

# ANSWERS

## Topic 1 Simultaneous Equations

1.  $\frac{1}{3} \begin{pmatrix} 6 & -3 \\ -7 & 4 \end{pmatrix}; x=2, y=-5$
2.  $x=4, y=2$  or  $x=-1\frac{1}{2}, y=-\frac{3}{4}$
3. (1, 11); (5, 7)
4. (i)  $\begin{pmatrix} k & -1 \\ -k+2 & 2 \\ -k+2 & -k+2 \end{pmatrix}$   
 (ii)  $x = \frac{9k-10}{-k+2}; y = \frac{-2}{-k+2}$   
 (iii)  $k=2$
5. (2, -1),  $(-\frac{1}{3}, -5\frac{2}{3})$
6.  $x=3, y=-2$
7.  $\frac{1}{23} \begin{pmatrix} 4 & -3 \\ 5 & 2 \end{pmatrix}; x=1, y=-2$
8.  $(1\frac{3}{5}, 2\frac{4}{5}), (0, 2)$
9.  $(-2, -1), (\frac{3}{5}, -1\frac{1}{5})$
10.  $\frac{1}{2} \begin{pmatrix} 3 & -5 \\ -2 & 4 \end{pmatrix}, x=2, y=-1$
11.  $x=3, y=4$
12. (i)  $\begin{pmatrix} 0 & 4 \\ 4 & 8 \end{pmatrix}$  (ii)  $\frac{1}{2} \begin{pmatrix} 3 & -1 \\ -1 & 1 \end{pmatrix}$   
 (iii)  $x = \frac{1}{2}, y = 2\frac{1}{2}$
13.  $\mathbf{A}^{-1} = \frac{1}{50} \begin{pmatrix} 6 & 8 \\ -1 & 7 \end{pmatrix}$   
 $p = -1\frac{1}{5}, q = \frac{1}{5}$
14. Ann is 18 yrs old and Betty is 12 yrs old.
15. Midpoint =  $(2, 1\frac{1}{2})$

## Topic 2 Surds, Indices and Logarithms

1. (i) 0.916 (ii) 7
2. (i)  $2+\sqrt{3}$  (ii)  $2\sqrt{3}$
3. (a) (i) 5.9 (ii) 6.5  
 (b) (i) 2.33 (ii)  $\frac{1}{4}$   
 (c)  $a=20, b=2$
4. (a)  $a+b^2$  (b)  $\frac{4}{5}$
5.  $1\frac{3}{5}$
6.  $(2\sqrt{2} + \sqrt{3})m$
7. -1, 0.631
8. 8
9. (a)  $p=2, q=4$   
 (b) (i)  $4\frac{1}{2}$  (ii)  $1\frac{1}{2}$   
 (c) (i) 1.08 (ii) 1995
10.  $x=5, y=9$
11. (i) 50 (iii) 224  
 (iv) 60 days
12. 28
13. (i) -3 (ii)  $\frac{1}{3}, 3$
14. (a) (i) 12100 (ii) 2006  
 (b) 1.63
15.  $a=19, b=-8$
16.  $\frac{2}{3}$
17. 2.32
18.  $(3+2\sqrt{3})m$
19. (a) 2 (b)  $\frac{3}{4}$
20. (a)  $\sqrt{30}$  (b)  $16+7\sqrt{5}$
21. (i) 0.0330 (ii) 371
22. (a) (i) 11.5 (ii) 2  
 (b) 28
23. (a)  $p=6, q=-3$   
 (b) (i)  $(2^x)^2 - 2(2^x) - 3 = 0$   
 (ii) 1.5

24.  $23 - 13\sqrt{3}$

25. (i) 0.227

(ii)  $\pm 16.6$

26. (a)  $\frac{8}{11}$

(b)  $c = a - 3b$

27.  $3 - 6\sqrt{5}$

28.  $x = \frac{1}{2}, y = -2\frac{1}{2}$

29.  $\frac{1}{9}, 3$

30. 9

31.  $6 - 2\sqrt{3}$

32. (i) 0.0693

(ii) 15.8

33.  $\frac{1}{2} + \frac{1}{6}\sqrt{3}$

34. (i) 2.16

(ii) 2

35. (i) 6

(ii) 625

36.  $x = -1\frac{4}{5}, y = 1\frac{1}{5}$

37.  $\frac{1}{2}$

38. (i) 1.2

(ii) 1.63

(iii) 81

39. (i)  $x = 2.4$

(ii)  $y \approx 0.585$  or  $y = 5$

40.  $a = 4, b = 2$

41. (i)  $x = 2\frac{2}{3}$

(ii)  $y = 16$

### Topic 3 Quadratic Equations and Inequalities

1.  $\pm 3$

3. (a)  $x < -2$  or  $x > \frac{1}{3}$  (b) 2,  $-1\frac{1}{5}$

4.  $-5 < x < -1$  or  $2 < x < 3\frac{1}{2}$

5.  $k < -6$

6.  $p < -4$  or  $p > 8$

7.  $\pm \frac{3}{2}$

8.  $\lambda < 4$

9.  $0 \leq k \leq 4$

10.  $x < 4$  or  $x > 9$

11.  $\pm 12$

12. -3, 9

13. -8, 32

14. (a)  $m = -1.25, x = -\frac{2}{3}$  (b)  $c = 2, d = 15$

15.  $k > 2, k > 18$

16. (i) 6

(ii) (0, -2)

17. 4

18. (a) Smallest integer value of  $a = 4$ .

(b) Smallest integer value of  $b = -6$ .

19.  $4x^2 - 20x + 33 = 0$

20. (i)  $-2 \leq x \leq 5$

(ii)  $c = 10$

### Topic 4 Partial Fractions

1.  $\frac{1}{x+2} - \frac{x-2}{x^2+1}$

2.  $\frac{-1}{2-x} + \frac{x+1}{1+x^2}$

3. (i)  $\frac{-1}{x-5} + \frac{9}{x+1}$  (ii)  $-\frac{8}{9}$

### Topic 5 The Modulus Function

1. (ii)  $1\frac{1}{4}, 4\frac{1}{2}$

2. (i) maximum point (iii)  $0 \leq f(x) \leq 9$

3.  $\frac{4}{5}$

4. (ii)  $-4 \leq f(x) \leq 3$  (iii)  $\frac{1}{2}$  or  $2\frac{1}{2}$

5.  $1 < 2x + 9 < 25$

6. (i)  $-11 \leq f(x) \leq 89$

(ii) (a) minimum point =  $(\frac{1}{3}, -11)$

(b) maximum point =  $(\frac{1}{3}, 11)$

7. (a)  $1 \leq x \leq 4$

(b) (i) 3, -7

(ii) -1.5, 3.5

8. (ii)  $1\frac{1}{2}, 3\frac{1}{2}$

9. (i) The graph of  $y = |3x - 5| - 2$  meets the axes at (0, 3), (1, 0) and  $(2\frac{1}{3}, 0)$ .

(iii)  $x = 3\frac{1}{2}$  or  $x = \frac{3}{4}$

## Topic 6 Binomial Theorem

- $64 + 192x + 240x^2; 48$
- 2268
- (i)  $243x^5 - 405x^4 + 270x^3$   
(ii) 135
- $a = 3, b = 238, n = 7$
- (i)  $\frac{1}{4}$  (ii) 15, 20
- $1 + 8y + 28y^2 + 56y^3; -1$
- $-\frac{71}{81}$
- (a)  $\frac{1}{2}$  (b) -5376
- $n = 8, p = -\frac{3}{2}, q = -189$
- 3
- (a) 60 (b) 15
- (i)  $128 - 224x + 168x^2$  (ii) 280
- (i) -280 (ii) -182
- (i) 4 (ii) 56
- (i)  $k = \frac{3}{5}$  (ii) -20
- (i)  $2^n, -n2^{n-1}\left(\frac{x}{4}\right), \frac{n(n-1)}{2}2^{n-2}\left(\frac{x}{4}\right)^2$   
(ii)  $n = 8$   
(iii)  $a = 256, b = -144$

## Topic 7 Coordinate Geometry

- (i)  $5y = 12x + 4$  (ii)  $5x + 12y = 111$
- (i)  $X = (13, 0), C = (5, 8)$   
(ii)  $\left(5\frac{2}{3}, 0\right)$  (iii) 1 : 2.12
- $6y + 4x + 5 = 0$
- $4y + 5x = 26$
- (i)  $C(6, 3), B(8, 9), D(4, 2)$   
(ii) 26.1 units
- 30 units<sup>2</sup>
- 25 units<sup>2</sup>
- $A = (5, 15), B = \left(0, \frac{50}{3}\right), C = \left(-\frac{10}{3}, \frac{20}{3}\right)$
- (ii) (10, 0) (iii) 1 : 3

- 1 : 1.75
- (11, -1)
- $2y + x = 8$
- (i)  $\left(4\frac{1}{2}, -1\right)$  (ii)  $\left(7\frac{1}{2}, 7\right)$   
(iii)  $\frac{1}{3}$
- $y = 2x - 9$
- $5\sqrt{13}$  units
- (i)  $3y + 2x = 19$  (ii) (2, 5)  
(iii) (8, 1)
- (i) (8.4, 3.8) (ii) 9 : 1  
(iii) (9.8, -0.4)
- (i)  $y = \frac{1}{4}x + 6$   
(ii) Coordinates of B = (8, 8)  
(iii) Coordinates of C = (18, 2)  
(iv) 102 units<sup>2</sup>

## Topic 8 Linear Law

- (ii)  $A = 0.72, B = 38$  (iv) 0.72
- (a) (ii)  $y = 2.92 + 4.03x^2$  (iii) 2.2, 2.0  
(b)  $y = \sqrt{e^5x}$
- (a) (i)  $\lg y = b \lg x + \lg a$   
(ii)  $a = 8.40, b = 1.20$  (iii) 400  
(b)  $y = -\frac{7}{2}x^2 + 25x$
- (ii)  $\beta = 1.56, k = 2.63$  (iii) 8.57 m/s
- (i)  $\lg y = (\lg a)t - b \lg a$   
(ii)  $a = 4.0, b = 1.2$  (iii) 769 litres
- $a = 100, n = -\frac{1}{2}$
- (ii)  $a = 19.6, n = 2.47$  (iii) 1.95
- (ii)  $A = 2.02, b = 1.20$  (iii) 37.9  
(iv) 7.20
- (i)  $A = 3.98, b = 2.29$  (ii) 0.35
- (i) Plot  $x$  against  $L^{1.5}$ ;  $a = x$  - intercept  
 $b =$  gradient of the line  
(ii)  $c = 1.92, d = 1.60$