LINEAR RELATIONSHIPS

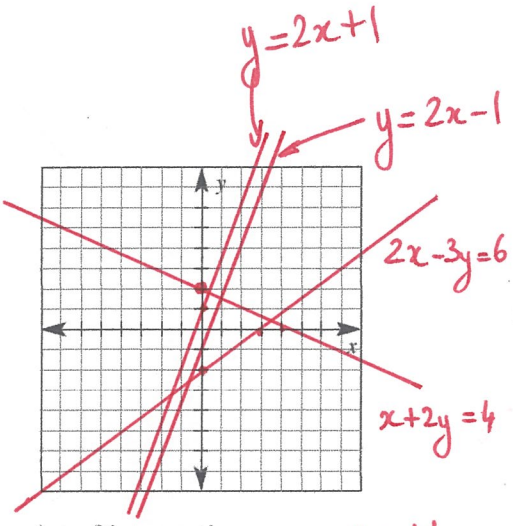
QUESTION 5 On the same number plane, draw the graphs of the following.

a $y = 2x + 1$

b $y = 2x - 1$

c $x + 2y = 4$

d $2x - 3y = 6$



QUESTION 2 Graph each pair of lines on the same number plane and find their point of intersection.

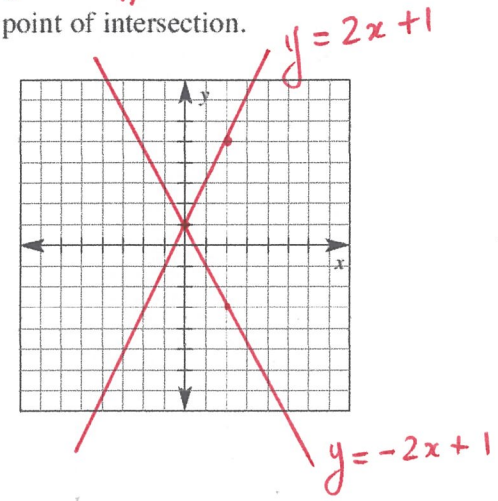
a $y = 2x + 1$; $y = -2x + 1$

$y = 2x + 1$

x	0	1	2
y	1	3	5

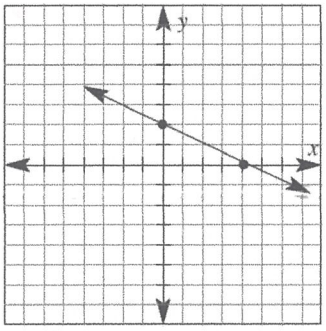
$y = -2x + 1$

x	0	1	2
y	1	-1	-3



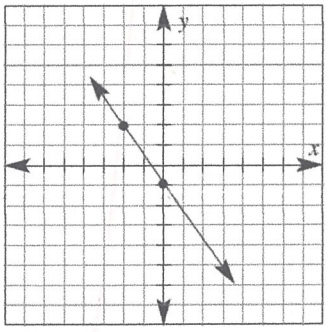
QUESTION 2 Find the gradient of each line.

a



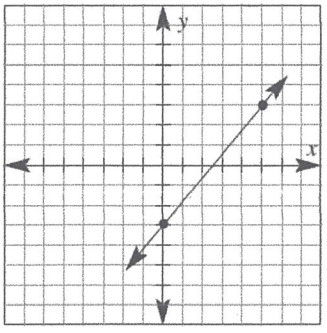
$-\frac{1}{2}$

b



$-\frac{3}{2}$

c



$\frac{6}{5}$

QUESTION 1 Andrew receives a fixed amount of pocket money each week. In addition, if Andrew chooses to help his mother, she gives him an extra amount per hour for the time worked. The graph shows the amount of money Andrew might receive in pocket money each week.

a What is the intercept on the vertical axis?

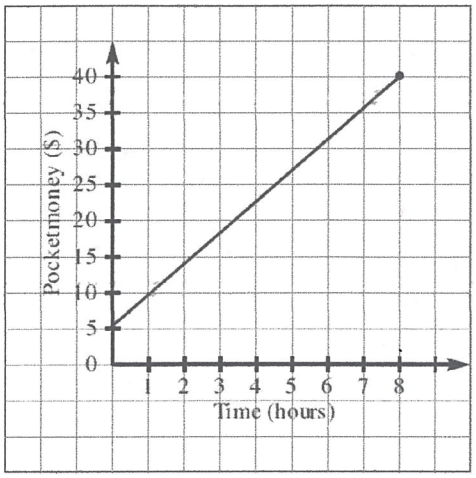
5

b What does the intercept on the vertical axis represent?

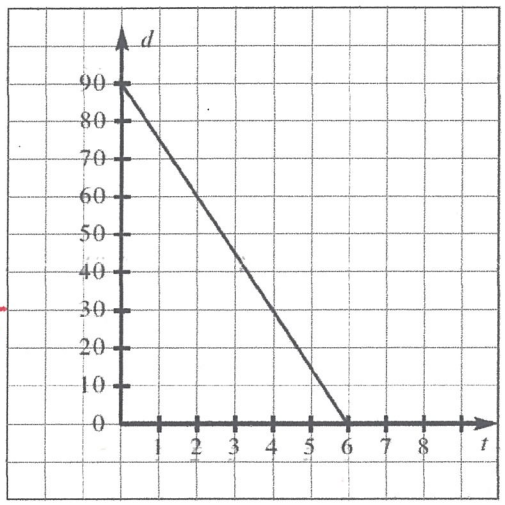
the amount of pocket money he gets when he doesn't help.

c What is the gradient of this line? $\frac{35}{8}$

d What does the gradient represent? how much extra money he gets per hour worked



QUESTION 2 Melissa intends to ride a bicycle from Baxton to Clair to raise money for the local hospital. The graph shows her expected distance from Clair in kilometres over time (in hours).



a What is the intercept on the vertical axis?

90

b What information does this intercept tell us?

distance from Clair at start

c What is the gradient of the line? $-90/6 = -30/2 = -15$

d What information does the gradient tell us?

~~Speed~~ Velocity in km/hr

e What is the equation of the line?

$y = -15t + 90$

QUESTION 1 For each given equation, write down the gradient and y-intercept.

a $y = 3x - 5$

gradient: 3

y-intercept: -5

b $y = 2x + 3$

gradient: 2

y-intercept: 3

c $y = x - 8$

gradient: 1

y-intercept: -8

QUESTION 2 Write down the equation of the line with:

a Gradient: 4

y-intercept: 1

$y = 4x + 1$

b Gradient: -3

y-intercept: 2

$y = -3x + 2$

c Gradient: 5

y-intercept: -1

$y = 5x - 1$

QUESTION 2 Each of the following equations is in general form. Change it to the gradient-intercept form, then write down its gradient and y-intercept.

a $2x + 3y - 8 = 0$

$3y = -2x + 8$

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

b $x + 5y - 7 = 0$

$5y = -x + 7$

$y = -\frac{x}{5} + \frac{7}{5}$

c $3x - 2y - 3 = 0$

$2y = 3x - 3$

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

d $x - y + 7 = 0$

$y = x + 7$

gradient 1

y-intercept: 7

e $2x + y - 9 = 0$

$y = -2x + 9$

f $5x - 6y + 11 = 0$

$6y = 5x + 11$

$y = \frac{5}{6}x + \frac{11}{6}$

LINEAR RELATIONSHIPS

QUESTION 1 Find the gradient of the line joining:

a (1, 2) and (3, 5)

$m = \frac{5-2}{3-1}$

$m = 3/2$

b (4, −1) and (5, −3)

$m = \frac{-3-(-1)}{5-4}$

$m = -2$

c (−8, −3) and (1, −6)

$m = \frac{-6-(-3)}{1-(-8)}$

$m = \frac{-3}{9} = -1/3$

d (0, 0) and (5, 1)

$m = \frac{1-0}{5-0} = 1/5$

QUESTION 1 Find the equation of the line passing through the point P with gradient m. Give the answer in gradient-intercept form.

a P(1, 3) $m = 2$

$y - 3 = 2(x-1)$

$y = 2x + 1$

b P(−3, 5) $m = 4$

$y - 5 = 4(x+3)$

$y = 4x + 17$

c P(4, −1) $m = -1$

$y - (-1) = -1(x-4)$

$y + 1 = -x + 4$

$y = -x + 3$

QUESTION 3 Find the gradient of any line perpendicular to:

a $y = 2x + 1$

$m = 2$

$\therefore m_\perp = -1/2$

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

$m = -4/3$

$\therefore m_\perp = 3/4$

c $x - 3y + 6 = 0 \iff 3y = x + 6$

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

$\therefore m_\perp = -3$

QUESTION 4 Show that the line joining (−1, 8) and (5, −2) is parallel to the line $5x + 3y + 2 = 0$

$m = \frac{-2-8}{5-(-1)} = \frac{-10}{6} = \frac{-5}{3}$

$3y = -5x - 2$

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

So they have the same gradient, $\therefore$ are perpendicular

QUESTION 3 The gradient of the line joining A(1, −5) to B(3, y) is −2. Find y.

$\frac{y+5}{3-1} = -2 \iff y + 5 = -2 \times 2 = -4$

$\therefore y = -9$

QUESTION 4 Find the gradient of a line which makes an angle with the positive direction of the x-axis of:

a 45°

$m = 1$

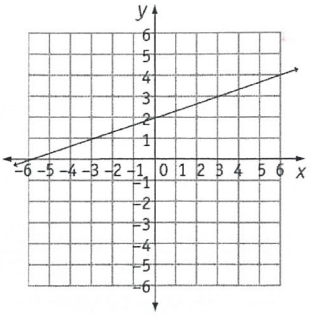
b 135°

$m = -1$

LINEAR RELATIONSHIPS

QUESTION 3 Determine the gradient and y-intercept from the diagram and hence write down the equation of the given line.

a

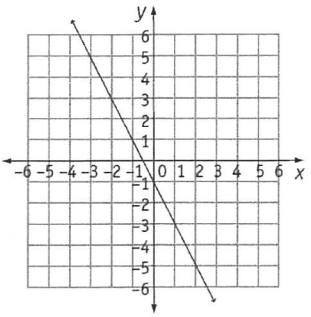


gradient = $1/3$

y-intercept = 2

equation: $y = \frac{1}{3}x + 2$

b



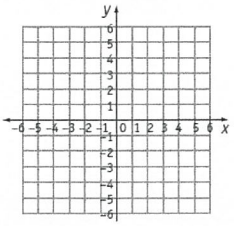
gradient = -2

y-intercept = -1

equation: $y = -2x - 1$

QUESTION 4 Write down the gradient and y-intercept for each equation and hence graph the line on the given grid.

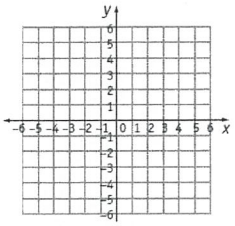
a $y = 3x - 2$



gradient = 3

y-intercept = -2

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



gradient = $-1/2$

y-intercept = 1

QUESTION 3 A straight line with gradient $-\frac{1}{4}$ passes through the point $(1, -5)$. Where does it cut the y-axis?

$y-(-5) = -\frac{1}{4}(x-1) \Leftrightarrow y = -1/4x - 5 + 1/4$

So $y = -1/4x - 19/4$ so it cuts the y-axis at $y = -19/4$

QUESTION 1 Find the equation of the line, in general form, joining the points:

a $(1, 3)$ and $(2, 7)$

$y - 3 = \left(\frac{7-3}{2-1}\right)(x-1)$

$y - 3 = 4(x-1)$

$y - 4x + 1 = 0$

b $(3, -2)$ and $(0, 5)$

$y + 2 = \left(\frac{5-(-2)}{0-3}\right)(x-3)$

$y + 2 = -\frac{7}{3}(x-3)$

$y + \frac{7}{3}x - 5 = 0$

$3y + 7x - 15 = 0$

QUESTION 5 Show that the line joining $(3, 4)$ and $(-6, -1)$ is perpendicular to the line $9x + 5y - 4 = 0$

$M = \frac{-1-4}{-6-3} = \frac{-5}{-9} = \frac{5}{9}$

whereas $5y = -9x + 4$

$\Rightarrow y = -\frac{9}{5}x + \frac{4}{5}$

The product of the gradient is -1, $\therefore$ lines are perpendicular