## Straight line practice questions

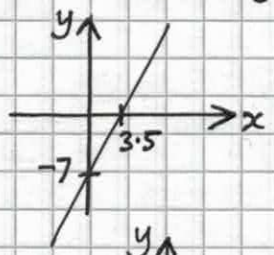
1. (a) $y = 8x - 4$
Gradient $= 8$
y-int $= -4$

(b) $4y = 12x - 1$
$y = \frac{12}{4}x - \frac{1}{4}$
$y = 3x - \frac{1}{4}$
Grad $= 3$, y-int. $= -\frac{1}{4}$

(c) $x + y = 1$
$y = -x + 1$
Grad. $= -1$
y-int. $= 1$

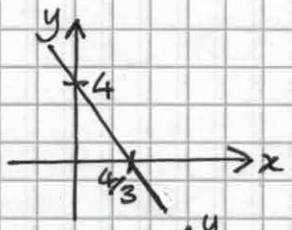
(d) $4y = 12 - x$
$y = \frac{12}{4} - \frac{1}{4}x$
$y = -\frac{1}{4}x + 3$
Grad. $= -\frac{1}{4}$, y-int. $= 3$

2. (a) $y = 2x - 7$
$m = 2 \quad c = -7$
When $y = 0$, $2x - 7 = 0$
$\Rightarrow 2x = 7 \quad \Rightarrow x = 3{\cdot}5$

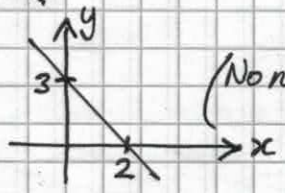



[Don't forget – if Q asks for intercepts then it means both x- and y-intercepts!]

(b) $y = 4 - 3x$
$m = -3 \quad c = 4$
When $y = 0$, $4 - 3x = 0$
$\Rightarrow 4 = 3x \quad \Rightarrow x = \frac{4}{3}$ or $1\frac{1}{3}$
(NOT 1.3!)




(c) $2y + 3x = 6$ – use cover-up method:
When $x = 0$, $2y = 6 \Rightarrow y = 3$
When $y = 0$, $3x = 6 \Rightarrow x = 2$




(No need to put into $y = mx + c$ form)

3. Gradients: (a) (4,2) & (7,8) (b) (7,4) & (4,13) (c) (-1,-1) & (8,3)
$\left(\frac{y_2 - y_1}{x_2 - x_1}\right)$
(a) $m = \frac{8-2}{7-4} = \frac{6}{3} = 2$
(b) $m = \frac{13-4}{4-7} = \frac{9}{-3} = -3$
(c) $m = \frac{3--1}{8--1} = \frac{4}{9}$

[Remember to put the same point first, both top & bottom]

4. (a) Grad. $= 5$, thro' $(1,-2)$
Eqn. is $y + 2 = 5(x - 1)$

OR $y = 5x + c$
$-2 = 5 \times 1 + c \Rightarrow c = -2 - 5 = -7$
$y = 5x - 7$

(b) Grad. $= -2$, thro' $(2,3)$ ← using $y - y_1 = m(x - x_1)$
Eqn. is $y - 3 = -2(x - 2)$

OR $y = -2x + c$
$3 = -2 \times 2 + c \Rightarrow c = 3 + 4 = 7$
$y = -2x + 7$

5. Thro' $(-4,3)$ & parallel to $y = 3x - 8$ $\Rightarrow y - 3 = 3(x + 4)$ or $y = 3x + 15$

6. Thro' $(-2,1)$ & parallel to $y = \frac{1}{2}x - 3$ $\Rightarrow y - 1 = \frac{1}{2}(x + 2)$ or $2y = x + 4$ or $y = \frac{1}{2}x + 2$

7. $A = (-1,2) \quad B = (0,4)$
$m_{AB} = \frac{4-2}{0--1} = \frac{2}{1} = 2$
Thro' $(1,-1)$
Eqn. is $y + 1 = 2(x - 1)$ or $y = 2x - 3$

8. (a) Thro' (4,1) and (1,-3): $m = \frac{-3-1}{1-4} = \frac{-4}{-3} = \frac{4}{3}$ so $y - 1 = \frac{4}{3}(x - 4)$ (or $3y = 4x - 13$) or $y + 3 = \frac{4}{3}(x - 1)$

(b) Thro' (-3,4) and (-1,-4): $m = \frac{-4-4}{-1+3} = \frac{-8}{2} = -4$ so $y - 4 = -4(x + 3)$ or $y + 4 = -4(x + 1)$

9. Mid-points (mean x, mean y)
(a) (2,4) to (8,2)
$\left(\frac{2+8}{2}, \frac{4+2}{2}\right)$
$= (5,3)$

(b) (1,-4) to (-3,10)
$\left(\frac{1+-3}{2}, \frac{-4+10}{2}\right)$
$= (-1,3)$

10. Distance between points: $AB = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

(a) (4,1) & (1,−3): Dist. $= \sqrt{(4-1)^2 + (1-(-3))^2} = \sqrt{3^2+4^2} = \sqrt{25} = \underline{5}$

(b) (4,−2) & (3,0): Dist. $= \sqrt{(4-3)^2 + (-2-0)^2} = \sqrt{1^2+(-2)^2} = \underline{\sqrt{5}}$

(c) (2·5,4) & (1,6): Dist. $= \sqrt{(2.5-1)^2 + (4-6)^2} = \sqrt{1.5^2 + (-2)^2} = \sqrt{2.25+4} = \sqrt{6.25} = \underline{2.5}$

or $\sqrt{(\frac{3}{2})^2 + (-2)^2} = \sqrt{\frac{9}{4}+4} = \sqrt{\frac{25}{4}} = \underline{\frac{5}{2}}$

11. Perpendicular to $y = 5-3x$: $m_1 = -3$ so $m_2 = \frac{-1}{-3} = \frac{1}{3}$

Thro' (6,1) ⇒ eqn is $\underline{y-1 = \frac{1}{3}(x-6)}$

$(\Rightarrow 3y-3 = x-6 \Rightarrow 3y = x-3 \Rightarrow)$ $\begin{cases} y = \frac{1}{3}x + c \\ 1 = \frac{1}{3}(6) + c \Rightarrow c = 1-2 = -1 \\ \underline{y = \frac{1}{3}x - 1} \end{cases}$

12. Parallel to $y = 3x-2$, thro' (4,0): $m = 3$ Eqn is $y-0 = 3(x-4)$

$\underline{y = 3x-12}$

13. Perp. to $2y = 7-x$, thro' (−3,−2): $y = \frac{7}{2} - \frac{1}{2}x \Rightarrow m_1 = -\frac{1}{2}$ so $m_2 = \frac{-1}{-\frac{1}{2}} = -1 \times -2_{/1} = 2$

Eqn is $y-(-2) = 2(x-(-3))$

$\underline{y+2 = 2(x+3)}$ or $\underline{y = 2x+4}$

14. Identify parallel (||) & perp. lines:

(a) $y = 7-2x$, $m = -2$

(b) $y = 2x-5$, $m = 2$

(c) $4y = x+3$, $y = \frac{1}{4}x + \frac{3}{4}$, $m = \frac{1}{4}$

(d) $5x-y = 7$, $5x-7 = y$, $m = 5$

(e) $y + 0{\cdot}5x = 1$, $y = -\frac{1}{2}x + 1$, $m = -\frac{1}{2}$

(f) $4y - x + 4 = 0$, $4y = x-4$, $y = \frac{1}{4}x - 1$, $m = \frac{1}{4}$

(g) $10y = 2-2x$, $y = \frac{1}{5} - \frac{1}{5}x$, $m = -\frac{1}{5}$

(h) $y + 2x = 6$, $y = -2x+6$, $m = -2$

(i) $2y + 4x = 5$, $2y = -4x+5$, $y = -2x + \frac{5}{2}$, $m = -2$

Parallel lines have same gradient: (a), (h), (i) are parallel ($m = -2$)

(c) & (f) are parallel ($m = \frac{1}{4}$)

Lines are perpendicular if $m_1 \times m_2 = -1$

$2 \times -\frac{1}{2} = -1$ so (b) & (e) are perpendicular

$5 \times -\frac{1}{5} = -1$ so (d) & (g) are perpendicular

15. Perpendicular bisector of (2,−2) & (6,4):

$m_1 = \frac{4-(-2)}{6-2} = \frac{6}{4} = \frac{3}{2} \Rightarrow m_2 = -\frac{2}{3}$

Mid-point $= (\frac{2+6}{2}, \frac{-2+4}{2}) = (4,1)$

(perp. bisector goes thro' this point)

⇒ Eqn. of perp. bisector is

$\underline{y-1 = -\frac{2}{3}(x-4)}$

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

$2x + 3y = 11$

When $x = 0$, $3y = 11 \Rightarrow x = 11/3$

When $y = 0$, $2x = 11 \Rightarrow x = 11/2$