Book 2A Chapter 5   Linear Equations in Two Unknowns

5.1   Linear Equations in Two Unknowns

Level 1

Demonstration 1

In each of the following, check whether the given ordered pair is a solution of the equation $3x + y = 1$.

(a) $(0, 1)$ **(b)** $(1, -3)$

Solution

(a) Put $x = 0$ and $y = 1$ into the equation.

L.H.S. $= 3(0) + 1 = 1$

R.H.S. $= 1$

Since L.H.S. $=$ R.H.S., $(0, 1)$ is a solution of the equation $3x + y = 1$.

(b) Put $x = 1$ and $y = -3$ into the equation.

L.H.S. $= 3(1) + (-3) = 0$

R.H.S. $= 1$

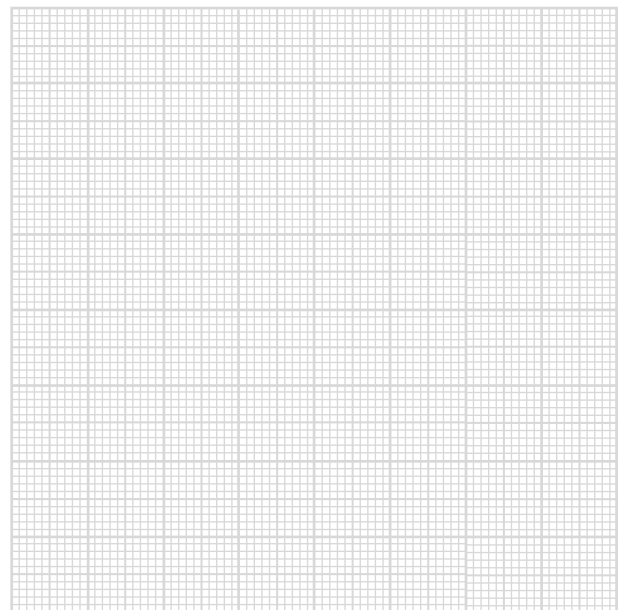Since L.H.S. $\neq$ R.H.S., $(1, -3)$ is not a solution of the equation $3x + y = 1$.

**1.** In each of the following, check whether the given ordered pair is a solution of the equation $2x - 3y = 2$.

(a) $(4, 3)$ **(b)** $(-5, -4)$

Demonstration 2

Draw the graph of the equation $y = 3x - 1$.

Solution

$y = 3x - 1$

x	-1	0	2
y	-4	-1	5

The graph of $y = 3x - 1$ is shown below.

2. Draw the graph of the equation $y = -x + 3$.
[*Suggested scale for* both *axes: 10 divisions (1 cm) = 2 units*]

Demonstration 3

Use the graph of the equation $y = -2x + 5$ to answer the following questions.
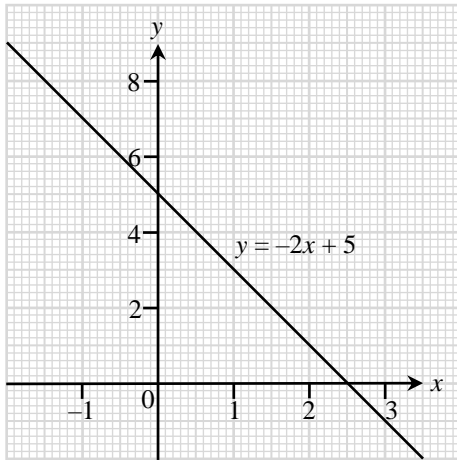
(a) Is (2, 1) a solution of the equation?

(b) Is (–1, 6) a solution of the equation?

(c) The point $A(1, a)$ lies on the graph. What is the value of a?

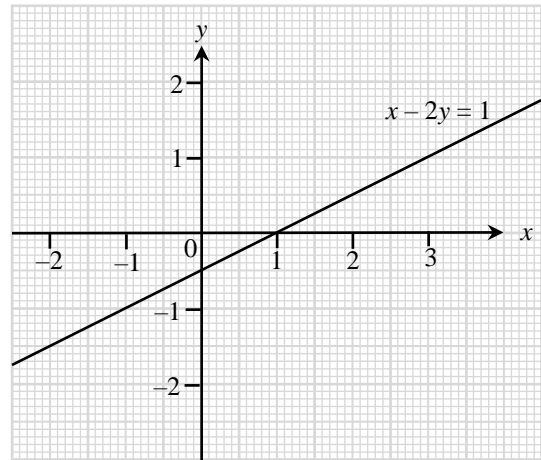**(d)** The point $B(b, 6)$ lies on the graph. What is the value of b?

Solution

(a) (2, 1) is a point on the graph of $y = -2x + 5$.

   Therefore, (2, 1) is a solution of the equation.

(b) (–1, 6) is not a point on the graph of $y = -2x + 5$. Therefore, (–1, 6) is not a solution of the equation.

(c) From the graph, when $x = 1$, $y = 3$.

   ∴ The coordinates of A are (1, 3).

   $a = \underline{\underline{3}}$

(d) From the graph, when $y = 6$, $x = -0.5$.

   ∴ The coordinates of B are (–0.5, 6).

   $b = \underline{\underline{-0.5}}$

3. Use the graph of the equation $x - 2y = 1$ to answer the following questions.

(a) Is (0, 1) a solution of the equation?

(b) Is (3, 1) a solution of the equation?

(c) The point $P(p, -1)$ lies on the graph. What is the value of p?

(d) The point $Q(2, q)$ lies on the graph. What is the value of q?

Level ②

According to the table below, find three solutions for each equation and complete the table. (**4** – **8**)

	Equation	**Solutions**		
4.	$y = 3x$	(–2, _____)	(0, _____)	(3, _____)
5.	$y = 4x - 1$	(–3, _____)	(0, _____)	(3, _____)
6.	$y = -5x + 2$	(–1, _____)	(0, _____)	(1, _____)
7.	$y = \dfrac{-x-3}{3}$	(–3, _____)	(0, _____)	(6, _____)
8.	$y = 2(x - 3)$	(0, _____)	(3, _____)	(4, _____)

9. In each of the following, complete the table such that the ordered pairs (x, y) satisfy the given equation.

(a) $y = 6x + 4$

x	−1	0	1	2
y				

(b) $y = 1 - 4x$

x	−2	0	2	3
y				

10. In each of the following, complete the table such that the ordered pairs (x, y) satisfy the given equation.

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

x	−1	0	1	2
y				

(b) $y = 2(1 - x)$

x	−2	0	2	3
y				

11. In each of the following, complete the table such that the ordered pairs (x, y) satisfy the given equation.

(a) $y = \dfrac{x}{3} + 4$

x	−3	0	3	6
y				

(b) $y = \dfrac{x - 5}{2}$

x	−3	−1	0	3
y				

12. In each of the following, check whether the given ordered pair is a solution of the equation $y = 2x - 1$.

(a) $(2, 3)$ **(b)** $(-2, -3)$

13. In each of the following, check whether the given ordered pair is a solution of the equation $x - 2y = 3$.

(a) $(3, 3)$ **(b)** $(-3, 0)$

14. In each of the following, check whether the given ordered pair is a solution of the equation $x + 2y = 4$.

(a) $(0, 2)$ **(b)** $(-2, 4)$

15. In each of the following, check whether the given ordered pair is a solution of the equation $3x + y = -1$.

(a) $(2, -5)$ **(b)** $(-1, 2)$

In each of the following,

(a) complete the following table such that the ordered pairs (x, y) satisfy the given equation,

x	−2	0	2
y			

(b) draw the graph of the given equation.

[*Suggested scale for both axes: 10 divisions (1 cm) = 1 unit*] (**16 – 17**)

16. $y = 2x - 3$ **17.** $y = 1 - x$

In each of the following, draw the graph of the equation.

[*Suggested scale for x-axis: 10 divisions (1 cm) = 1 unit*

Suggested scale for y-axis: 10 divisions (1 cm) = 2 units] (**18 – 19**)

18. $y = 4x - 6$ **19.** $y = 2 - 3x$

20. In each of the following, determine whether the point lies on the graph of the equation $x + 4y = 3$.

    (a) $A(7, -1)$ **(b)** $B(0, 1)$

21. In each of the following, determine whether the point lies on the graph of the equation $y = 6x - 1$.

    (a) $A(1, 6)$ **(b)** $B(-1, -7)$

22. Determine whether the graph of the equation $2x + 4y = 1$ passes through each of the following points.

    (a) $A(-4, 2)$ **(b)** $B(5, -2)$

23. Determine whether the graph of the equation $5x - 3y + 1 = 0$ passes through each of the following points.

    (a) $A(-2, 3)$ **(b)** $B(1, 2)$

24. Determine whether $(2, -1)$ lies on both the graphs of the equations $x - 3y = 5$ and $x + 5y + 3 = 0$.

25. Determine whether $(-5, -2)$ lies on both the graphs of the equations $4x + 3y + 26 = 0$ and $5y - 2x = 1$.

26. Determine whether $(1, \dfrac{3}{2})$ lies on both the graphs of the equations $3x + 2y = 6$ and $4x + 6y = 13$.

27. Determine whether $(-\dfrac{1}{2}, \dfrac{5}{2})$ lies on both the graphs of the equations $x + 3y - 7 = 0$ and $2x + \dfrac{3y}{2} - \dfrac{11}{4} = 0$.
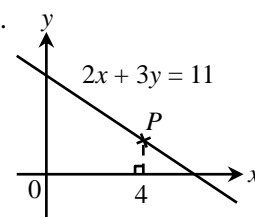
28. The figure shows the graph of the equation $2x + 3y = 11$. P is a point on the graph.

    (a) Find the y-coordinate of P.

    (b) Determine whether the graph passes through each of the following points.

        (i) $(-2, 5)$ **(ii)** $(2, 3)$
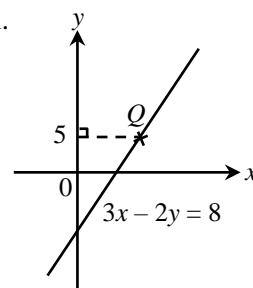
29. The figure shows the graph of the equation $3x - 2y = 8$. Q is a point on the graph.

    (a) Find the x-coordinate of Q.

    (b) Determine whether the graph passes through the point $(-2, -6)$.
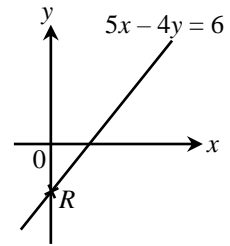
    (c) Determine whether the graph cuts the y-axis at $(0, -4)$.

30. The figure shows the graph of the equation $5x - 4y = 6$. R is a point on the graph.

    (a) Find the coordinates of R.

    (b) John is going to draw the graph of $5x - 8y = 12$ on the same rectangular coordinate plane. Does the graph pass through R?

31. Consider the equation $y = mx + c$, where m and c are constants.

    (a) $A(0, 3)$ and $B(6, 0)$ lie on the graph of the equation. Find the values of m and c.

    (b) Determine whether the graph passes through the point $(-8, 7)$.

32. Consider the equation $px - 3y = 8$, where p is a constant.

    (a) $P(-1, p)$ and $Q(q, 4)$ lie on the graph of the equation. Find the values of p and q.

   **(b)** $R(r, -6)$ lies on the graph of the equation. Find the value of r.

33. Consider the equation $ax + by = 5$, where a and b are non-zero constants. If the graph of $ax + by = 5$ passes through $(4, 3)$, give two possible sets of values of a and b.

Level 3

34. Consider the equation $ax + by = c$, where a, b and c are non-zero constants. The graph of the equation cuts the x-axis and y-axis at $(4, 0)$ and $(0, 6)$ respectively. Find $a : b : c$.
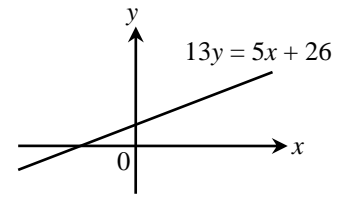
Multiple Choice Questions

35. Which of the following may represent the graph of the equation $6x + 5y = 3$?

  A.

  B.

  C.

  D.
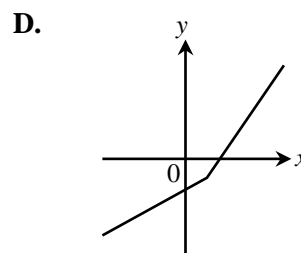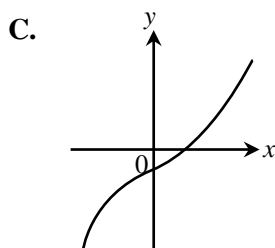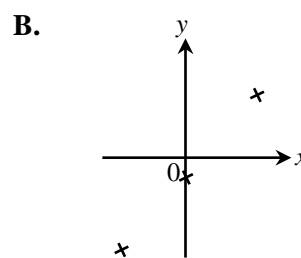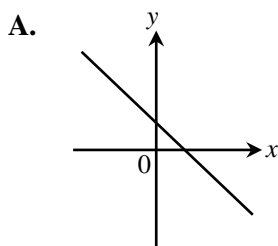
36. The figure shows the graph of $13y = 5x + 26$. Which of the following points lie(s) on the graph?

    I.   (5, 4)

    II. (8, 5)

    III. (13, 7)

    A. I only

    B. III only

    C. I and II only

    D. II and III only

37. Which of the following points does not lie on the graph of $4x - y + 3 = 0$?

    A. (−3, −9)

    B. (−1, 1)

    C. (0, 3)

    D. (2, 11)

38. Which of the following equations has (3, −4) as a solution?

    A. $3x + 8y + 24 = 0$

    B. $3x - 5y = 30$

    C. $3x - 4y = 24$

    D. $2x - 3y = 18$

5.2 Solving Simultaneous Linear Equations in Two Unknowns by the Graphical Method

Level ①

Demonstration 1

Solve the following simultaneous equations by the graphical method.

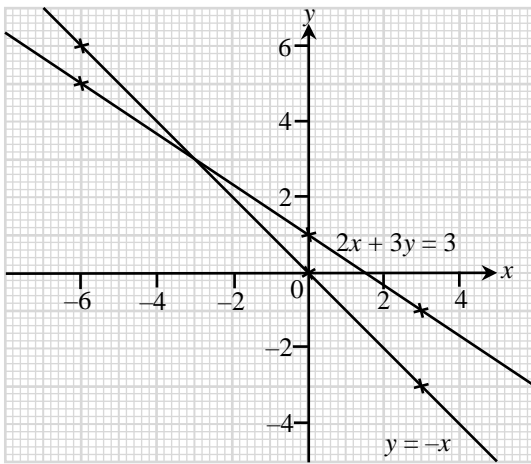$$\begin{cases} y = -x \\ 2x + 3y = 3 \end{cases}$$

Solution

$y = -x$

x	-6	0	3
y	6	0	-3

$2x + 3y = 3$

x	-6	0	3
y	5	1	-1

The graphs of $y = -x$ and $2x + 3y = 3$ are shown below.

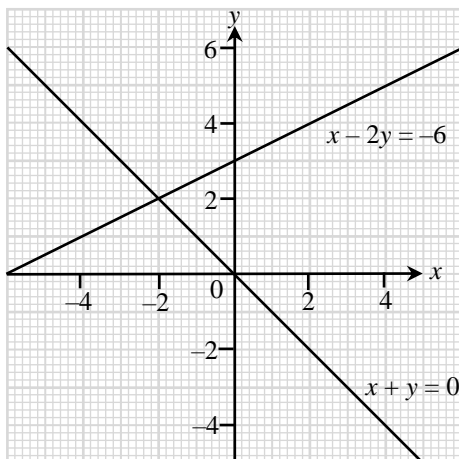From the figure, the solution is $x = -3$, $y = 3$.

1. Solve the simultaneous equations $\begin{cases} x + 2y = 5 \\ x - y = -1 \end{cases}$
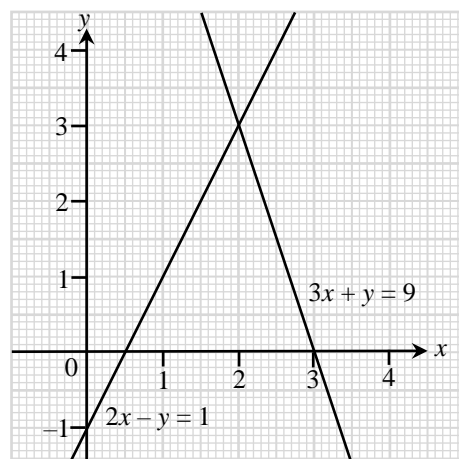
   by the graphical method.
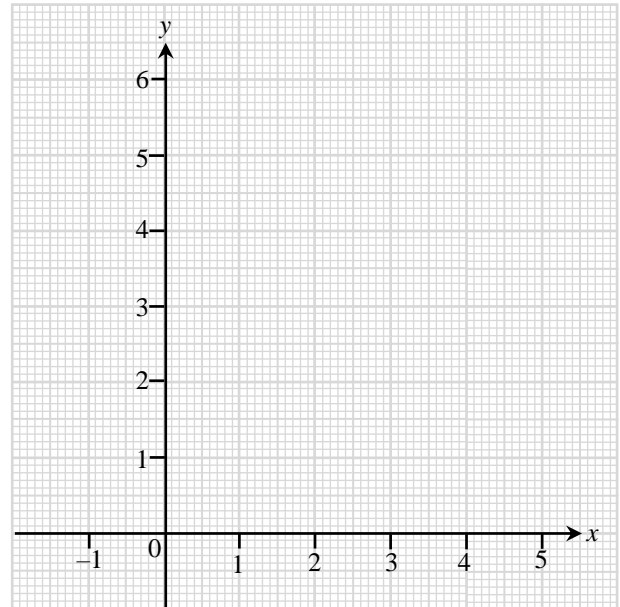
Level ②

In each of the following, write down the solution of the simultaneous linear equations in two unknowns. **(2 – 5)**
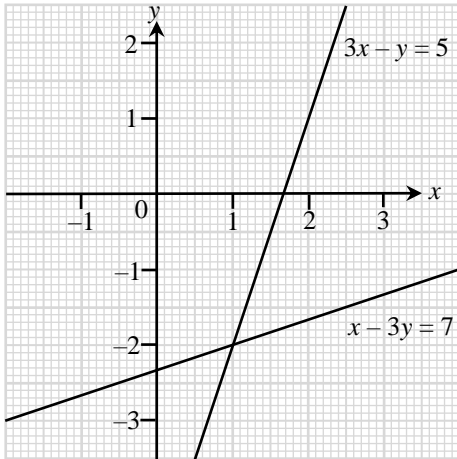
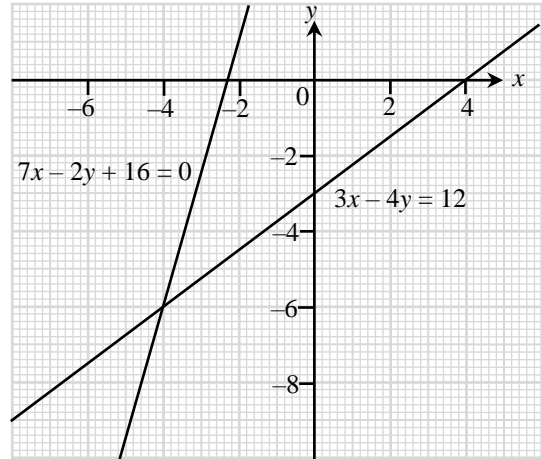2. $\begin{cases} x + y = 0 \\ x - 2y = -6 \end{cases}$

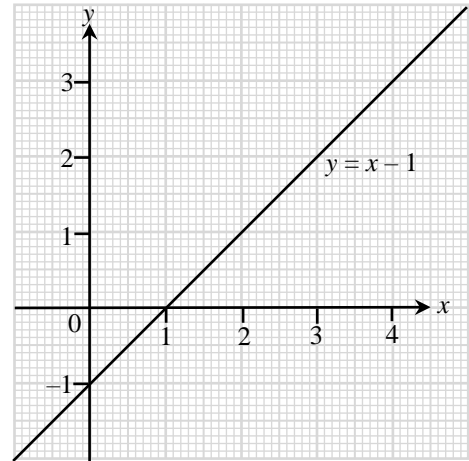3. $\begin{cases} 3x + y = 9 \\ 2x - y = 1 \end{cases}$

**4.** $\begin{cases} 3x - y = 5 \\ x - 3y = 7 \end{cases}$

5. $\begin{cases} 3x - 4y = 12 \\ 7x - 2y + 16 = 0 \end{cases}$

6. The figure on the right shows the graph of $y = x - 1$. Solve the simultaneous equations $\begin{cases} y = x - 1 \\ y = 3 - x \end{cases}$ by drawing the graph of $y = 3 - x$ on the same rectangular coordinate plane.
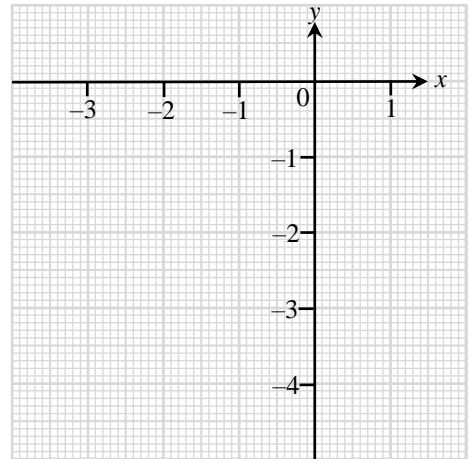

7. The figure on the right shows the graph of $y = x - 3$. Solve the simultaneous equations $\begin{cases} y = x - 3 \\ x + 2y = 0 \end{cases}$ by drawing the graph of $x + 2y = 0$ on the same rectangular coordinate plane.
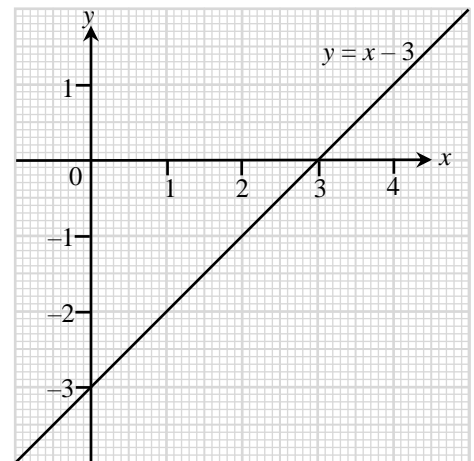
8. **(a)** Draw the graphs of the equations $y = 2x + 2$ and $x - 2y = 2$ on the rectangular coordinate plane provided.

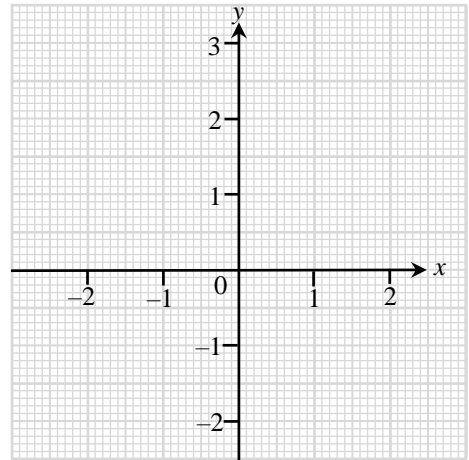**(b)** Using the graphs in **(a)**, solve the simultaneous equations
$$\begin{cases} y = 2x + 2 \\ x - 2y = 2 \end{cases}.$$

9. **(a)** Draw the graphs of the equations $y = x + 1$ and $y = \dfrac{x}{2} + 1$ on the rectangular coordinate plane provided.

(b) Using the graphs in **(a)**, solve the simultaneous equations
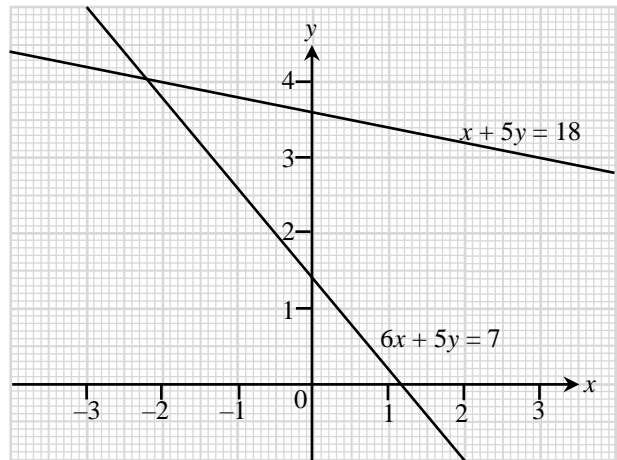$$\begin{cases} y = x + 1 \\ y = \dfrac{x}{2} + 1 \end{cases}.$$

In each of the following, write down the solution of the simultaneous linear equations in two unknowns. **(20 – 25)**

(*Give the answers correct to 1 decimal place if necessary.*)

10. $\begin{cases} x - 2y + 1 = 0 \\ 3x + y = 9 \end{cases}$
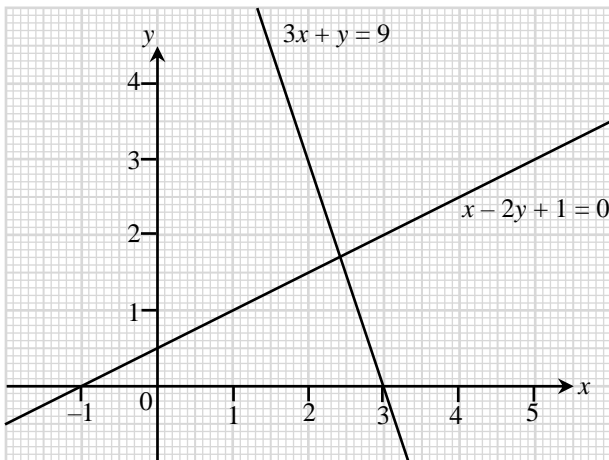
11. $\begin{cases} x + 5y = 18 \\ 6x + 5y = 7 \end{cases}$

12. $\begin{cases} x - 4y = 7 \\ 4x - 3y = -8 \end{cases}$
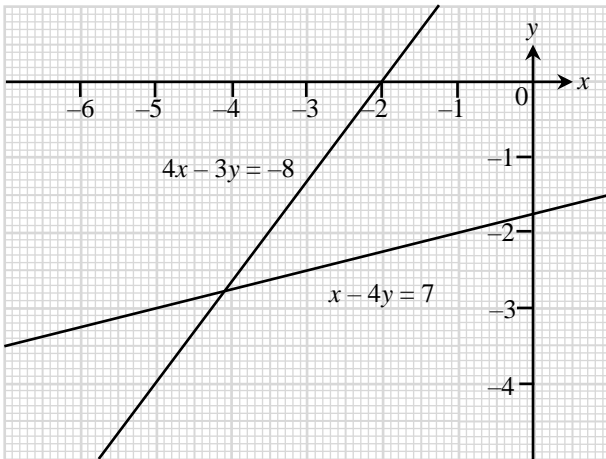
13. $\begin{cases} x - 6y = 15 \\ 3x + 4y = -7 \end{cases}$
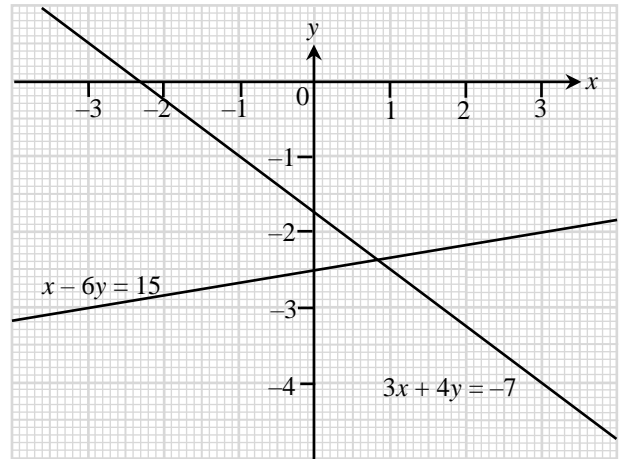
14. $\begin{cases} 3x + 7y - 5 = 0 \\ 5x - 3y + 6 = 0 \end{cases}$
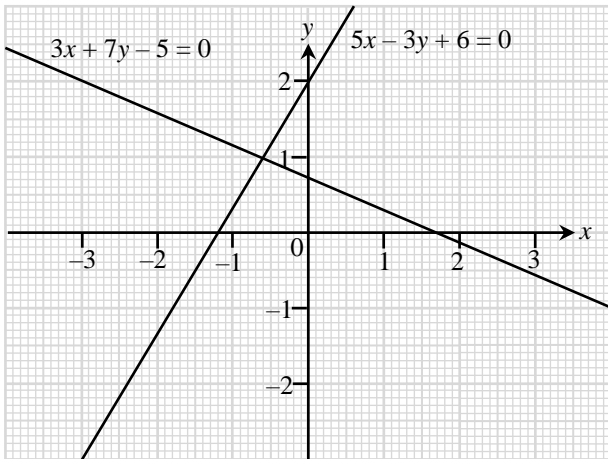
15. $\begin{cases} x - 3y + 5 = 0 \\ 5x - 2y = 5 \end{cases}$
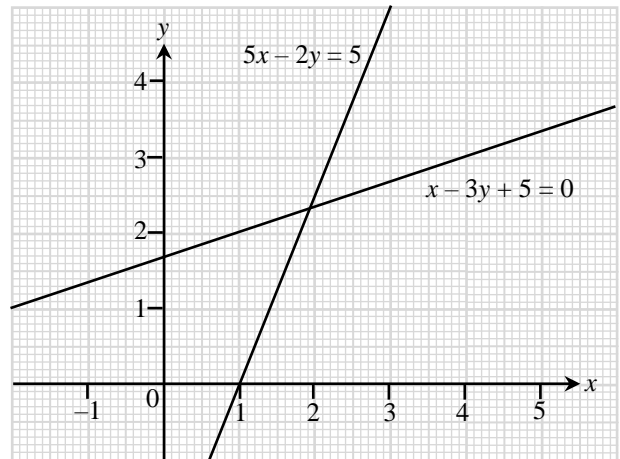

16. The figure shows the graphs of the simultaneous equations $\begin{cases} x - 3y + 4 = 0 \\ y = mx + 3 \end{cases}$ which intersect at a point on

the *x*-axis, where *m* is a constant. Find the value of *m*.
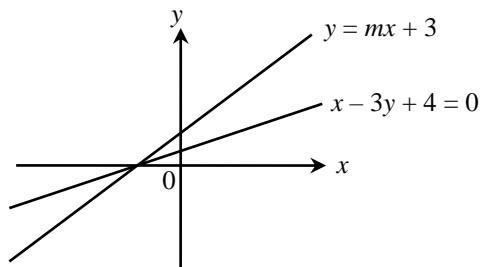
17. The figure shows the graphs of the simultaneous equations $\begin{cases} kx - y = 8 \\ 3x + 5y + 1 = 0 \end{cases}$ which intersect at a point

$(a, -2)$, where a and k are constants. Find the values of a and k.
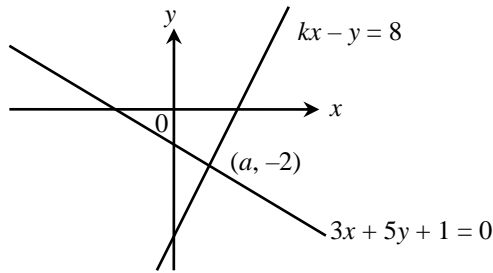
Multiple Choice Questions

18. The figure shows the graphs of $x = 2y$, $y = x - 2$ and $y = 2x - 3$.

Solve the simultaneous equations $\begin{cases} y = 2x - 3 \\ x = 2y \end{cases}$ graphically.

    A. $(1, -1)$

    B. $(2, 1)$

    C. $(3, 3)$

    D. $(4, 2)$
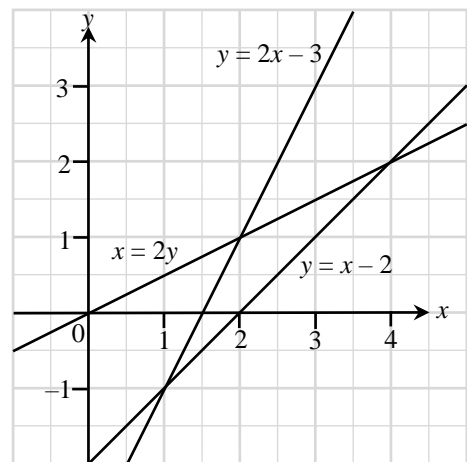
19. The figure shows the graphs of $y = 5x + 1$ and $3x - 4y = 2$.

Solve the simultaneous equations $\begin{cases} y = 5x + 1 \\ 3x - 4y = 2 \end{cases}$ graphically.

    A. The approximate solution is $(-0.8, -0.4)$.

    B. The approximate solution is $(-0.4, -0.8)$.

    C. The exact solution is $(-0.8, -0.4)$.

    D. The exact solution is $(-0.4, -0.8)$.

5.3 Solving Simultaneous Linear Equations in Two Unknowns by Algebraic Methods

Level (1)

Demonstration 1

Solve the simultaneous equations $\begin{cases} y = x+5 \\ y = 1-3x \end{cases}$ by the method of substitution.

Solution

$\begin{cases} y = x+5 \dots\dots\dots(1) \\ y = 1-3x \dots\dots(2) \end{cases}$

Put (1) into (2).

$x+5 = 1-3x$

$x+3x = 1-5$

$\quad 4x = -4$

$\quad\quad x = -1$

Put $x = -1$ into (1).

$y = (-1)+5$

$\quad = 4$

$\therefore$ The solution is $x = -1$, $y = 4$.
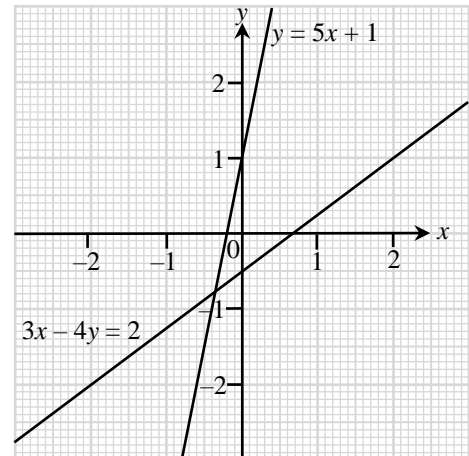
1. Solve the simultaneous equations $\begin{cases} x = 3y+3 \\ x = y+1 \end{cases}$ by the method of substitution.

Demonstration 2

Solve the simultaneous equations $\begin{cases} x+2y = 8 \\ 3x-4y = -6 \end{cases}$ by the method of substitution.

Solution

$\begin{cases} x+2y = 8 \dots\dots\dots(1) \\ 3x-4y = -6 \dots\dots(2) \end{cases}$

From (1), we have

$x = 8-2y \dots\dots\dots(3)$

Put (3) into (2).

$3(8-2y)-4y = -6$

$24-6y-4y = -6$

$\quad\quad -10y = -30$

$\quad\quad\quad y = 3$

Put $y = 3$ into (3).

$x = 8-2(3) = 2$

$\therefore$ The solution is $x = 2$, $y = 3$.

2. Solve the simultaneous equations

$\begin{cases} -x+2y = 1 \\ 3x-y = 2 \end{cases}$ by the method of substitution.

Demonstration 3

Solve the simultaneous equations $\begin{cases} 5x + 2y = 9 \\ 3x - 2y = -1 \end{cases}$ by the method of elimination.

Solution

$\begin{cases} 5x + 2y = 9 \text{...........}(1) \\ 3x - 2y = -1 \text{.........}(2) \end{cases}$

$(1) + (2)$:

$(5x + 2y) + (3x - 2y) = 9 - 1$

$$8x = 8$$

$$x = 1$$

Put $x = 1$ into (1).

$5(1) + 2y = 9$

$$2y = 4$$

$$y = 2$$

$\therefore$ The solution is $x = 1$, $y = 2$.

3. Solve the simultaneous equations

$\begin{cases} -x + 6y = -8 \\ -x + y = 2 \end{cases}$ by the method of elimination.

Demonstration 4

Solve the simultaneous equations $\begin{cases} 3x + 5y = 9 \\ 5x - y = -13 \end{cases}$ by the method of elimination.

Solution

$\begin{cases} 3x + 5y = 9 \text{...........}(1) \\ 5x - y = -13 \text{.........}(2) \end{cases}$

$(1) + 5 \times (2)$:

$(3x + 5y) + 5(5x - y) = 9 + 5(-13)$

$$28x = -56$$

$$x = -2$$

Put $x = -2$ into (2).

$5(-2) - y = -13$

$-10 - y = -13$

$$-y = -3$$

$$y = 3$$

$\therefore$ The solution is $x = -2$, $y = 3$.

4. Solve the simultaneous equations $\begin{cases} 2x + y = 5 \\ x - 3y = 6 \end{cases}$ by the method of elimination.

Level ②

Solve each of the following simultaneous equations by the method of substitution. (**5 – 22**)

5. $\begin{cases} y = x \\ y = 12 + 4x \end{cases}$

6. $\begin{cases} x = -y \\ 4x + 3y = 1 \end{cases}$

7. $\begin{cases} y = 3 - 4x \\ y = 4 - 3x \end{cases}$

8. $\begin{cases} x + y = 0 \\ y = 4x - 15 \end{cases}$

9. $\begin{cases} y = 2 - 3x \\ x = 5y + 6 \end{cases}$

10. $\begin{cases} x = 5y + 2 \\ 5x + 3y = 38 \end{cases}$

11. $\begin{cases} x = 17 - 5y \\ 2x + 3y = 6 \end{cases}$

12. $\begin{cases} 4x - 3y = 26 \\ y = 8 - 2x \end{cases}$

13. $\begin{cases} x + y = 1 \\ x + 2y = 4 \end{cases}$

14. $\begin{cases} x - y = 6 \\ 2x + y = 9 \end{cases}$

15. $\begin{cases} x - 3y = -27 \\ x + 4y = 29 \end{cases}$

16. $\begin{cases} 4x + y = 42 \\ 5x - y = 39 \end{cases}$

17. $\begin{cases} 4x + 3y = 39 \\ 2x - y = 7 \end{cases}$

18. $\begin{cases} 9y - x = 2 \\ 2x + 3y = 17 \end{cases}$

19. $\begin{cases} 28 = 4x - y \\ 32 = 5x - 2y \end{cases}$

20. $\begin{cases} 5 = x + y \\ 28 = 4x + 5y \end{cases}$

21. $\begin{cases} x - y - 15 = 0 \\ 3x + y - 45 = 0 \end{cases}$

22. $\begin{cases} 5x + y - 28 = 0 \\ 4x - y - 26 = 0 \end{cases}$

Solve each of the following simultaneous equations by the method of elimination. (**23 – 40**)

23. $\begin{cases} x + y = 2 \\ x - y = 4 \end{cases}$

24. $\begin{cases} x + y = 3 \\ -x + y = -1 \end{cases}$

25. $\begin{cases} x - 2y = -1 \\ x + 2y = 11 \end{cases}$

26. $\begin{cases} 5x + y = 28 \\ 5x - y = 32 \end{cases}$

27. $\begin{cases} x - y = 5 \\ x - 2y = 8 \end{cases}$

28. $\begin{cases} x + 3y = 15 \\ 5x + 3y = 51 \end{cases}$

29. $\begin{cases} x + 5y = 49 \\ 4x - 5y = -4 \end{cases}$

30. $\begin{cases} 5x + y = 22 \\ 5x + 4y = 13 \end{cases}$

31. $\begin{cases} 2x - 3y = 1 \\ 2x + y = 21 \end{cases}$

32. $\begin{cases} 5x - 4y = 22 \\ x - 4y = 14 \end{cases}$

33. $\begin{cases} 5x + 2y + 13 = 0 \\ 5x + 4y + 21 = 0 \end{cases}$

34. $\begin{cases} 5x + y - 26 = 0 \\ 2x - y - 9 = 0 \end{cases}$

35. $\begin{cases} x - 3y + 11 = 0 \\ 2x - 3y + 16 = 0 \end{cases}$

36. $\begin{cases} 3y = x + 15 \\ 2x - 3y + 15 = 0 \end{cases}$

37. $x + 2y = 2y - x = 8$

38. $-7x + 3y = 2x - 3y = 5$

39. $4x + 5y = -(4x - y) = 6$

40. $2x + 4y = -2x + 3y + 3 = 26$

Solve each of the following simultaneous equations by an algebraic method. (**41 – 44**)

41. $\begin{cases} 2x = 5y \\ x - 4y = 3 \end{cases}$

42. $\begin{cases} x - 5y = 9 \\ 3x + 5y = 3 \end{cases}$

43. $\begin{cases} 3x - 2y = 3 \\ 7x - 3y = 2 \end{cases}$

44. $\begin{cases} 2x + 4y = 1 \\ 3(x+1) + 8y = 1 \end{cases}$

45. It is given that (–3, 4) is the solution of the simultaneous equations $\begin{cases} ax + by = 22 \\ bx - ay = -29 \end{cases}$, where a and b are constants. Find the values of a and b.

46. It is given that (2, –1) is the solution of the simultaneous equations $\begin{cases} mx + ny = 7 \\ nx + my = 1 \end{cases}$, where m and n are constants. Find the values of m and n.

47. It is given that (–2, –5) is the solution of the simultaneous equations $\begin{cases} px - qy - 20 = 0 \\ qx + py + 37 = 0 \end{cases}$, where p and q are constants. Find the values of p and q.

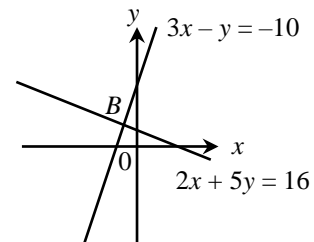**48.** If $\begin{cases} y = 4x - 3c \\ x = 4y + 12 \end{cases}$, where c is a constant, find $x + y$ in terms of c.

49. If $\begin{cases} y = 3x + 2k \\ x = 3y - 8 \end{cases}$, where k is a constant, find $x - y$ in terms of k.

50. Find the coordinates of the point of intersection A in the figure.
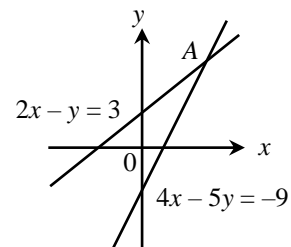
51. Find the coordinates of the point of intersection B in the figure.

52. **(a)** Solve $\begin{cases} 2x + 4y = 5 \\ 3x - 2y = 5 \end{cases}$.

(b) Using the result of **(a)**, solve $\dfrac{2}{p} + \dfrac{4}{q} = \dfrac{3}{p} - \dfrac{2}{q} = 5$.

53. The solution of the simultaneous equations $\begin{cases} ax + by = 2 \\ ax - cy = 1 \end{cases}$ is (–3, 1), where a, b and c are positive

constants. Find two possible sets of values of a, b and c.

Level 3

54. **(a)** Solve $\begin{cases} 10x + 7y = 4 \\ 5x + 8y = 6 \end{cases}$.

(b) Using the result of **(a)**, solve $\begin{cases} 10(a - b) + 7(a + b) = 4 \\ 5(a - b) + 8(a + b) = 6 \end{cases}$.

Multiple Choice Questions

55. If $5p - 2q = 2p - 4q = 16$, then $q =$

A. –4.

B. –3.

C. 2.

D. 3.

56. If $(x, y) = (8, -1)$ is a solution of the simultaneous equations $\begin{cases} ax + by = 22 \\ bx - ay = 19 \end{cases}$, then $a =$

A. –3.

B. –2.

C. 2.

D. 3.

Answers

2A Chapter 5

Section 5.1

Level 1

1. **(a)** no **(b)** yes
3. **(a)** no **(b)** yes
   (c) −1 **(d)** 0.5

Level 2

	Equation	Solutions		
4.	$y = 3x$	(−2, −6)	(0, 0)	(3, 9)
5.	$y = 4x − 1$	(−3, −13)	(0, −1)	(3, 11)
6.	$y = −5x + 2$	(−1, 7)	(0, 2)	(1, −3)
7.	$y = \dfrac{−x − 3}{3}$	(−3, 0)	(0, −1)	(6, −3)
8.	$y = 2(x − 3)$	(0, −6)	(3, 0)	(4, 2)

9. **(a)**

x	−1	0	1	2
y	−2	4	10	16

(b)

x	−2	0	2	3
y	9	1	−7	−11

10. **(a)**

x	−1	0	1	2
y	3	2	1	0

(b)

x	−2	0	2	3
y	6	2	−2	−4

11. **(a)**

x	−3	0	3	6
y	3	4	5	6

(b)

x	−3	−1	0	3
y	−4	−3	$−\dfrac{5}{2}$	−1

12. **(a)** yes **(b)** no
13. **(a)** no **(b)** no
14. **(a)** yes **(b)** no
15. **(a)** no **(b)** yes

16. **(a)**

x	−2	0	2
y	−7	−3	1

17. **(a)**

x	-2	0	2
y	$\underline{3}$	$\underline{1}$	$\underline{-1}$

20. **(a)** yes **(b)** no
21. **(a)** no **(b)** yes
22. **(a)** no **(b)** no
23. **(a)** no **(b)** yes
24. yes **25.** no
26. yes **27.** yes
28. **(a)** 1
     (b) **(i)** yes **(ii)** no
29. **(a)** 6
     (b) **(i)** no **(ii)** yes
30. **(a)** $(0, -\dfrac{3}{2})$ **(b)** yes
31. **(a)** $m = -0.5, c = 3$ **(b)** yes
32. **(a)** $p = -2, q = -10$ **(b)** 5
33. $a = 2, b = -1; a = -4, b = 7$ (or other reasonable answers)

Level 3
34. $3 : 2 : 12$

Multiple Choice Questions
35 A **36.** B
37. B **38.** D

Section 5.2
Level 1
1. $(1, 2)$

Level 2
2. $(-2, 2)$ **3.** $(2, 3)$
4. $(1, -2)$ **5.** $(-4, -6)$
6. $(2, 1)$ **7.** $(2, -1)$
8. **(b)** $(-2, -2)$ **9.** **(b)** $(0, 1)$
10. $(2.4, 1.7)$ **11.** $(-2.2, 4.0)$
12. $(-4.1, -2.8)$ **13.** $(0.8, -2.4)$
14. $(-0.6, 1.0)$ **15.** $(1.9, 2.3)$
16. $\dfrac{3}{4}$ **17.** $a = 3, k = 2$

Multiple Choice Questions
18. B **19.** B

Section 5.3
Level 1
1. $(0, -1)$ **2.** $(1, 1)$
3. $(-4, -2)$ **4.** $(3, -1)$

Level 2 (p.89)
5. $(-4, -4)$ **6.** $(1, -1)$
7. $(-1, 7)$ **8.** $(3, -3)$
9. $(1, -1)$ **10.** $(7, 1)$
11. $(-3, 4)$ **12.** $(5, -2)$

13. $(-2, 3)$ **14.** $(5, -1)$

15. $(-3, 8)$ **16.** $(9, 6)$

17. $(6, 5)$ **18.** $(7, 1)$

19. $(8, 4)$ **20.** $(-3, 8)$

21. $(15, 0)$ **22.** $(6, -2)$

23. $(3, -1)$ **24.** $(2, 1)$

25. $(5, 3)$ **26.** $(6, -2)$

27. $(2, -3)$ **28.** $(9, 2)$

29. $(9, 8)$ **30.** $(5, -3)$

31. $(8, 5)$ **32.** $(2, -3)$

33. $(-1, -4)$ **34.** $(5, 1)$

35. $(-5, 2)$ **36.** $(0, 5)$

37. $(0, 4)$ **38.** $(-2, -3)$

39. $(-1, 2)$ **40.** $(-1, 7)$

41. $(-5, -2)$ **42.** $(3, -\dfrac{6}{5})$

43. $(-1, -3)$ **44.** $(4, -\dfrac{7}{4})$

45. $a = 2, b = 7$ **46.** $m = 5, n = 3$

47. $p = 5, q = 6$ **48.** $c - 4$

49. $-2 - 0.5k$ **50.** $(4, 5)$

51. $(-2, 4)$

52. **(a)** $(\dfrac{15}{8}, \dfrac{5}{16})$ **(b)** $(\dfrac{8}{15}, \dfrac{16}{5})$

53. $a = 1, b = 5$ and $c = -4$; $a = 2, b = 8$ and $c = -7$
(or other reasonable answers)

Level 3

54. **(a)** $(-\dfrac{2}{9}, \dfrac{8}{9})$ **(b)** $(\dfrac{1}{3}, \dfrac{5}{9})$

Multiple Choice Questions

55. B **56.** D