Exercise 3A

1 a Multiply $2x - y = 6$ by 3:
$6x - 3y = 18$
$4x + 3y = 22$
Add:
$10x = 40$
$x = 4$
Substitute into $2x - y = 6$:
$8 - y = 6$
$y = 2$
Solution is $x = 4,\ y = 2$

b Multiply $7x + 3y = 16$ by 3:
$21x + 9y = 48$
$2x + 9y = 29$
Subtract:
$19x = 19$
$x = 1$
Substitute into $7x + 3y = 16$:
$7 + 3y = 16$
$y = 3$
Solution is $x = 1,\ y = 3$

c Multiply $5x + 2y = 6$ by 5:
$25x + 10y = 30$
$3x - 10y = 26$
Add:
$28x = 56$
$x = 2$
Substitute into $5x + 2y = 6$:
$10 + 2y = 6$
$y = -2$
Solution is $x = 2,\ y = -2$

d Multiply $2x - y = 12$ by 2:
$4x - 2y = 24$
$6x + 2y = 21$
Add:
$10x = 45$
$x = 4\frac{1}{2}$
Substitute into $2x - y = 12$:
$9 - y = 12$
$y = -3$
Solution is $x = 4\frac{1}{2},\ y = -3$

e Multiply $3x - 2y = -6$ by 2:
$6x - 4y = -12$
$6x + 3y = 2$
Subtract:
$-7y = -14$
$y = 2$
Substitute into $3x - 2y = -6$:
$3x - 4 = -6$
$3x = -2$
$x = -\frac{2}{3}$
Solution is $x = -\frac{2}{3},\ y = 2$

f Multiply $3x + 8y = 33$ by 2:
$6x + 16y = 66$
$6x = 3 + 5y$
$6x + 16y = 66$
$6x - 5y = 3$
Subtract:
$21y = 63$
$y = 3$
Substitute into $3x + 8y = 33$:
$3x + 24 = 33$
$3x = 9$
$x = 3$
Solution is $x = 3,\ y = 3$

2 a Rearrange $x + 3y = 11$ to give:
$x = 11 - 3y$
Substitute into $4x - 7y = 6$:
$4(11 - 3y) - 7y = 6$
$44 - 12y - 7y = 6$
$-19y = -38$
$y = 2$
Substitute into $x = 11 - 3y$:
$x = 11 - 6$
$x = 5$
Solution is $x = 5,\ y = 2$

2 b Rearrange $2x + y = 5$ to give:
$y = 5 - 2x$
Substitute into $4x - 3y = 40$:
$4x - 3(5 - 2x) = 40$
$4x - 15 + 6x = 40$
$x = 5\frac{1}{2}$
Substitute into $y = 5 - 2x$:
$y = 5 - 11 = -6$
Solution is $x = 5\frac{1}{2}$, $y = -6$

c Rearrange $3x - y = 7$ to give:
$y = 3x - 7$
Substitute into $10x + 3y = -2$:
$10x + 3(3x - 7) = -2$
$10x + 9x - 21 = -2$
$19x = 19$
$x = 1$
Substitute into $y = 3x - 7$:
$y = 3 - 7 = -4$
Solution is $x = 1$, $y = -4$

d Rearrange $3y = x - 1$ to give:
$x = 3y + 1$
Substitute into $2y = 2x - 3$:
$2y = 2(3y + 1) - 3$
$2y = 6y + 2 - 3$
$y = \frac{1}{4}$
Substitute into $x = 3y + 1$:
$x = \frac{3}{4} + 1 = 1\frac{3}{4}$
Solution is $x = 1\frac{3}{4}$, $y = \frac{1}{4}$

3 a Rearrange $3x - 2y + 5 = 0$ to give:
$3x - 2y = -5$ **(1)**
Expand and rearrange $5(x + y) = 6(x + 1)$ to give:
$5x + 5y = 6x + 6$
$x - 5y = -6$ **(2)**
Multiply **(2)** by 3 to give:
$3x - 15y = -18$ **(3)**
Subtract **(3)** from **(1)** to give:
$13y = 13$
$y = 1$, $x = 5(1) - 6 = -1$
$x = -1$ and $y = 1$

b Rearrange $\frac{x - 2y}{3} = 4$ to give:
$x - 2y = 12$ **(1)**
Rearrange $2x + 3y + 4 = 0$ to give:
$2x + 3y = -4$ **(2)**
Multiply **(1)** by 2 to give:
$2x - 4y = 24$ **(3)**
Subtract **(2)** from **(3)** to give:
$-7y = 28$
$y = -4$, $x = 2(-4) + 12 = 4$
Solution is $x = 4$ and $y = -4$

c Expand and rearrange $3y = 5(x - 2)$ to give:
$5x - 3y = 10$ **(1)**
Expand and rearrange $3(x - 1) + y + 4 = 0$ to give:
$3x + y = -1$ **(2)**
Multiply **(2)** by 3 to give:
$9x + 3y = -3$ **(3)**
Add **(1)** and **(3)** to give:
$14x = 7$
$x = \frac{1}{2}$, $y = -3(\frac{1}{2}) - 1 = -\frac{5}{2}$
Solution is $x = \frac{1}{2}$ and $y = -2\frac{1}{2}$

4 a $3x + ky = 8$ **(1)**
$x - 2ky = 5$ **(2)**
Multiply **(1)** by 2 to give:
$6x + 2ky = 16$ **(3)**
Add **(2)** and **(3)** to give:
$7x = 21$
$x = 3$

b Using **(1)**, $3(3) + k(\frac{1}{2}) = 8$
$\frac{1}{2}k = -1$
$k = -2$

5 Substitute $x = q$ and $y = -1$ into both equations to give:
$2q + p = 5$ **(1)**
$4q - 5 + q = 0$ **(2)**
From **(2)**, $5q = 5$, $q = 1$
Substituting $q = 1$ into **(1)** gives:
$2(1) + p = 5$
$p = 3$
So $p = 3$ and $q = 1$