EQUATION OF A STRAIGHT LINE

1 Find the equation of the straight line with:

(a) gradient $\frac{3}{4}$, passing through $(-6,5)$ **(b)** gradient $-\frac{1}{2}$, passing through $(4,-3)$

a) $y-5=\frac{3}{4}(x+6)$

$\Leftrightarrow y=\frac{3}{4}x+\frac{19}{2}$

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

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

2 Find the equation of the straight line passing through:

(a) $(3,3)$ and $(-4,-5)$ **(b)** $(2,-8)$ and $(7,2)$

a) $m_a=\frac{-5-3}{-4-3}=\frac{-8}{-7}=\frac{8}{7}$

$y+5=\frac{8}{7}(x+4)$ $y=\frac{8}{7}x-\frac{3}{7}$

b) $m_b=\frac{2+8}{7-2}=\frac{10}{5}=2$

$y-2=2(x-7)$

$y=2x-12$

3 Find the equation of the straight line passing through:

(a) $(6,6)$ with an angle of inclination of $45°$

(b) $(-2,3)$ with an angle of inclination of $53°8'$ $\left(\tan 53°8' \approx \frac{4}{3}\right)$

a) $m=1$ $y-6=1(x-6)$ $\Leftrightarrow y=x$

b) $m=\frac{4}{3}$ $y-3=\frac{4}{3}(x+2)$

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

$\Leftrightarrow y=\frac{4}{3}x+\frac{17}{3}$

EQUATION OF A STRAIGHT LINE

4 Find the equation of the straight line parallel to the x-axis and passing through the point $(5, 2)$.

$y = 2$

5 Find the equation of the straight line parallel to the y-axis and passing through the point $(-2, -4)$.

$x = -2$

6 The equation of the straight line with x-intercept 2 and y-intercept -5 is:

A $2x - 5y - 10 = 0$ **B** $5x - 2y - 10 = 0$ C $2x - 5y + 10 = 0$ D $5x - 2y + 10 = 0$

$m = \frac{5}{2}$ $y + 5 = \frac{5}{2}(x - 0) \Leftrightarrow y = \frac{5}{2}x - 5 \Leftrightarrow 2y - 5x + 10 = 0$

8 Write each equation in the form $y = mx + c$ and find the gradient of each line.

(a) $2x + 3y = 4$ (b) $3x - 2y = 7$ (c) $2y = 6 - 3x$ (d) $5y - 2x = 8$

a) $y = \frac{1}{3}[-2x + 4] = -\frac{2}{3}x + 4/3$ b) $y = \frac{1}{2}[3x - 7] = \frac{3}{2}x - 7/2$

c) $y = -\frac{3}{2}x + 3$ d) $y = \frac{1}{5}(2x + 8) = \frac{2}{5}x + \frac{8}{5}$

9 Indicate whether each statement is correct or incorrect for the line $2x + 3y - 12 = 0$.

(a) $m = -\frac{2}{3}$ True (b) x-intercept $= 6$ True (c) y-intercept $= -4$ NO (d) passes through $(3, 2)$ True

$y = \frac{1}{3}(-2x + 12) = -\frac{2}{3}x + 4$ when $y = 0$, $x = 6$

when $x = 0$, $y = 4$ $2 \times 3 + 3 \times 2 - 12 = 0$ True so $(3,2)$ belongs to the line

11 Find the equation of the line containing the point $(2, -3)$ that is:

(a) parallel to the line $3x + 2y - 6 = 0$

$y = \frac{1}{2}[-3x + 6] = -\frac{3}{2}x + 3$

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

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

(b) perpendicular to the line $3x + 2y - 6 = 0$

$y = \frac{1}{2}[-3x + 6] = -\frac{3}{2}x + 3$

$M_{\perp} = \frac{2}{3}$

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

$\Leftrightarrow y = \frac{2}{3}x - \frac{4}{3} - 3 = \frac{2}{3}x - \frac{13}{3}$

EQUATION OF A STRAIGHT LINE

13 The coordinates of two points A and B are $(0,-2)$ and $(3,0)$ respectively. The x-coordinate of a point C on the line AB is 6. Find:

(a) the equation of AB **(b)** the angle of inclination of AB

(c) the y-coordinate of C **(d)** the equation of the line through C that is perpendicular to AB.

a) $m = \frac{0+2}{3-0} = \frac{2}{3}$ $\quad y+2 = \frac{2}{3}(x-0)$ $\quad$ so $y = \frac{2}{3}x - 2$

b) $\tan\theta = 2/3$ $\quad$ so $\theta \simeq 33°41'$

c) $y_C = \frac{2}{3} \times 6 - 2 = 4 - 2 = 2$ $\quad$ so $C(6,2)$

d) $y - 2 = -\frac{3}{2}(x-6)$

$\Leftrightarrow \quad y = -\frac{3}{2}x + \frac{18}{2} + 2$

$y = -\frac{3}{2}x + 11$

14 Show that the line with equation $2x - y = 5$ is parallel to the line joining the points $(-1,5)$ and $(1,9)$.

$2x - y = 5 \Leftrightarrow y = 2x - 5$ $\quad$ gradient 2

$m = \frac{9-5}{1+1} = \frac{4}{2} = 2$

So both lines are parallel.