Equations and inequalities 3A

1 a Multiply $2x - y = 6$ by 3:

$6x - 3y = 18$

$4x + 3y = 22$

Add:

$10x = 40$

$x = 4$

Substitute into $2x - y = 6$:

$8 - y = 6$

$y = 2$

So 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 $7x + 3y = 16$:

$7 + 3y = 16$

$3y = 9$

$y = 3$

So 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 $5x + 2y = 6$:

$10 + 2y = 6$

$2y = -4$

$y = -2$

So 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 $2x - y = 12$:

$9 - y = 12$

$y = -3$

So 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 $3x - 2y = -6$:

$3x - 4 = -6$

$3x = -2$

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

So 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 $3x + 8y = 33$:

$3x + 24 = 33$

$3x = 9$

$x = 3$

So 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 $x = 11 - 3y$:

$x = 11 - 6$

$x = 5$

So solution is $x = 5,\ y = 2$.

b Rearrange $2x + y = 5$ to give:

$y = 5 - 2x$

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2 b Substitute into $4x-3y=40$:

$4x-3(5-2x)=40$

$4x-15+6x=40$

$10x=55$

$x=5\frac{1}{2}$

Substitute into $y=5-2x$:

$y=5-11$

$y=-6$

So solution is $x=5\frac{1}{2},\ y=-6$.

c Rearrange $3x-y=7$ to give:

$-y=7-3x$

$y=3x-7$

Substitute into $10x+3y=-2$:

$10x+3(3x-7)=-2$

$10x+9x-21=-2$

$19x=19$

$y=1$

Substitute into $y=3x-7$:

$y=3-7$

$y=-4$

So solution is $x=1,\ y=-4$.

d Rearrange $3y=x-1$ to give:

$x=3y+1$

Substitute into $2y=2x-3$:

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

$2y=6y+2-3$

$-4y=-1$

$y=\frac{1}{4}$

Substitute into $x=3y+1$:

$x=\frac{3}{4}+1$

$x=1\frac{3}{4}$

So 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:

$13y=13$

3 a $y=1$, $x=5(1)-6=-1$

$x=-1$ 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:

$-7y=28$

$y=-4$, $x=2(-4)+12=4$

So 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:

$14x=7$

$x=\frac{1}{2}$, $y=-3(\frac{1}{2})-1=-\frac{5}{2}$

So 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 $q=1$

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