Straight line graphs 5B

1 a The gradient = –2

b The gradient = –1

c The gradient = 3

d The gradient = $\frac{1}{3}$

e The gradient = $-\frac{2}{3}$

f The gradient = $\frac{5}{4}$

g $2x-4y+5=$
$2x+5=4y$
$4y=2x+5$
$y=\frac{2}{4}x+\frac{5}{4}$
$y=\frac{1}{2}x+\frac{5}{4}$
The gradient = $\frac{1}{2}$

h $10x-5y+1=0$
$10x+1=5y$
$5y=10x+1$
$y=\frac{10}{5}x+\frac{1}{5}$
$y=2x+\frac{1}{5}$
The gradient = 2

i $-x+2y-4=0$
$2y-4=x$
$2y=x+4$
$y=\frac{1}{2}x+2$
The gradient = $\frac{1}{2}$

j $-3x+6y+7=0$
$6y=3x-7$
$y=\frac{3}{6}x-\frac{7}{6}$
$y=\frac{1}{2}x+\frac{7}{6}$
The gradient = $\frac{1}{2}$

k $4x+2y-9=0$
$2y-9=-4x$
$2y=-4x+9$
$y=-\frac{4}{2}x+\frac{9}{2}$
$y=-2x+\frac{9}{2}$
The gradient = –2

l $9x+6y+2=0$
$6y+2=-9x$
$6y=-9x-2$
$y=-\frac{9}{6}x-\frac{2}{6}$
$y=-\frac{3}{2}x-\frac{1}{3}$
The gradient = $-\frac{3}{2}$

2 a $c=4$

b $c=-5$

c $c=-\frac{2}{3}$

d $y=-3x$
$y=-3x+0$
$c=0$

e $c=\frac{7}{5}$

f $y=2-7x$
$y=-7x+2$
$c=2$

g $3x-4y+8=0$
$3x+8=4y$
$4y=3x+8$
$y=\frac{3}{4}x+\frac{8}{4}$
$y=\frac{3}{4}x+2$
$c=2$

2 h $4x-5y-10=0$

$4x-10=5y$

$5y=4x-10$

$y=\frac{4}{5}x-\frac{10}{5}$

$y=\frac{4}{5}x-2$

$c=-2$

i $-2x+y-9=0$

$y-9=2x$

$y=2x+9$

$c=9$

j $7x+4y+12=0$

$4y+12=-7x$

$4y=-7x-12$

$y=-\frac{7}{4}x-\frac{12}{4}$

$y=-\frac{7}{4}x-3$

$c=-3$

k $7x-2y+3=0$

$7x+3=2y$

$2y=7x+3$

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

$c=\frac{3}{2}$

l $-5x+4y+2=0$

$4y+2=5x$

$4y=5x-2$

$y=\frac{5}{4}x-\frac{2}{4}$

$y=\frac{5}{4}x-\frac{1}{2}$

$c=-\frac{1}{2}$

3 a $y=4x+3$

$0=4x+3-y$

$4x+3-y=0$

$4x-y+3=0$

3 b $y=3x-2$

$0=3x-2-y$

$3x-2-y=0$

$3x-y-2=0$

c $y=-6x+7$

$6x+y=7$

$6x+y-7=0$

d $y=\frac{4}{5}x-6$

Multiply each term by 5:

$5y=4x-30$

$0=4x-30-5y$

$4x-30-5y=0$

$4x-5y-30=0$

e $y=\frac{5}{3}x+2$

Multiply each term by 3:

$3y=5x+6$

$0=5x+6-3y$

$5x+6-3y=0$

$5x-3y+6=0$

f $y=\frac{7}{3}x$

Multiply each term by 3:

$3y=7x$

$0=7x-3y$

$7x-3y=0$

g $y=2x-\frac{4}{7}$

Multiply each term by 7:

$7y=14x-4$

$0=14x-4-7y$

$14x-4-7y=0$

$14x-7y-4=0$

3 h $y = -3x + \frac{2}{9}$

Multiply each term by 9:

$9y = -27x + 2$

$27x + 9y = 2$

$27x + 9y - 2 = 0$

i $y = -6x - \frac{2}{3}$

Multiply each term by 3:

$3y = -18x - 2$

$18x + 3y = -2$

$18x + 3y + 2 = 0$

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

Multiply each term by 6 (6 is divisible by both 3 and 2:

$6y = -2x + 3$

$2x + 6y = 3$

$2x + 6y - 3 = 0$

k $y = \frac{2}{3}x + \frac{5}{6}$

Multiply each term by 6 (6 is divisible by both 3 and 6:

$6y = 4x + 5$

$0 = 4x + 5 - 6y$

$4x + 5 - 6y = 0$

$4x - 6y + 5 = 0$

l $y = \frac{3}{5}x + \frac{1}{2}$

Multiply each term by 10 (10 is divisible by both 5 and 2):

$10y = 6x + 5$

$0 = 6x + 5 - 10y$

$6x + 5 - 10y = 0$

$6x - 10y + 5 = 0$

4 $y = 6x - 18$

Substitute $y = 0$:

$6x - 18 = 0$

$6x = 18$

$x = 3$

The line meets the x-axis at $P(3, 0)$.

5 $3x + 2y = 0$

$2y = -3x$

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

The line meets the x-axis at $y = 0$.

Substituting $y = 0$ into $y = -\frac{3}{2}x$:

$0 = -\frac{3}{2}x$

$x = 0$

The line meets the x-axis at $R(0, 0)$.

6 $5x - 4y + 20 = 0$

Substitute $x = 0$:

$5(0) - 4y + 20 = 0$

$-4y + 20 = 0$

$20 = 4y$

$4y = 20$

$y = 5$

The line meets the y-axis at $A(0, 5)$.

Substitute $y = 0$:

$5x - 4(0) + 20 = 0$

$5x + 20 = 0$

$5x = -20$

$x = -4$

The line meets the x-axis at $B(-4, 0)$.

7 a The line passes through (0, 5) and (6, 7).

The gradient $= \frac{7-5}{6-0}$

$= \frac{2}{6}$

$= \frac{1}{3}$

b So $y = \frac{1}{3}x + c$

Use the point (0, 5).

Substitute $x = 0$ and $y = 5$ into $y = \frac{1}{3}x + c$ to find c.

$5 = \frac{1}{3}(0) + c$

$c = 5$

So $y = \frac{1}{3}x + 5$

$3y = x + 15$

$x - 3y + 15 = 0$

8 a The line passes through (5, 0) and (0, 2).

The gradient $= \dfrac{2-0}{0-5}$

$= -\dfrac{2}{5}$

b $y = -\frac{2}{5}x + c$

From the coordinates (0, 2) the y-intercept is 2.

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

$5y = -2x + 10$

$2x + 5y - 10 = 0$

9 $ax + by + c = 0$

$by = -ax - c$

$y = -\frac{a}{b}x - \frac{c}{b}$

The gradient $= -\frac{a}{b}$

The y-intercept $= -\frac{c}{b}$

10 $ax - 2y + c = 0$

$2y = ax + c$

$y = \frac{a}{2}x + \frac{c}{2}$

The gradient $= \frac{a}{2} = 3$, so $a = 6$

The y-intercept $= \frac{c}{2} = 5$, so $c = 10$

$a = 6$, $c = 10$

11 Line l has equation $y = -2x + 6$.

For the second line:

$5x - 8y - 15 = 0$

$8y = 5x - 15$

$y = \frac{5}{8}x - \frac{15}{8}$

The lines intersect where:

$y = -2x + 6$ and $y = \frac{5}{8}x - \frac{15}{8}$ cross

So $-2x + 6 = \frac{5}{8}x - \frac{15}{8}$

Multiply through by 8.

$-16x + 48 = 5x - 15$

$21x = 63$

$x = 3$

Substituting $x = 3$ into $y = -2x + 6$:

$y = -2(3) + 6$

$y = 0$

The lines intersect at $P(3, 0)$.

12 a l_1: $y = 3x - 7$

The point of intersection is $P(-3, b)$.

Substituting $x = -3$ and $y = b$ into l_1:

$b = 3(-3) - 7$

$b = -16$

b l_2: $ax + 4y - 17 = 0$

The point $P(-3, -16)$ is on the line.

Substituting $x = -3$ and $y = -16$ into l_2:

$a(-3) + 4(-16) - 17 = 0$

$-3a - 81 = 0$

$a = -27$

Challenge

The line passes through $(0, a)$ and $(b, 0)$.

The gradient $= \dfrac{0-a}{b-0}$

$= -\dfrac{a}{b}$

The y-intercept is at $x = 0$.

This is the point $(0, a)$.

$y = -\dfrac{a}{b}x + a$

$by = -ax + ab$

$ax + by - ab = 0$