining

(4.5,220) and (6, 220)

$\therefore y = 220$

$\therefore M = 220\ 4.5 < t \leq 6$

e. B - $0.60, as read from the graph
f. C - $1.40 - Letters can cost $0.40, $0.60, $0.90, $1.50

A. 0.80 (0.40+0.40)
B. 1.20 (0.60+0.60)
C. 1.40 NOT POSSIBLE
D. 2.10 (1.50+1.50)
E. 3.00 (1.50+1.50)

g. a. 16km in 7 hours = 16/7 = 2.3km/hr
b. a = 1.5, b = 5.5
$t = 3\ d = 10\ (3,10)$
$t = 7\ d = 16\ (7,16)$

$$m = \frac{16-10}{7-3} = \frac{6}{4} = \frac{3}{2} = 1.5$$

$d = 1.5t + b$
Sub (3,10) to find *b*
$10 = 1.5(3) + b$
$10 = 4.5 + b$

t=3 d=10 (3,10)
t=7 d=16 (7,16)
$$m = \frac{16-10}{7-3} = \frac{6}{4} = \frac{3}{2} = 1.5$$
$\therefore a = 1.5$

$d = 1.5t + b$
Sub (3,10) to find *b*
10= $1.5(3) + b$
10= $4.5 + b$
b = 5.5

h. C

$$m = \frac{1}{3} or\ k = \frac{1}{3}$$

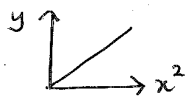
$$\therefore y = \frac{1}{3}x^3$$

Check which point satisfies this equation found above

A. (1,3) $x = \frac{1}{3} \times 1^3 = \frac{1}{3}$
B. (3,1) $x = 3\ y = \frac{1}{3} \times 3^3 = 9$
C. (1, $\frac{1}{3}$) $x = 1\ y = \frac{1}{3} \times 1^3 = \frac{1}{3}$

i. C - m = ¼ or k = ¼ therefore y = ¼x^2
j. A

$y = 3x^2$ graph is given



y vs x^2 is a straight line

Check which graph gives a gradient of 3 or check which point (option) satisfies equation.

A. (9,27)

$y = 3x^2$

$y = 3 \times 9$

$\therefore y = 27$

$m = \frac{27}{9} = 3$

(9,27)

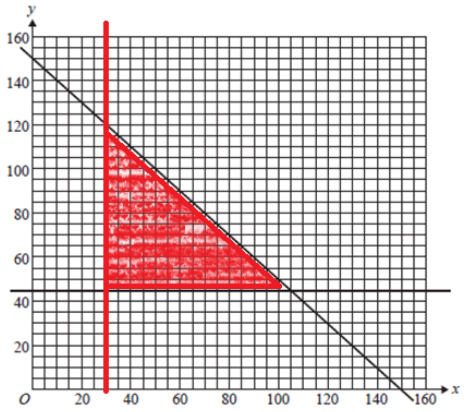
$\downarrow \quad \downarrow$

$x^2 \quad y$

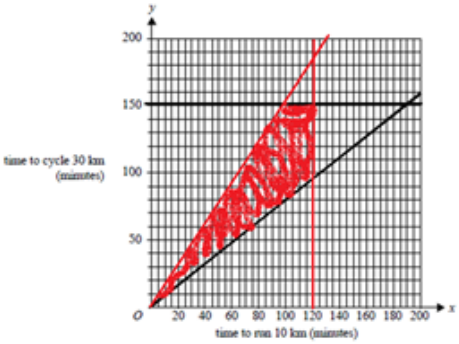
k. a. The total number of Softsleep pillows and Resteasy pillows are equal to or less than 150

b. on the graph, y=45. As y = k, k = 45

c. See below.

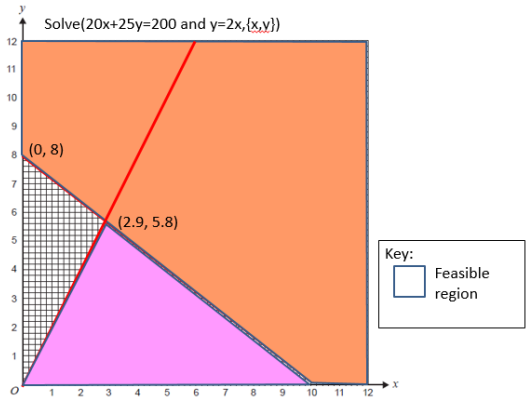


l. b.



m. b. $y \geq 2x$

n. i. See below



ii. 2

d. P = 40x + 30y

e. i. 2 washed, 6 clipped

(1,7) $P = 40(1) + 30(7) = 250$

$(2,6)\ P = 40(2) + 30(6) = 260$

ii. $260

o. A – Z = x + y

Find point M on calculator

$y = \frac{-100}{40}x + 100 \rightarrow y = 2.5x + 100$

$y = \frac{-60}{120}x + 60 \rightarrow y = 0.5x + 60$

Find M (20, 50)

	A $Z=x+y$	B $Z=x-y$	C $Z=3x+y$
A (0,60)	60	−60	60
M (20,50)	**70**	−30	110
B (40,0)	40	**40**	**120**

↑ option A gives max value at point M