Exercise 6(C)

Solve, using cross-multiplication:

1. 4x + 3y = 17
3x - 4y + 6 = 0
Solution:

Given equations are 4x + 3y = 17 and 3x – 4y + 6 = 0
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 4, b_1 = 3, c_1 = -17$ and $a_1 = 3, b_1 = -4, c_1 = 6$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2-c_2a_1)/(a_1b_2-a_2b_1)$
$x = (3 \times 6 – (-4) \times (-17))/(4 \times (-4) – 3 \times 3)$ and $y = (-17 \times 3 – 6 \times 4)/(4 \times (-4) – 3 \times 3)$
$x = (18 – 68)/(-16 – 9)$ and $y = (-51 – 24)/(-16 – 9)$
$x = (-50/-25)$ and $y = (-75/-25)$
Therefore, x = 2 and y = 3

2. 3x + 4y = 11
2x + 3y = 8
Solution:

Given equations are 3x + 4y = 11 and 2x + 3y = 8
On comparing equations with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 3, b_1 = 4, c_1 = -11$ and $a_2 = 2, b_2 = 3, c_2 = -8$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2-c_2a_1)/(a_1b_2-a_2b_1)$
$x = [4 \times (-8) – 3 \times (-11)]/(3 \times 3 – 2 \times 4)$ and $y = [-11 \times 2 – (-8) \times 3]/(3 \times 3 – 2 \times 4)$
$x = (-32 + 33)/(9 – 8)$ and $y = (-22 + 24)/(9 – 8)$
Therefore, x = 1 and y = 2

3. 6x + 7y - 11 = 0
5x + 2y = 13
Solution:

Given equations are 6x + 7y – 11 = 0 and 5x + 2y = 13
On comparing equations with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 6, b_1 = 7, c_1 = -11$ and $a_2 = 5, b_2 = 2, c_2 = -13$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [7 \times (-13) – 2 \times (-11)]/(6 \times 2 – 5 \times 7)$ and $y = [-11 \times 5 – (-13) \times 6]/(6 \times 2 – 5 \times 7)$
$x = (-91 + 22)/(12 – 35)$ and $y = (-55 + 78)/(12 – 35)$
$x = (-69/-23)$ and $y = (23/-23)$
Therefore, x = 3 and y = -1

4. 5x + 4y + 14 = 0
3x = -10 - 4y
Solution:

Given equations are 5x + 4y + 14 = 0 and 3x = - 10 – 4y

On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 5, b_1 = 4, c_1 = 14$ and $a_2 = 3, b_2 = 4, c_2 = 10$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [4 \times 10 – 4 \times 14]/(5 \times 4 – 3 \times 4)$ and $y = [14 \times 3 – 10 \times 5]/(5 \times 4 – 3 \times 4)$
$x = (-91 + 22)/(12 - 35)$ and $y = (-55 + 78)/(12 - 35)$
$x = (40 - 56)/(20 – 12)$ and $y = (42 – 50)/(20 – 12)$
$x = -16/8$ and $y = -8/8$
Therefore, $x = -2$ and $y = -1$

5. $x - y + 2 = 0$
$7x + 9y = 130$
Solution:

Given equations are $x - y + 2 = 0$ and $7x + 9y = 130$
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 1, b_1 = -1, c_1 = 2$ and $a_2 = 7, b_2 = 9, c_2 = -130$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [-1 \times (-130) – 9 \times 2]/[1 \times 9 – 7 \times (-1)]$ and $y = [2 \times 7 – (130) \times 1]/[1 \times 9 – 7 \times (-1)]$
$x = (130 - 18)/(9 + 7)$ and $y = (14 + 130)/(9 + 7)$
$x = 112/16$ and $y = 144/16$
Therefore, $x = 7$ and $y = 9$

6. $4x - y = 5$
$5y - 4x = 7$
Solution:

Given equations are $4x - y = 5$ and $5y – 4x = 7$
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 4, b_1 = -1, c_1 = -5$ and $a_2 = -4, b_2 = 5, c_2 = -7$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [-1 \times (-7) – 5 \times (-5)]/[4 \times 5 – (-4) \times (-1)]$ and $y = [(-5) \times (-4) – (-7) \times 4]/[4 \times 5 – (-4) \times (-1)]$
$x = (7 + 25)/(20 - 4)$ and $y = (20 + 28)/(20 - 4)$
$x = 32/16$ and $y = 48/16$
Therefore, $x = 2$ and $y = 3$

7. $4x - 3y = 0$
$2x + 3y = 18$
Solution:

Given equations are $4x - 3y = 0$ and $2x + 3y = 18$
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 4, b_1 = -3, c_1 = 0$ and $a_2 = 2, b_2 = 3, c_2 = -18$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [-3 \times (-18) – 3 \times 0]/[4 \times 3 – 2 \times (-3)]$ and $y = [0 \times 2 – (-18) \times 4]/[4 \times 3 – 2 \times (-3)]$
$x = (54 - 0)/(12 + 6)$ and $y = (0 + 72)/(12 + 6)$

x = 54/18 and y = 72/18
Therefore, x = 3 and y = 4

8. 8x + 5y = 9
3x + 2y = 4
Solution:

Given equations are 8x + 5y = 9 and 3x + 2y = 4
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 8$, $b_1 = 5$, $c_1 = -9$ and $a_2 = 3$, $b_2 = 2$, $c_2 = -4$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [5 \times (-4) – 2 \times (-9)]/[8 \times 2 – 3 \times 5]$ and $y = [-9 \times 3 – (-4) \times 8]/[8 \times 2 – 3 \times 5]$
x = (-20 + 18)/(16 - 15) and y = (-27 + 32)/(16 - 15)
x = -2/1 and y = 5/1
Therefore, x = -2 and y = 5

9. 4x - 3y - 11 = 0
6x + 7y - 5 = 0
Solution:

Given equations are 4x - 3y - 11 = 0 and 6x + 7y – 5 = 0
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 4$, $b_1 = -3$, $c_1 = 11$ and $a_2 = 6$, $b_2 = 7$, $c_2 = -5$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [-3 \times (-5) – 7 \times (-11)]/[4 \times 7 – 6 \times (-3)]$ and $y = [-11 \times 6 – (-5) \times 4]/[4 \times 7 – 6 \times (-3)]$
x = (15 + 77)/(28 + 18) and y = (-66 + 20)/(28 + 18)
x = (92/46) and y = (-46/46)
Therefore, x = 2 and y = -1

10. 4x + 6y = 15
3x - 4y = 7
Solution:

Given equations are 4x + 6y = 15 and 3x - 4y = 7
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 4$, $b_1 = 6$, $c_1 = -15$ and $a_2 = 3$, $b_2 = -4$, $c_2 = -7$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [6 \times (-7) – (-4) \times (-15)]/[4 \times (-4) – 3 \times 6]$ and $y = [-15 \times 3 – (-7) \times 4]/[4 \times (-4) – 3 \times 6]$
x = (-42 - 60)/(-16 - 18) and y = (-45 + 28)/(-16 - 18)
x = (-102/-34) and y = (-17/-34)
Therefore, x = 3 and y = 1/2

11. 0.4x - 1.5y = 6.5
0.3x + 0.2y = 0.9
Solution:

Given equations are $0.4x – 1.5y = 6.5$ and $0.3x + 0.2y = 0.9$
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = 0.4$, $b_1 = -1.5$, $c_1 = -6.5$ and $a_2 = 0.3$, $b_2 = 0.2$, $c_2 = -0.9$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [(-1.5) \times (-0.9) – (0.2) \times (-6.5)]/[0.4 \times (0.2) – (0.3) \times (-1.5)]$ and $y = [(-6.5) \times (0.3) – (-0.9) \times (0.4)]/[0.4 \times (0.2) – (0.3) \times (-1.5)]$
$x = (1.35 + 1.3)/(0.08 + 0.45)$ and $y = (-1.95 + 0.36)/(0.08 + 0.45)$
$x = (2.65/0.53)$ and $y = (-1.59/0.53)$
Therefore, $x = 5$ and $y = -3$

12. $\sqrt{2}x - \sqrt{3}y = 0$
$\sqrt{5}x + \sqrt{2}y = 0$
Solution:

Given equations are $\sqrt{2}x - \sqrt{3}y = 0$ and $\sqrt{5}x + \sqrt{2}y = 0$
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have
$a_1 = \sqrt{2}$, $b_1 = -\sqrt{3}$, $c_1 = 0$ and $a_2 = \sqrt{5}$, $b_2 = \sqrt{2}$, $c_2 = 0$
Now, $x = (b_1c_2 - b_2c_1)/(a_1b_2 – a_2b_1)$ and $y = (c_1a_2 - c_2a_1)/(a_1b_2 - a_2b_1)$
$x = [(-\sqrt{3}) \times 0 – \sqrt{2} \times 0]/[\sqrt{2} \times \sqrt{2} – \sqrt{5} \times (-\sqrt{3})]$ and $y = [0 \times \sqrt{5} – 0 \times \sqrt{2}]/[\sqrt{2} \times \sqrt{2} – \sqrt{5} \times (-\sqrt{3})]$
$x = [0/(2 + \sqrt{15})]$ and $y = [0/(2 + \sqrt{15})]$
Therefore, $x = 0$ and $y = 0$