

Topic: The Straight Line & Scattergraphs

24.01

a)  $4x + 3y = 12$   
 $3y = -4x + 12$   
 $y = -\frac{4}{3}x + 4$   
 $m = -\frac{4}{3}$

b) when line crosses x-axis  
 $y = 0$   
 $4x + 3y = 12$   
 $4x + 3(0) = 12$   
 $4x = 12$   
 $x = 3$        $(3, 0)$

24.02

$(-2, 5)$      $(3, 15)$   
 $x_1, y_1$      $x_2, y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{15 - 5}{3 - (-2)} = \frac{10}{5} = \underline{\underline{2}}$

$(3, 15)$   
a    b

$y - b = m(x - a)$   
 $y - 15 = 2(x - 3)$   
 $y - 15 = 2x - 6$   
 $y = 2x - 6 + 15$   
 $y = 2x + 9$

24.03

$x + 2y = -5$	Sim
$3x - y = 13 \times 2$	Equations
<hr/>	
$x + 2y = -5$	
+ $3x - 2y = 26$	
<hr/>	
$4x = 21$	
$x = 5.25$ $(5\frac{1}{4})$	
<hr/>	
$x + 2y = -5$	
$5.25 + 2y = -5$	
$2y = -5 - 5.25$	
$2y = -10.25$	
$y = -5.125$ $(-5\frac{1}{8})$	

24.04

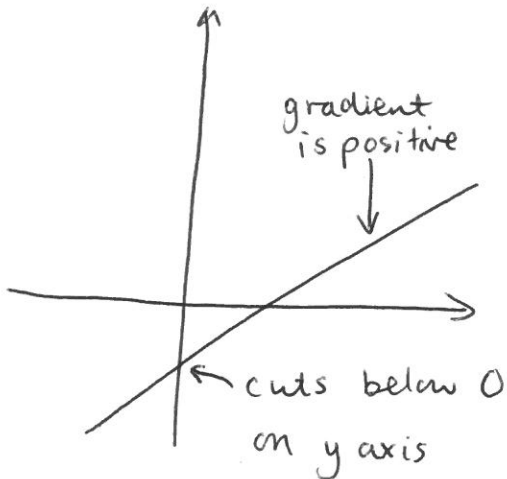
$x + y = 5$   
 $y = -x + 5$   
 $m = -1$

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24.05

$$y = mx + c$$

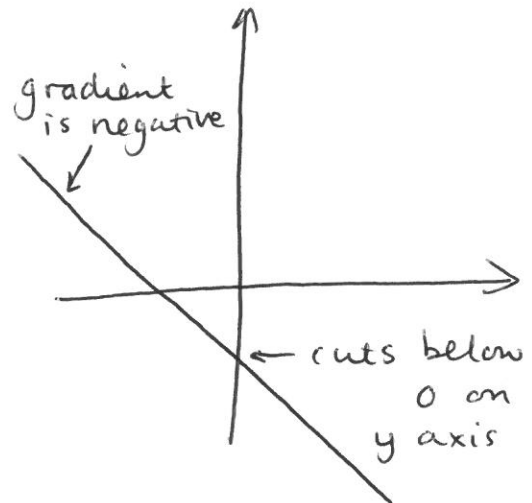
$$m > 0 \quad c < 0$$



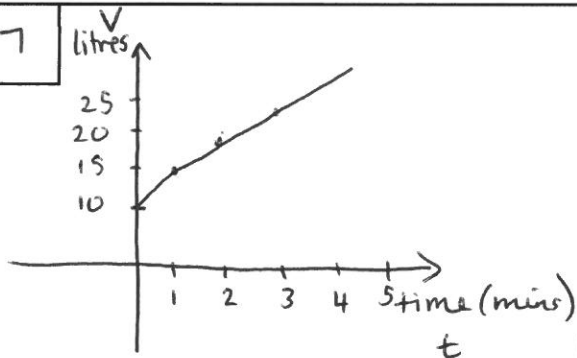
24.06

$$y = ax + b$$

$$a < 0 \quad b < 0$$



24.07



$$(0, 10) \quad (1, 15)$$

$$m = \frac{15-10}{1-0} = \frac{5}{1} = 5$$

$$y - b = m(x - a)$$

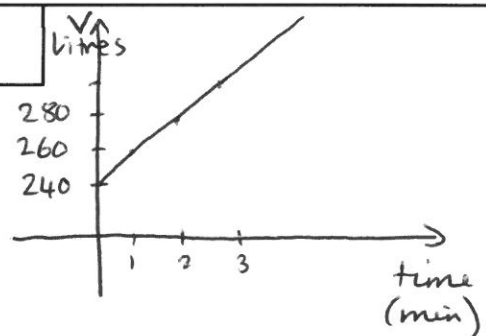
$$y - 10 = 5(x - 0)$$

$$y - 10 = 5x$$

$$y = 5x + 10$$

$$V = 5t + 10$$

24.08



$$(0, 240) \quad (1, 260)$$

$$m = \frac{260-240}{1-0} = \frac{20}{1} = 20$$

$$c = 240$$

$$y = 20x + 240$$

$$V = 20t + 240$$

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24.09

$$\begin{aligned} \text{a) } 2y + x &= 6 \\ 2y &= -x + 6 \\ y &= -\frac{1}{2}x + 3 \\ m &= \underline{\underline{-\frac{1}{2}}} \end{aligned}$$

$$\begin{aligned} \text{b) } (0, c) \quad x &= 0 \\ \begin{matrix} x & y \end{matrix} \\ 2y + x &= 6 \\ 2y + 0 &= 6 \\ 2y &= 6 \\ y &= 3 \quad \underline{\underline{(0, 3)}} \end{aligned}$$

24.10

$$\begin{aligned} y &= 4x + 5 \\ m &= \underline{\underline{4}} \end{aligned}$$

24.11

$$3y = 12 - 4x$$

crosses x-axis,  $y = 0$ 

$$0 = 12 - 4x$$

$$4x = 12$$

$$x = 3$$

$$\underline{\underline{(3, 0)}}$$

24.12

$$(0, 3) \quad (1, 5) \quad (\text{from graph})$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 3}{1 - 0} = \frac{2}{1} = 2$$

$$c = \underline{\underline{3}} \quad (\text{from graph})$$

$$y = 2x + 3$$

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24.13

(4, 0) (10, 3)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 0}{10 - 4} = \frac{3}{6} = \frac{1}{2}$$

(4, 0)  
a b

$$y - b = m(x - a)$$

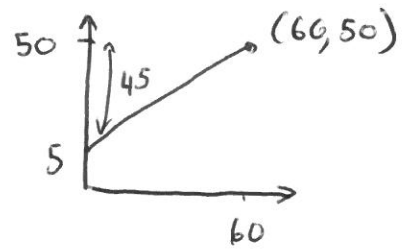
$$y - 0 = \frac{1}{2}(x - 4)$$

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

$$T = \frac{1}{2}S - 2$$

=

24.14



(0, 5) (60, 50)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{50 - 5}{60 - 0} = \frac{45}{60} = \frac{3}{4}$$

$c = 5$  (from graph)

$$y = \frac{3}{4}x + 5$$

$$V = \frac{3}{4}t + 5$$

=

24.15

(a<sup>2</sup>, a) (t<sup>2</sup>, t)  
x<sub>1</sub> y<sub>1</sub> x<sub>2</sub> y<sub>2</sub>

$$m = \frac{t - a}{t^2 - a^2} = \frac{t - a}{(t - a)(t + a)}$$

$$= \frac{1}{t + a}$$

=

24.16

(-1, -7) (4, 3)  
x<sub>1</sub> y<sub>1</sub> x<sub>2</sub> y<sub>2</sub>

a)  $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$= \frac{3 - (-7)}{4 - (-1)} = \frac{10}{5} = 2$$

b)  $c = -5$

$$y = 2x - 5$$

c) (3k, k)  $y = 2x - 5$   
x y  $k = 2(3k) - 5$   
 $k = 6k - 5$   
 $k - 6k = -5$   
 $-5k = -5$   
 $k = 1$

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24.17

 $(0, 8)$   $(4, 0)$  from graph

$$a) m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 8}{4 - 0} = \frac{-8}{4}$$

$$m = \underline{\underline{-2}}$$

$$c = 8 \Rightarrow \text{from graph}$$

$$y = -2x + 8$$

$$b) \begin{array}{l} y_1 = 2x \\ y_2 = -2x + 8 \end{array} \quad \begin{array}{l} y_1 = y_2 \text{ when} \\ \text{lines meet} \end{array}$$

$$2x = -2x + 8$$

$$2x + 2x = 8$$

$$4x = 8$$

$$x = 2$$

$$\underline{\underline{(2, 4)}}$$

$$y = 2x, \quad y = 2(2) = 4$$

24.18

 $(0, 6)$   $(1, 4) \Rightarrow$  from table

$$m = \frac{4 - 6}{1 - 0} = \frac{-2}{1} = \underline{\underline{-2}}$$

$$c = 6 \quad (\text{from table})$$

$$y = -2x + 6$$

24.19

 $(0, 8)$   $(6, 12)$ 

$$m = \frac{12 - 8}{6 - 0} = \frac{4}{6} = \frac{2}{3}$$

$$c = 8 \quad (\text{from graph})$$

$$y = \frac{2}{3}x + 8$$

24.20

 $(0, 18)$   $(9, 0)$ 

from graph

$$m = \frac{0 - 18}{9 - 0} = \frac{-18}{9} = -2$$

$$c = 18 \quad (\text{from graph})$$

$$y = -2x + 18$$

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24.21

 $(0, 5)$   $(-2, 0)$ 

from graph

$$m = \frac{0-5}{-2-0} = \frac{-5}{-2} = \frac{5}{2} / 2.5$$

$$c = 5 \quad (\text{from graph})$$

$$y = 2.5x + 5$$

or

$$y = \frac{5}{2}x + 5$$

24.22

 $(0, 1)$   $(1, 3)$ 

from graph

$$m = \frac{3-1}{1-0} = \frac{2}{1} = \underline{\underline{2}}$$

$$c = 1 \quad (\text{from graph})$$

$$y = 2x + 1$$

24.23

 $(0, -3)$   $(-2, -11)$ 

$$m = \frac{-11 - (-3)}{-2 - 0} = \frac{-11 + 3}{-2} = \frac{-8}{-2}$$

$$m = 4$$

$$c = -3 \quad (\text{from graph})$$

$$y = 4x - 3$$

24.24

 $(0, -1)$   $(1, 2)$ 

$$m = \frac{2 - (-1)}{1 - 0} = \frac{2 + 1}{1} = \frac{3}{1} = \underline{\underline{3}}$$

$$c = -1 \quad (\text{from graph})$$

$$y = 3x - 1$$

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24.25

~~(0, 12)~~ (6, 0) (0, 8)

$$m = \frac{8-0}{0-6} = \frac{8}{-6} = -\frac{4}{3}$$

$c = 8$  (from graph)

$$y = -\frac{4}{3}x + 8$$

24.26

a)  $4x + 3y = 36$

at A  $x = 0$

$$4(0) + 3y = 36$$

$$3y = 36$$

$$y = 12$$

A(0, 12)

b) B(0, 8)  $y = 8$  at B

$$4x + 3y = 36$$

$$4x + 3(8) = 36$$

$$4x + 24 = 36$$

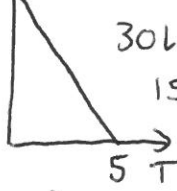
$$4x = 36 - 24$$

$$4x = 12, x = 3$$

C(3, 8)

24.27

V



bath drains at  
30l per min.  
150l will take  
5 mins to  
drain

(0, 150) (5, 0)

$$m = \frac{0-150}{5-0} = \frac{-150}{5} = -30$$

$c = 150$  (from graph)

$$y = -30x + 150$$

$$V = -30t + 150$$

24.28

(0, 2) (12, 6)

a)  $m = \frac{6-2}{12-0} = \frac{4}{12} = \frac{1}{3}$

$c = 2$

$$y = \frac{1}{3}x + 2 \quad \times 3$$

$$3y = x + 6$$

$$3y - x = 6$$

b) Simultaneous Equations

with  $3y - x = 6$

$$4y + 5x = 46$$

will give  $x = 6$  (6, 4)  
 $y = 4$

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24.29

 $(150, 0)$   $(0, 100)$ 

$$a) m = \frac{100-0}{0-150} = \frac{100}{-150} = -\frac{2}{3}$$

$$c = 100$$

$$y = -\frac{2}{3}x + 100$$

$$V = -\frac{2}{3}t + 100$$

b) loses 30l of water then

$$V = 70 \quad 70 = -\frac{2}{3}t + 100$$

$$\frac{2}{3}t = 100 - 70$$

$$\frac{2}{3}t = 30$$

$$2t = 90 \quad t = 45$$

 $\Rightarrow$  45 minutes

24.30

$$a) \text{£}10$$

$$b) m = \frac{13-10}{60-0} \quad (0, 10) \quad (60, 13)$$

$$= \frac{3}{60} = \frac{1}{20} = 0.05$$

5 p per minute

24.31

$$p = 2 + 1.5m$$

if  $m = 6$  then

$$p = 2 + 1.5(6)$$

$$p = 2 + 9$$

$$= 11$$

£11

24.32

 $(-3, 5)$   $(7, -4)$ 

$$m = \frac{-4-5}{7-(-3)} = \frac{-9}{10}$$

$$=$$



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24-33

a)  $(5, 200)$   $(25, 500)$   
 $\begin{matrix} a & b & \backslash & / \\ & & & \end{matrix}$   
 from graph

a)  $m = \frac{500 - 200}{25 - 5} = \frac{300}{20} = 15$

$y - b = m(x - a)$

$y - 200 = 15(x - 5)$

$y - 200 = 15x + 75$

$y = 15x + 275$

$c = 15F + 275$

b)  $F = 40$

$c = 15(40) + 275$   
 $= 600 + 275 = \underline{\underline{875}}$

24-34

$(0, 130)$   $(25, 30)$

a)

$m = \frac{30 - 130}{25 - 0} = \frac{-100}{25} = -4$

$c = 130$  (from graph)

$y = -4x + 130$

$S = -4T + 130$

b)  $T = 30$

$S = -4(30) + 130$

$S = -120 + 130$

$S = 10$  £10

23-35

parts c) and d) only

c)  $(0, 20)$   $(40, 40)$   
 from graph

$m = \frac{40 - 20}{40 - 0} = \frac{20}{40} = \frac{1}{2}$

$c = 20$  from graph

$y = \frac{1}{2}x + 20$

d)  $x = 76$   $y = \frac{1}{2}(76) + 20$

$y = 38 + 20$

$y = 58$

58% in physics

24-36

$(9, 21)$   $(15, 33)$

a)  $m = \frac{33 - 21}{15 - 9} = \frac{12}{6} = 2$

$(9, 21)$   
 $\begin{matrix} a & b \end{matrix}$   $y - b = m(x - a)$

$y - 21 = 2(x - 9)$

$y - 21 = 2x - 18$   $+21$

$y = 2x + 3$

b)  $x = 20$   $y = 2(20) + 3$

$= 40 + 3$

$= 43$

43

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24-37

A(0, 12) B(90, 82)

$$m = \frac{82-12}{90-0} = \frac{70}{90} = \frac{7}{9}$$

c = 12 (from graph)

$$y = \frac{7}{9}x + 12$$

$$h = \frac{7}{9}g + 12$$