

# ANSWERS

## Exercise 1.1

1. (i)  $\frac{5}{8}$                       (ii)  $\frac{9}{8}$                       (iii)  $\frac{509}{125}$ .
2. (i) 0.25                      (ii) 0.425                      (iii)  $2.\dot{2}$                       (iv)  $0.29\dot{5}\dot{4}$                       (v)  $0.\overline{571428}$ .
3. (i)  $0.\dot{4}$                       (ii)  $0.\overline{27}$                       (iii)  $0.3\overline{45}$                       (iv)  $0.\overline{538461}$ .
4. 0.1042.                      5. 1.087.                      6.  $-\frac{5}{7}, -\frac{3}{8}, \frac{9}{14}, \frac{20}{21}$ .                      7.  $\frac{13}{18}, \frac{7}{12}, -\frac{8}{15}, -\frac{17}{24}$ .
8.  $\frac{3}{8}, \frac{4}{11}, \frac{8}{23}, \frac{15}{46}$ ; 0.05.
9. (i) Terminating decimal; 0.4375                      (ii) terminating decimal; 0.2625  
 (iii) terminating decimal; 0.544                      (iv) recurring decimal  
 (v) terminating decimal; 0.9                      (vi) recurring decimal  
 (vii) recurring decimal                      (viii) terminating decimal; 1.96875  
 (ix) recurring decimal                      (x) recurring decimal.
10. (i), (iii) and (iv).
11. (i)  $\frac{4}{9}$                       (ii)  $\frac{1}{6}$                       (iii)  $\frac{5}{33}$                       (iv)  $\frac{368}{495}$                       (v)  $\frac{389}{165}$ .

## Exercise 1.2

1.  $\frac{43}{144}, \frac{3}{8}, \frac{43}{144}, \frac{2}{9}$ .                      2.  $\frac{7}{24}, \frac{13}{48}, \frac{1}{4}, \frac{13}{48}, \frac{7}{24}, \frac{1}{3}$ .
3.  $-\frac{11}{24}, -\frac{5}{12}, -\frac{1}{2}, -\frac{11}{24}, -\frac{5}{12}, -\frac{1}{3}$ .                      4.  $\frac{27}{60}, \frac{17}{30}, \frac{41}{60}, \frac{4}{5}, \frac{41}{60}, \frac{17}{30}, \frac{27}{60}, \frac{1}{3}$ .
5. 4.125, 4.25, 4.375.                      6.  $\frac{19}{30}, \frac{2}{3}, \frac{7}{10}, \frac{11}{15}, \frac{23}{30}$ .
7.  $\frac{23}{30}, \frac{47}{60}, \frac{4}{5}, \frac{49}{60}$ .

## Exercise 1.3

1. (i) True                      (ii) False                      (iii) False                      (iv) False                      (v) False.
6. (i)  $\sqrt{\frac{7}{25}}, \sqrt{\frac{16}{5}}$                       (ii)  $-\sqrt{\frac{2}{49}}, \sqrt{\frac{25}{3}}$ .                      7. (i), (iii) and (iv).
8. (i), (ii), (iii), (iv), (vi) and (viii).                      9. (i)  $\sqrt{15}; -\sqrt{7}$                       (ii)  $\frac{9}{\sqrt{5}}; -3\sqrt{2}$ .
10. (i)  $2\sqrt{3}, \sqrt{15}, -4, 3\sqrt{2}$                       (ii)  $4, 3\sqrt{2}, 2\sqrt{8}, 4\sqrt{3}, \sqrt{50}$ .

11. (i)  $4\sqrt{3}, \frac{9}{\sqrt{2}}, \frac{3}{2}\sqrt{5}, 3\sqrt{\frac{6}{5}}$  (ii)  $3\sqrt{5}, 2\sqrt{7}, \frac{7}{3}\sqrt{2}, \frac{5}{\sqrt{3}}, -\sqrt{3}$ .
12.  $\sqrt[3]{2}, \sqrt[6]{5}, \sqrt{3}$ . 14.  $\sqrt{2.5}$ . 15. 1.5. 16.  $\sqrt{5}, \sqrt{6}$ . 17. 3.5, 3.6.
18.  $\frac{1}{\sqrt{5}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{2}}$ . 19.  $\sqrt{21}, \sqrt{22}$ . 20.  $\sqrt{6}, \sqrt{7}, \sqrt{8}$ .
21. (i)  $\frac{3\sqrt{5}}{20}$  (ii)  $\frac{5\sqrt{21}}{3}$  (iii)  $\frac{4+\sqrt{7}}{3}$  (iv)  $3\sqrt{2}-1$  (v)  $-5-2\sqrt{6}$ .
22. (i)  $\frac{47+21\sqrt{5}}{2}$  (ii)  $17-12\sqrt{2}$  (iii)  $\frac{-119+31\sqrt{14}}{7}$ .
23. (i)  $a = -\frac{53}{59}, b = -\frac{22}{59}$  (ii)  $a = 32, b = -11$ . 22.  $a = 3, b = 0$ .
25.  $p = 0, q = 1$ . 26.  $a = \frac{13}{7}, b = -\frac{2}{7}$ . 27. 16. 28. 98.
29. (i) -18 (ii)  $8\sqrt{5}$  (iii) 322 (iv)  $-144\sqrt{5}$ .

### Chapter Test

1. (i) Recurring decimal (ii) recurring decimal (iii) terminating decimal; 0.056  
(iv) terminating decimal; -0.2875 (v) recurring decimal.
2. 0.139. 3. 23.33. 4. (i)  $\frac{74}{55}$  (ii)  $\frac{2355}{999}$ .
5.  $\frac{64}{117}, \frac{7}{13}, \frac{64}{117}, \frac{5}{9}$ . 6.  $\frac{1}{3}, \frac{7}{24}, \frac{1}{4}, \frac{5}{24}, 0; \frac{3}{8}, \frac{1}{3}, \frac{7}{24}, \frac{1}{4}, \frac{5}{24}, 0, -\frac{1}{3}$ .
11. (i)  $2(2\sqrt{2}-\sqrt{3})$  (ii)  $\frac{57}{15}-\frac{41}{30}\sqrt{6}$  (iii)  $\frac{2+\sqrt{6}-\sqrt{2}}{4}$ . 12.  $p = 3, q = -\frac{2}{3}$ .
13. (i)  $550\frac{1}{4}$  (ii)  $20\frac{7}{9}$  (iii) 970.
14.  $\frac{5}{2}\sqrt{3}, 3.5, 2\sqrt{2}, \sqrt{10}, -\frac{5}{\sqrt{2}}$ . 15.  $2; \frac{\sqrt{3}+\sqrt{5}}{2}$ .
16.  $\sqrt{15}, \sqrt{14}, 2\sqrt{3}; 3, 2\sqrt{3}, \sqrt{14}, \sqrt{15}, 4$ .
17.  $\sqrt{13}, \sqrt{15}, 3\sqrt{2}; 2\sqrt{5}, 3\sqrt{2}, \sqrt{15}, \sqrt{13}, 2\sqrt{3}$ .
18.  $-\frac{1}{3}, -\frac{1}{6}, 0, \frac{1}{6}; \frac{1}{\sqrt{10}}$ . 19. (i)  $\sqrt{2}; \sqrt{3}$  (ii)  $\sqrt{2}, \sqrt{3}$ .
20. Take  $a = 3\sqrt{2}, b = 5\sqrt{2}$ .
21.  $q$  can be expressed as  $q = 2^m 5^n$  where  $m$  and  $n$  are non-negative integers.
22. (i) Rational; prime factors of  $q$  are 2 or 5 or both only  
(ii) rational;  $q$  has a prime factor other than 2 and 5  
(iii) irrational  
(iv) rational; prime factors of  $q$  are 2 or 5 or both only  
(v) rational;  $q$  has a prime factor other than 2 and 5  
(vi) irrational.

### Exercise 2.1

1. ₹ 10; 25%. 2. (i) ₹ 460 (ii) ₹ 376. 3. 5%.
4. ₹ 4000. 5. ₹ 450. 6. ₹ 252. 7. Loss ₹ 15.
8. ₹ 60;  $33\frac{1}{3}\%$ . 9. ₹ 345. 10. ₹ 520. 11.  $5\frac{5}{8}\%$
12. ₹ 66. 13.  $6\frac{1}{4}\%$ . 14. ₹ 64.80. 15.  $88\frac{8}{9}\%$ .

16. ₹ 255.                      17. 40%.                      18.  $6\frac{2}{13}\%$ .                      19. ₹ 400.  
 20. ₹ 300.                      21. (i) 96 (ii) ₹ 288 (iii) ₹ 3.  
 22. Loss ₹ 200; 4%.                      23. Profit 12.1%.                      24. Loss 4%.                      25. 21%.  
 26. 50%.                      27.  $5\frac{5}{19}\%$ .                      28. 50%.                      29. ₹ 11.50 per metre.  
 30. ₹ 3540.                      31. ₹ 4500.                      32. Loss 1%.                      33. 20%.  
 34. ₹ 135;  $33\frac{1}{3}\%$ .                      35. 25000; ₹ 5.50.                      36. ₹ 1000.  
 37. ₹ 175.                      38. Chair ₹ 175, desk ₹ 196.                      39. ₹ 53000.  
 40. ₹ 156, ₹ 159.

### Exercise 2.2

1. ₹ 66.                      2. ₹ 650.                      3. 10%.                      4. (i) ₹ 133 (ii) ₹ 125.  
 5. (i) ₹ 720 (ii) ₹ 108 (iii) 53%.                      6. 5 pairs.                      7. (i) ₹ 240 (ii) ₹ 200.  
 8. (i) ₹ 3000 (ii) ₹ 2520 (iii) 5%.                      9. ₹ 288.                      10. ₹ 5000.  
 11. ₹ 308.70.  
 12. (i) ₹ 76.50 (ii) ₹ 10000 (iii) (a) ₹ 8000 (b) Loss  $4\frac{3}{8}\%$ .  
 13. ₹ 6; 18.75%.                      14. 10.4%.                      15.  $15\frac{3}{8}\%$ .                      16. 14%.                      17. ₹ 36.  
 18. ₹ 33600; ₹ 33480.                      19. (i) ₹ 722 (ii)  $3\frac{1}{7}\%$ .                      20. X.  
 21. 31.6%.                      22. 40%.                      23. ₹ 44.                      24. ₹ 2260.  
 25. ₹ 300; ₹ 1080; ₹ 1100; ₹ 1320.

### Chapter Test

1. ₹ 145000.                      2. 275 ml.                      3. ₹ 84000.                      4. 5%.                      5. ₹ 230.  
 6. ₹ 856.                      7. ₹ 900.                      8. ₹ 1000.                      9. ₹ 42000.                      10. ₹ 650.  
 11. 29%.                      12.  $15\frac{15}{16}\%$ .                      13. (i)  $14\frac{2}{7}\%$  (ii) 25%.

### Exercise 3.1

1. ₹ 11236; ₹ 1236.  
 2. (i) ₹ 1000 (ii) ₹ 13500 (iii) ₹ 1080 (iv) ₹ 14580 (v) ₹ 2080.  
 3. (i) ₹ 16500 (ii) ₹ 1650 (iii) ₹ 19965.  
 4. ₹ 1540; ₹ 18634.  
 5. (i) ₹ 3750 (ii) ₹ 54675 (iii) ₹ 4374 (iv) ₹ 59049.  
 6. ₹ 70246.40.  
 7. (i) ₹ 17600 (ii) ₹ 19360 (iii) ₹ 3360 (iv) ₹ 1760 (v) ₹ 21296.  
 8. ₹ 787.                      9. ₹ 46305; ₹ 6305.                      10. ₹ 17658; ₹ 2658.  
 11. ₹ 27104; ₹ 7104.                      12. (i) 10% (ii) ₹ 14520 (iii) ₹ 2520.  
 13. (i) 8% (ii) ₹ 1350 (iii) ₹ 19683 (iv) ₹ 1458 (v) ₹ 4058.  
 14. ₹ 26620; ₹ 6620.

### Exercise 3.2

1. ₹ 9331.20; ₹ 1331.20.                      2. ₹ 13867.50; 1867.50.  
 3. ₹ 70246.40; ₹ 20246.40.                      4. ₹ 22781; ₹ 6781.

5. ₹ 36602.50; ₹ 11602.50.

6. ₹ 4056; ₹ 306.

7. ₹ 9261; ₹ 1261.

8. ₹ 32.

## Chapter Test

1. (i) ₹ 1650 (ii) ₹ 16650 (iii) ₹ 1831.50 (iv) ₹ 18481.50 (v) ₹ 3481.50.

2. (i) ₹ 15400 (ii) ₹ 1540 (iii) ₹ 18634 (iv) ₹ 4634 (v) ₹ 1694.

3. (i) 8% (ii) ₹ 864 (iii) ₹ 12597.

4. ₹ 18522; ₹ 2522.

5. ₹ 31492.80; ₹ 6492.80.

6. ₹ 72.

7. ₹ 42182.40; ₹ 4682.40.

## Exercise 4.1

1. (i)  $4x^2 + 28xy + 49y^2$

(ii)  $\frac{1}{4}x^2 + \frac{2}{3}xy + \frac{4}{9}y^2$

2. (i)  $9x^2 + \frac{1}{4x^2} + 3$

(ii)  $9x^4y^2 + 30x^2yz + 25z^2$

3. (i)  $9x^2 + \frac{1}{4x^2} - 3$

(ii)  $\frac{1}{4}x^2 - \frac{3}{2}xy + \frac{9}{4}y^2$

4. (i)  $x^2 + 8x + 15$

(ii)  $x^2 - 2x - 15$

(iii)  $x^2 + 2x - 63$

(iv)  $x^2 - 5xy + 6y^2$

5. (i)  $x^2 + 4y^2 + z^2 - 4xy + 4yz - 2zx$

(ii)  $4x^2 + 9y^2 + 16z^2 - 12xy - 24yz + 16zx$

6. (i)  $4x^2 + \frac{9}{x^2} + 13 - \frac{6}{x} - 4x$

(ii)  $\frac{4}{9}x^2 + \frac{9}{4x^2} - 1 - \frac{4}{3}x + \frac{3}{x}$

7. (i)  $x^3 + 6x^2 + 12x + 8$

(ii)  $8a^3 + b^3 + 12a^2b + 6ab^2$

8. (i)  $27x^3 + \frac{1}{x^3} + 27x + \frac{9}{x}$

(ii)  $8x^3 - 12x^2 + 6x - 1$

9. (i)  $125x^3 - 27y^3 - 225x^2y + 135xy^2$

(ii)  $8x^3 - \frac{1}{27y^3} - \frac{4x^2}{y} + \frac{2x}{3y^2}$

10. (i)  $2(a^2 + b^2)$  (ii)  $4ab$  11. (i)  $2\left(a^2 + \frac{1}{a^2}\right)$  (ii) 4. 12. (i)  $3 - 3x$  (ii) 0.

13. (i)  $49p^2 - 81q^2$

(ii)  $4x^2 - \frac{9}{x^2}$

14. (i)  $4x^2 - 4xy + y^2 - 9$

(ii)  $9x^2 - 30x + 25 - y^2$

15. (i)  $x^2 - 6x + 9 - \frac{4}{x^2}$

(ii)  $625 - 16x^4$

16. (i)  $x^2 + 4xy + 4y^2 + 10x + 20y + 21$

(ii)  $4x^2 + 4xy + y^2 - 8x - 4y - 45$

(iii)  $x^2 - 4xy + 4y^2 - 2x + 4y - 15$

(iv)  $9x^2 - 24xy + 16y^2 - 24x + 32y + 12$

17. (i)  $8p^3 + 27q^3$  (ii)  $x^3 + \frac{1}{x^3}$

18. (i)  $27p^3 - 64q^3$  (ii)  $x^3 - \frac{27}{x^3}$

19.  $8x^3 + 27y^3 + 64z^3 - 72xyz$

20. (i)  $x^3 + 6x^2 + 11x + 6$

(ii)  $x^3 - x^2 - 14x + 24$

21. 0; -37.

22. 4.

23. (i) 10201

(ii) 1006009

(iii) 104.04.

24. (i) 9801

(ii) 994009

(iii) 96.04.

25. (i) 1092727

(ii) 970299

(iii) 1030.301.

28. 0.

29. (i) 13770

(ii) -16380.

30. 1.

## Exercise 4.2

1. 74.      2. 116.      3. 25.      4. 352.      5. 68.      6. (i)  $\pm 5$     (ii)  $\pm 1$ .  
 7. (i)  $\pm 8$     (ii)  $\pm 32$ .      8. (i)  $\pm 15$     (ii)  $\pm 135$ .      9. (i) 26    (ii) 5.  
 10. 11.      11. (i)  $\pm 7$     (ii)  $169\frac{1}{2}$     (iii)  $310\frac{1}{2}$     or  $254\frac{1}{2}$ .    12. 123.  
 13. 63.      14. 135.    15. (i) 14    (ii) 194    (iii) 52    (iv)  $\pm 2\sqrt{3}$ .  
 16. 727.      17. (i) 7    (ii)  $\pm 3$     (iii)  $\pm 18$ .  
 18. (i)  $\pm 4\sqrt{2}$     (ii)  $\pm 24\sqrt{2}$ .      20. 45      23.  $\pm 5$ .      24.  $\pm 445$ .  
 25.  $\pm 3$ .      26.  $\pm 22\frac{1}{2}$ .      27. (i) 7    (ii) 18.  
 28. (i) 5    (ii)  $\pm \sqrt{29}$     (iii)  $\pm 5\sqrt{29}$ .    29. 0.      30.  $2\sqrt{3}$ .    31. 100.  
 32. 22.      33.  $\pm 15$ .    34. -2.      35. 721.      36. 10.      37. 152.

## Chapter Test

1. (i)  $4x^2 + 9y^2 + 12xy - 25$   
 (ii)  $36 + 16a^2 + 49b^2 - 48a + 56ab - 84b$   
 (iii)  $343 - 27x^3y^3 - 441xy + 189x^2y^2$   
 (iv)  $x^3 + y^3 + 3x^2y + 3xy^2 + 6x^2 + 6y^2 + 12xy + 12x + 12y + 8$ .
2.  $x^8 - 256$ .      3. 999996.      4. 0.      5. 27.      6. 27.      7.  $p^2 - q^2 = 4$ .  
 8. 104.      9. (i) 4    (ii) 52    (iii) 2702.    10.  $27 + 19\sqrt{2}$ .    11.  $\pm 26\frac{26}{27}$ .  
 12.  $-30\sqrt{3}$       13. 85.      14. (i) -10    (ii) 29.      15. 6.

## Exercise 5.1

1. (i)  $4xy^2(2y + 3x)$       (ii)  $3ax^2(5x - 3)$ .  
 2. (i)  $7py(3y - 8)$       (ii)  $2x^2(2x - 3)$ .  
 3. (i)  $2\pi r(r - 2)$       (ii)  $2(9m + 8n)$ .  
 4. (i)  $5abc(5c - 3ab)$       (ii)  $14pq^2r(2p - 3r)$ .  
 5. (i)  $2x(4x^2 - 3x + 5)$       (ii)  $2(7mn + 11m - 31p)$ .  
 6. (i)  $6pq(3pq - 4q + 5p)$       (ii)  $3a^2b^2(9ab - 6b + 25a)$ .  
 7. (i)  $5(2p - 3q)(3a - 2b)$       (ii)  $3(x^2 + y^2)(a + 2b)$ .  
 8. (i)  $2(x + 2y)^2(3x + 6y + 4)$       (ii)  $7(a - 3b)[2(a - 3b)^2 - 3p]$ .  
 9. (i)  $5(2p + q)[2a(2p + q)^2 - 3b(2p + q) + 7]$   
 (ii)  $(x^2 + y^2 - z^2)(x - y - z)$ .

## Exercise 5.2

1. (i)  $(x + y)(x - 1)$       (ii)  $(y - z)(y - 5)$ .  
 2. (i)  $(x - y)(5y - 7)$       (ii)  $(5p - 8q)(p - 2)$ .  
 3. (i)  $(a - b)(ab + 3)$       (ii)  $(x - 3)(x^2 + 1)$ .  
 4. (i)  $(2y - 1)(3xy - 5)$       (ii)  $(x - 2y)(3a + 4b)$ .  
 5. (i)  $(1 - a)(1 - b)$       (ii)  $(a - 2b)(a - c)$ .  
 6. (i)  $(x + y)(x + y^2)$       (ii)  $(y - x)(y + x^2)$ .  
 7. (i)  $(b + 1)(ab - 1)$       (ii)  $(a - 2b)(2 - x)$ .  
 8. (i)  $(5 + 2r)(ph - 2qk)$       (ii)  $(x - a)(x - 2b)$ .  
 9. (i)  $(bx - ay)(ax - by)$       (ii)  $(x^2 + y^2)(a^2 + b^2)$ .

10. (i)  $(a - 2b)(a^2 + b)$

(ii)  $3(x - 1)(xy + 4)$ .

11.  $(a + b)(ab - bc + xy)$ .

12.  $(a - b)(x^2 + y^2 + z^2)$ .

13.  $(x - 1)(2 - x + a)$ .

**Exercise 5.3**

1. (i)  $(2x + 5y)(2x - 5y)$

(ii)  $(3x + 1)(3x - 1)$ .

2. (i)  $6(5 + a)(5 - a)$

(ii)  $2(4x + 3y)(4x - 3y)$ .

3. (i)  $(x - y + 3)(x - y - 3)$

(ii)  $(4x + 3y)(2x + 3y)$ .

4. (i)  $5(2x + 3y)(2x - 3y)$

(ii)  $-(7x + 2y)(x + 2y)$ .

5. (i)  $2(x + 3y)(x - 7y)$

(ii)  $2x(8 - x)$ .

6. (i)  $3(6a + b - c)(6a - b + c)$

(ii)  $\pi a(a^2 + \pi b)(a^2 - \pi b)$ .

7. (i)  $8(2x + 1)(3x - 1)$

(ii)  $(x + 1)(x - 1)$ .

8. (i)  $(x - 2y)(1 - x - 2y)$

(ii)  $(2a + b)(2a - b + 1)$ .

9. (i)  $(a - b)(a + b - 2)$

(ii)  $(a - b)(a + b - 1)$ .

10. (i)  $(3 + x - y)(3 - x + y)$

(ii)  $(3x^2 + x + 1)(3x^2 - x - 1)$ .

11. (i)  $(3x^2 + x + 6)(3x^2 - x - 6)$

(ii)  $(x + 1)(x - 1)(x - 5)$ .

12. (i)  $(a^2 + b^2 - 1)(a^2 - b^2 + 1)$

(ii)  $x(x + 5)(x - 5)$ .

13. (i)  $2(x^2 + 4)(x + 2)(x - 2)$

(ii)  $(b + c)(a + b + c)(a - b - c)$ .

14. (i)  $(a + b)(a + b + 1)(a + b - 1)$  (ii)  $(x - y + a + b)(x - y - a - b)$ .

15. (i)  $(ac - bd + bc + ad)(ac - bd - bc - ad)$

(ii)  $(x - y)(4x + y + 2)$ .

16. (i)  $(x - \frac{1}{x} + 3)(x - \frac{1}{x} - 3)$

(ii)  $(x^2 + x + 3)(x^2 - x + 3)$ .

17. (i)  $(a^2 + b^2 + 3ab)(a^2 + b^2 - 3ab)$  (ii)  $(x^2 + 4x + 1)(x^2 - 4x + 1)$ .

18. (i)  $(x^2 + 7)^2 - (5x)^2$  (ii)  $(x^2 - 5x)^2 - 7^2$  (iii)  $x^2 - (5x - 7)^2$ .

19. (i) 958000

(ii) 9980.

20. (i)  $\frac{97}{36}$

(ii)  $\frac{13}{6}$

(iii)  $\frac{793}{216}$

(iv)  $\frac{6305}{1296}$ .

21. (i) 0 (ii) 0.

**Exercise 5.4**

1. (i)  $(x + 2)(x + 3)$

(ii)  $(x - 1)(x - 7)$ .

2. (i)  $(x + 7)(x - 1)$

(ii)  $(y + 9)(y - 2)$ .

3. (i)  $(y - 9)(y + 2)$

(ii)  $(a + 6)(a - 9)$ .

4. (i)  $(x - 2)(2x - 3)$

(ii)  $(3x - 1)(2x + 5)$ .

5. (i)  $(2x + 5)(3x - 2)$

(ii)  $(3x + 1)(2x - 3)$ .

6. (i)  $(x - 2)(2x + 3)$

(ii)  $(x + 1)(3x - 7)$ .

7. (i)  $(y + 5)(2y - 9)$

(ii)  $(1 - 2x)(5 + 6x)$ .

8. (i)  $(4x + 5)(3x - 2)$

(ii)  $(x - 8)(x - 2)$ .

9. (i)  $10(2x - 3)(3x + 1)$

(ii)  $(x + y)(x - 7y)$ .

10. (i)  $(x + 8y)(2x - 3y)$

(ii)  $(2x - 3y)(3x + 2y)$ .

11. (i)  $(x + 4y)(5x - 3y)$

(ii)  $(xy + 4)(xy - 12)$ .

12. (i)  $(ab - 6)(2ab + 5)$

(ii)  $(2a + b)(a - b)$ .

13. (i)  $(x - y - 5)(x - y - 1)$

(ii)  $(2x - y - 7)(2x - y - 4)$ .

14. (i)  $(2a - 5)(2a - 1)$

(ii)  $(1 - 3a - 3b)(1 + a + b)$ .

15. (i)  $(1 - 3a - 3b)(3 + 4a + 4b)$

(ii)  $(a^2 - 10)(a + 1)(a - 1)$ .

16. (i)  $(x + y + 4)(x - 6y + 4)$

(ii)  $(x + 2)(x - 4)(x + 3)(x - 5)$ .

17.  $(3a - 4)(a - 5)$ .

18.  $(x - 1)(2x + 7)(x + 4)(2x - 3)$ .

## Exercise 5.5

1. (i)  $(2x + y)(4x^2 - 2xy + y^2)$  (ii)  $(4x - 5y)(16x^2 + 20xy + 25y^2)$ .
2. (i)  $(4x + 1)(16x^2 - 4x + 1)$  (ii)  $7(a + 2b)(a^2 - 2ab + 4b^2)$ .
3. (i)  $\left(\frac{x^2}{7} + \frac{7}{x^2}\right)\left(\frac{x^4}{49} - 1 + \frac{49}{x^4}\right)$  (ii)  $\left(2x - \frac{1}{3y}\right)\left(4x^2 + \frac{2x}{3y} + \frac{1}{9y^2}\right)$ .
4. (i)  $x^2(1 + x)(1 - x + x^2)$  (ii)  $4x(2x - 5)(4x^2 + 10x + 25)$ .
5. (i)  $(3xy - 2)(9x^2y^2 + 6xy + 4)$  (ii)  $(7x + y)(13x^2 - 4xy + 19y^2)$ .
6. (i)  $(a + b)(a^2 - ab + b^2 + 1)$  (ii)  $(a - b)(a^2 + ab + b^2 - 1)$ .
7. (i)  $(x + 1)(x^2 - x + 2)$  (ii)  $(a - 5)(a^2 + 5a + 24)$ .
8. (i)  $(x + 4)(x^2 + 2x + 4)$  (ii)  $(a - 2b)(a^2 - ab + b^2)$ .
9. (i)  $(a + 2b)(2a^2 - 4ab + 8b^2 - 5)$  (ii)  $\left(a - \frac{1}{a}\right)\left(a^2 + \frac{1}{a^2} - 1\right)$ .
10. (i)  $(a + b)(a - b)(a^2 + ab + b^2)(a^2 - ab + b^2)$   
(ii)  $(x + 1)(x - 1)(x^2 + x + 1)(x^2 - x + 1)$ .
11. (i)  $(2x + 3y)(2x - 3y)(4x^2 + 6xy + 9y^2)(4x^2 - 6xy + 9y^2)$   
(ii)  $\frac{1}{x}(x - 2)(x^2 + 2x + 4)$ .
12. (i)  $2(5a - 5b + 1)(25a^2 - 50ab + 25b^2 - 5a + 5b + 1)$   
(ii)  $(2a + b)(2a - b)(2x - y)(4x^2 + 2xy + y^2)$ .
13. (i)  $(x + y)(x^2 - xy + y^2)(x^6 - x^3y^3 + y^6)$   
(ii)  $(x - 2)(x^2 + 2x + 4)(x + 1)(x^2 - x + 1)$ .

## Chapter Test

1. (i)  $5(2x - 3)[3(2x - 3)^2 - 2]$  (ii)  $(b - c)[a(b + c) + d]$ .
2. (i)  $(x + 1)(2a^2 - b)$  (ii)  $(p - a)(p - 2b)$ .
3. (i)  $(x - z)(xz + y^2)$  (ii)  $5a(a - 1)(a^2 + 6)$ .
4. (i)  $(c - d)(bc - bd - a + 3)$  (ii)  $(x - 1)(x^2 - y + 1)$ .
5. (i)  $(x - y)(x + y + z)$  (ii)  $a^4x^4(a^4 + x^4)(a^2 + x^2)(a + x)(a - x)$ .
6. (i)  $(3x + 2 + 4y)(3x + 2 - 4y)$  (ii)  $(x^2 + x + 2)(x^2 - x + 2)$ .
7. (i)  $(3x - 5y)(7x - 8y)$  (ii)  $4xy(x - 4)(x - 7)$ .
8. (i)  $(xy - 9)(xy + 8)$  (ii)  $xy(x + 4y)(9x + 5y)$ .
9. (i)  $(3a - 2b + 5)(3a - 2b - 2)$  (ii)  $(x^2 - 3x + 5)(x - 1)(x - 2)$ .
10. (i)  $(x + 1)(x - 2)(4x^2 - 4x + 3)$  (ii)  $(x^2 + 9y^2 + 3xy)(x^2 + 9y^2 - 3xy)$ .
11. (i)  $\left(\frac{2}{3}x - \frac{1}{2}y\right)\left(\frac{4}{9}x^2 + \frac{1}{3}xy + \frac{1}{4}y^2\right)$   
(ii)  $(x + 4)(x^2 - 4x + 16)(x - 1)(x^2 + x + 1)$ .
12. (i)  $\left(x + \frac{1}{x}\right)\left(x^2 - 1 + \frac{1}{x^2} + x - \frac{1}{x}\right)$  (ii)  $4x(x^2 + 3)(3x^2 + 1)$ . 14. 931.

## Exercise 6.1

1. (i)  $s = \frac{v^2 - u^2}{2a}$  (ii)  $a = \frac{2(s - ut)}{t^2}$  2. (i)  $h = \frac{S - 2\pi r^2}{2\pi r}$  (ii)  $m = \frac{nP}{1 - P}$ .
3. (i)  $R = \pm \sqrt{\frac{A}{\pi} + r^2}$  (ii)  $x = \pm \sqrt{\frac{2(W - pq)}{N}}$  4. (i)  $I = \frac{T^2MH}{4\pi^2}$  (ii)  $t = \pm \sqrt{\frac{1 - c}{1 + c}}$ .
5. (i)  $x = \frac{b(t+1)}{a-t}$  (ii)  $r_1 = \frac{Rr_2}{r_2 - R}$ .

$$6. (i) n = \pm \sqrt{\frac{lRm^2}{Rl - m^2}} \quad (ii) c = -ax^2 - bx. \quad 7. p = \frac{2(q+4r)}{5}. \quad 8. n = \frac{l-a+d}{d}.$$

$$9. m = \frac{b-dp}{cp-a}. \quad 10. n = \frac{3x}{tx+y}. \quad 11. x = \frac{3}{2}(a+b). \quad 12. z = \frac{2(x+4)}{11x-6}.$$

### Exercise 6.2

$$1. x = \frac{3y+1}{2-y}; 4. \quad 2. H = 2(W+20); 180. \quad 3. h = \frac{A}{2\pi r} - r; 9.$$

$$4. c = \frac{T}{n}; \text{Rs } 1.50. \quad 5. c = \frac{a-b}{bt}, 0.001. \quad 6. r = \frac{q}{pq-1}; 1\frac{1}{20}.$$

$$7. u = v - a(t_2 - t_1); 7. \quad 8. 5. \quad 9. a = \pm \sqrt{2b\left(\frac{p+q}{p-q}\right)}; \pm 6.$$

$$10. v = \frac{uf}{u-f}; 10.5. \quad 11. d = \frac{2(s-an)}{n(n-1)}; -1. \quad 12. c = \frac{100(y-x)}{y+x}; 50.$$

$$13. d = n - 3; (i) 7 (ii) 8.$$

### Chapter Test

$$1. (i) T = 2\pi\sqrt{\frac{l}{g}} \quad (ii) l = \frac{T^2g}{4\pi^2} \quad (iii) \frac{44}{35} \text{ sec.} \quad 2. x = \pm \sqrt{\frac{a+b}{c}}; \pm \sqrt{2}.$$

$$3. x = \frac{y+3}{y-1}; -1, 3. \quad 4. x = \frac{a-y}{k-y}; 2. \quad 5. z = \frac{x}{2}; \frac{5}{2}.$$

### Exercise 7

$$1. (i) 18 \quad (ii) 3 - 2\sqrt{2}. \quad 2. (i) \frac{10}{9} \quad (ii) 4. \quad 3. (i) -25 \quad (ii) 6\frac{1}{2}.$$

$$4. (i) -1 \quad (ii) 10. \quad 5. (i) 1 \quad (ii) \frac{13}{4}. \quad 6. (i) \frac{25}{12} \quad (ii) 7. \quad 7. (i) 2\frac{1}{12} \quad (ii) 7.$$

$$8. (i) -1 \quad (ii) -2. \quad 9. (i) -\frac{1}{2} \quad (ii) 2\frac{1}{4}. \quad 10. 1. \quad 11. 78\frac{1}{2}.$$

$$12. x = 6, p = \frac{5}{6}. \quad 13. x = -6, a = 2. \quad 14. x = -1, y = \frac{2}{3}. \quad 15. 10.$$

$$16. -7. \quad 17. 30. \quad 18. 4. \quad 19. 0. \quad 20. 6 \text{ cm.}$$

### Chapter Test

$$1. 5. \quad 2. \frac{1}{2}. \quad 3. 2. \quad 4. 1. \quad 5. 2. \quad 6. \frac{5+3\sqrt{5}}{10}.$$

$$7. 1\frac{3}{5}. \quad 8. 1. \quad 9. -\frac{14}{13}. \quad 10. -104. \quad 11. 8. \quad 12. 4 \text{ cm.}$$

### Exercise 8.1

$$1. (i) x = 1, y = 4 \quad (ii) x = -8, y = -4. \quad 2. (i) a = 2, b = 1 \quad (ii) x = 2, y = -\frac{3}{2}.$$

$$3. (i) x = 3, y = 4 \quad (ii) x = 7\frac{27}{31}, y = 2\frac{13}{31}.$$

$$4. (i) x = 4, y = 3 \quad (ii) x = \frac{21}{20}, y = -\frac{3}{10}. \quad 5. (i) x = 5, y = -3 \quad (ii) x = 2, y = 1.$$

$$6. (i) x = 12, y = 8 \quad (ii) x = \frac{26}{11}, y = -\frac{5}{11}.$$

$$7. (i) x = \frac{26}{3}, y = -\frac{8}{3} \quad (ii) x = \frac{3}{4}, y = -\frac{9}{4}.$$

$$8. (i) x = 5, y = 2 \quad (ii) x = 3, y = 2. \quad 9. (i) x = 4, y = -4 \quad (ii) x = 2, y = -1.$$



10. (i)  $x = \frac{1}{5}, y = -2$  (ii)  $x = 2, y = 1$ .  
 11. (i)  $x = 4, y = -2$  (ii)  $x = \frac{1}{2}, y = \frac{1}{3}$ .  
 12. (i)  $x = 0, y = 0; x = 7, y = 1$  (ii)  $x = 0, y = 0; x = \frac{11}{7}, y = \frac{11}{3}$ .  
 13. (i)  $x = 4, y = 5$  (ii)  $x = 2, y = 1$ .  
 14. (i)  $x = 2, y = 1$  (ii)  $x = \frac{1}{2}, y = \frac{5}{4}$ .  
 15.  $x = 15, y = 5; 3$ .  
 16.  $x = \frac{16}{5}, y = \frac{23}{5}; p = \frac{19}{8}$ .  
 17.  $x = 7, y = 9; x - 3y = -20, 5y - 2x = 31$ .  
 18.  $a = 2, b = 3$ .  
 19. 28 cm.  
 20. Yes;  $x = 7, y = 2$ .

### Exercise 8.2

3. 15 sq. units. 4. 6 sq. units. 5. (i) -7 (ii) 3. 6. 2. 7.  $a = 0, b = 1$ .

### Exercise 8.3

1.  $x = -2, y = -5$ . 2.  $x = -4, y = -2$ . 3.  $x = 2, y = -2$ . 4.  $x = -1, y = 0$ .  
 5.  $x = 2, y = 2$ . 6.  $x = 2, y = 1$ . 7. (ii)  $(-2, -1)$  (iii) 4.5 cm.  
 8.  $x = 2, y = -1$ . 9. (ii)  $(2, 4); 6\frac{2}{3}$  sq. units.  
 10.  $x = 1, y = -2; \frac{3}{2}$  sq. units. 11.  $x = 2, y = 1; \frac{4}{3}$  sq. units.  
 12.  $(-3, 2), (-3, 6), (3, 2)$ . 13.  $(0, 0), (5, 0), (2, 2); 5$  sq. units.

### Chapter Test

1. (i)  $x = 3, y = 4$  (ii)  $x = 14, y = 2$ . 2. (i)  $x = -2, y = 7$  (ii)  $x = 3.2, y = 2.3$ .  
 3. (i)  $x = 0, y = 0; x = \frac{1}{3}, y = \frac{1}{4}$  (ii)  $x = 8, y = 3$ .  
 4. (i)  $x = 1, y = -1$  (ii)  $x = 2, y = 3$ . 5.  $x = 3, y = -1; k = 2$ .  
 6.  $x = 3, y = 2; 14$ . 7. Yes;  $x = \frac{1}{3}, y = \frac{1}{2}$ . 8. 12 cm.  
 9.  $x = 5, y = 1$ . 10.  $x = 2, y = -1$ . 11.  $(4, 5); 12.5$  sq. units.  
 12.  $(-3, -2), (5, 1)$  and  $(1, 6)$ . 13.  $(2, -1), (3, 2), (-4, 2); 10.5$  sq. units.

### Exercise 9.1

1. 33. 2. -7. 3. 7. 4. 4. 5. 15, 10.  
 6. Dress ₹ 480, belt ₹ 90. 7. Don 765, Peter 660. 8.  $6\frac{1}{4}$ .  
 9. 60 cm. 10. 19. 11. 64. 12. 88. 13. 37, 39. 14. 3, 5, 7.  
 15. 22, 24. 16. 45 years, 20 years. 17. 40 years, 20 years.  
 18. Anand 14 years, Anju 9 years, father 34 years. 19. 18 years, 8 years.  
 20. ₹ 9900. 21. ₹ 90000, ₹ 120000. 22. 73. 23. 26, 27, 28.  
 24. 73. 25. 78. 26. 71.  
 27. 83. 28. 96 square units. 29. 25 m, 20 m. 30. 4 m.  
 31. 12 litres. 32. 80 ml.  
 33. Single-bed room ₹ 840, double-bed room ₹ 1260.  
 34. Shirt ₹ 360, tie ₹ 156. 35.  $\frac{1}{30} + \frac{1}{x} = \frac{1}{20}; 60$  36.  $\frac{15}{29}$ .  
 37. 23, 9. 38. 0.6 km. 39. 3 km. 40. 540 km/hr, 580 km/hr.  
 41. 25 km/hr, 30 km/hr. 42. 37.5 km/hr. 43. 3 km/hr. 44. 10 kg.

## Exercise 9.2

1. 33, 17.
2. 11, -9.
3. 33, 10.
4. ₹ 206.
5. 16 kg and 20 kg.
6. 10, 8.
7. 20 paise 20 coins, 25 paise 18 coins.
8. 20 rupee notes = 16, 5 rupee notes = 12.
9. 8 and 12.
10.  $\frac{2}{15}$ .
11.  $\frac{8}{15}$ .
12.  $\frac{6}{8}$ .
13. 43.
14. 34.
15. 72.
16. 84.
17. 45.
18. 842.
19. 34 years, 14 years.
20. ₹ 800.
21. ₹ 5000 at 12% and ₹ 7000 at 10%.
22. Table ₹ 600; chair ₹ 400.
23. A has ₹ 500, B has ₹ 900.
24. 60.
25. 4 litres 25%, 6 litres 50%.
26. 80 gm 18-carat, 40 gm 12-carat.
27. A in 25 days, B in  $37\frac{1}{2}$  days.
28. 18 days.
29. 20 hours, 30 hours.
30. 10 km/hr, 40 km/hr.
31. 360 km.
32. 15 km/hr, 5 km/hr.
33. 8 km/hr, 3 km/hr.
34. 520 km/hr, 40 km/hr.
35. ₹ 1200, ₹ 70.

## Chapter Test

1. 12.
2. 3 weeks 5 days.
3. 660.
4. 10.
5. 84 years.
6. Rohan 13 years, his sister 5 years.
7. 1325 m<sup>2</sup>.
8. ₹ 1000, ₹ 700, ₹ 500.
9. ₹ 78.
10. 150.
11. Almonds 400 gm, cashew kernel 300 gm.
12. 8.
13. ₹ 8 per regular hour and ₹ 10 per hour for overtime.
14. 16.
15. Man's age 42 years, his son's age 12 years.
16. 113 m<sup>2</sup>.
17. 40 metres.
18. 19.5 metres.
19. Longer candle 27 cm, smaller candle 24 cm.

## Exercise 10

1. (i)  $a^5b^{10}$  (ii)  $\frac{1}{16x^2y^2}$ .
2. (i)  $8a^{-9}b^6$  (ii)  $a + b$ .
3. (i)  $\frac{1}{x+y}$  (ii)  $3 \times (10)^{-8}$ .
4. (i)  $5ab$  (ii)  $2\frac{1}{4}$ .
5. (i)  $2\frac{1}{2}$  (ii) 0.3.
6. (i) 9 (ii)  $1\frac{11}{16}$ .
7. (i)  $3^{3n}$  (ii)  $\frac{1}{6}$ .
8. (i)  $\frac{1}{2}$  (ii)  $-12\frac{3}{4}$ .
9. (i)  $\frac{1}{27}$  (ii)  $2x$ .
10. (i) 19 (ii) 231.
11. (i) 12 (ii) 27.
12. (i)  $2\frac{1}{4}$  (ii) 19.
13. (i)  $\frac{1}{2}$  (ii) 243.
14. (i) -2 (ii)  $\frac{4}{21}$ .
15. (i) 4 (ii)  $\frac{1}{25}$ .
16. (i) -42 (ii) 98.25.
17. (i) 3 (ii)  $x - \frac{1}{x}$ .
18. (i) 1 (ii) 1.
19. (i) 1 (ii) 1 (iii)  $x^2(a^3 + b^3 + c^3)$
20. (i)  $\frac{ab}{b-a}$  (ii) 1.
26. 1,  $\frac{1}{x^2y^2}$ ,  $9a^6$ .
27. (i)  $27\frac{1}{4}$  (ii)  $-7\frac{8}{9}$ .
28. 3.
29. 6.
30.  $x = 2, y = 3, z = 7$ .
31.  $x = 2, y = -\frac{2}{3}$ .
33. 6.
34. (i)  $-\frac{3}{2}$  (ii) 4 (iii) -7 (iv) -4.
35. (i)  $\frac{3}{4}$  (ii)  $\frac{5}{7}$ .
36.  $x = 1, y = -3$ .
38. 1.
39. 64.
40. (i)  $x = 3$  (ii)  $x = 1, y = -1$ .

## Chapter Test

1.  $x = 4, y = 3, z = 1; 2 \frac{1}{40}$ .    2. (i)  $3 \frac{26}{27}$     (ii)  $9 \frac{1}{8}$ .  
 9. (i)  $x = 6$     (ii)  $x = \frac{3}{4}, y = -\frac{8}{3}$     (iii)  $x = 3, y = \frac{5}{2}$     (iv)  $x = 3, y = 1$ .

### Exercise 11.1

1. (i)  $\log_5 25 = 2$     (ii)  $\log_a 64 = 5$     (iii)  $\log_7 100 = x$     (iv)  $\log_9 1 = 0$   
 (v)  $\log_6 6 = 1$     (vi)  $\log_3 \frac{1}{9} = -2$     (vii)  $\log_{10} 0.01 = -2$     (viii)  $\log_{81} 27 = \frac{3}{4}$ .
2. (i)  $2^5 = 32$     (ii)  $3^4 = 81$     (iii)  $3^{-1} = \frac{1}{3}$     (iv)  $(8)^{\frac{2}{3}} = 4$   
 (v)  $(8)^{\frac{5}{3}} = 32$     (vi)  $10^{-3} = 0.001$     (vii)  $2^{-2} = 0.25$     (viii)  $a^{-1} = \frac{1}{a}$ .
3. (i) 4    (ii) 3    (iii)  $\frac{3}{2}$     (iv)  $\frac{3}{2}$     (v) -2    (vi) -1    (vii) -8    (viii) -2.
4. (i) 9    (ii) 5    (iii) 0.01    (iv) 2    (v) 11    (vi) 4    (vii) 729    (viii) 243  
 (ix)  $\frac{1}{8}$     (x) 5    (xi) 10    (xii) 2    (xiii)  $\frac{5}{2}$     (xiv) 2    (xv)  $\pm \square 3$     (xvi)  $\frac{1}{10}$   
 (xvii)  $6 \frac{1}{2}$     (xviii)  $\frac{1}{100}, 1, \sqrt[3]{10}$ .
5.  $\frac{a^2}{1000}$ .    6. (i)  $\frac{x^2}{1000}$     (ii)  $\frac{y^3}{10}$     (iii)  $\frac{x^2 \sqrt{y}}{z^3}$ .    7.  $10^{a+b}$ .
8.  $10^{3m-2n}$ .    9. (i)  $\sqrt{x}$     (ii)  $10y^4$     (iii)  $\frac{x^{3/2}}{y^4}$ .    10.  $y^3 z^2$ .    11.  $\frac{x^4 y^4}{100}$ .

### Exercise 11.2

1. (i)  $\log a$     (ii)  $\frac{3}{2}$     (iii) 2    (iv)  $\log 4$     (v) 6    (vi)  $\frac{1}{3}$ .
2. (i)  $\frac{2}{3}$     (ii)  $\frac{1}{2}$     (iii) 2    (iv) 1    (v) 2    (vi) 0    (vii) 1    (viii) 2.
3. (i)  $\log 27$     (ii)  $\log_{10} 8000$     (iii)  $\log 256$     (iv)  $\log \frac{50}{9}$     (v)  $\log 2$ .
5.  $1 - 4a + 2b - 3c$ .    6. (i)  $10^a$     (ii)  $\frac{2}{5} a$ .    7. (i) 0    (ii) 1.
8. (i) 0    (ii) 1.    9. (i) 1    (ii) 7.    10.  $\frac{4}{3} \pi r^3$ .    11. 3.    12.  $\frac{100}{x^2}$ .
13.  $\log_{10} 20$ .    14.  $\frac{\sqrt{x}}{\sqrt[3]{y}}$ .    15.  $3x + y$ .    16.  $1 - m + 3n$ .    17. 1.
18. (i)  $\frac{9}{5}$     (ii) 6    (iii)  $\frac{3}{2}$     (iv) 1000.    19. (i) 5    (ii) 1.    20.  $x = \frac{1}{25}, y = \frac{1}{2}$ .
22. (i) 2    (ii) 5    (iii) 4.5    (iv) 3    (v) 1    (vi) 14    (vii) 2.
23.  $1 \frac{1}{40}$ .    24. 10.    27. 3.    30.  $\frac{1}{\alpha + \beta + \gamma}$ .    31. (i) 3    (ii) 2.

## Chapter Test

1.  $\frac{7}{3} \log_a x + \frac{8}{3} \log_a y - \frac{1}{12} \log_a z$ .    2. 5.
7. (i) 7    (ii)  $\sqrt{2}$     (iii)  $\frac{1}{\sqrt{3}}$     (iv)  $6 \frac{1}{2}$     (v) 5, -5    (vi) 11, -11    (vii) 3, -4  
 (viii) 3    (ix) 10.    8.  $x = 1000, y = 100$ .

**Exercise 12.1**

1. (i) Congruent; A.A.S. (ii) Congruent; R.H.S. (iii) Congruent; A.S.A.  
(iv) Not necessary; corresponding sides may not be equal.
2. (i) Congruent; S.A.S. (ii) Not necessary; included angles may not be equal.  
(iii) Congruent; A.A.S. (iv) Congruent; S.S.S. (v) Congruent; R.H.S.  
(vi) Congruent; S.S.S. (vii) Congruent; R.H.S.
16. (i)  $x = 15, y = 41$  (ii)  $x = 13, y = 11$  (iii)  $x = 8, y = 4$ .

**Exercise 12.2**

1. (i) 115 (ii) 68 (iii) 12. 2. (i) 42 (ii) 40 (iii) 93.
3. (a)  $x = 75^\circ, y = 75^\circ, z = 45^\circ$  (b)  $a = 60, b = 60, c = 65$  (c)  $72^\circ$ .
4. (a)  $\angle b = 65^\circ, \angle d = 65^\circ$ ; yes (b)  $135^\circ$  (c)  $x = 127^\circ, y = 38^\circ$ .
5. (a)  $95^\circ$  (b)  $74^\circ$  (c)  $\angle CDE = 52^\circ, \angle DCE = 12^\circ$ .
6.  $100^\circ$ . 7. (a)  $\angle ACE = 120^\circ, \angle AEC = 30^\circ$ .
9. (a)  $x = 20, y = 140$  (b)  $x = 42^\circ, y = 66^\circ, z = 48^\circ$ .

**Exercise 12.3**

1. AB. 2.  $\angle P$ . 3. (i)  $\angle C$  (ii)  $\angle A$ .
4.  $RP < 17.5$  cm and  $RP > 2.5$  cm. 5. No;  $8.5 + 2.7 < 12$ .
6. BC, CA, AB. 7. CA, CD, AD. 8. (a) AB, DC, BD (b)  $28^\circ$ ; BD.

**Exercise 12.4**

4.  $107^\circ$  approx. 5.  $BC = 3.6$  cm, length of perpendicular =  $3.1$  cm.
6.  $8.7$  cm. 12.  $4.3$  cm,  $5.5$  cm,  $5.5$  cm. 15.  $3.5$  cm.
17.  $6$  cm,  $5$  cm. 19.  $4.7$  cm. 20.  $3.1$  cm. 21.  $3.9$  cm.

**Chapter Test**

1. (i)  $x = 98^\circ, y = 77^\circ$  (ii)  $x = 108^\circ$ . 5. (b) (i) 34 (ii) 70 (iii)  $44^\circ$ .
6. (a)  $x = 46^\circ, y = 26^\circ, z = 72^\circ$ .

**Exercise 13**

1. (a) (i)  $13$  cm (ii)  $8.2$  cm (b) (i)  $2.8$  cm (ii)  $72^\circ$  (c)  $5.2$  cm.
14. (c) (i)  $5$  cm (ii)  $10$  cm.
16. (i)  $3$  cm (ii)  $4.6$  cm (iii)  $2.4$  cm (iv)  $2.2$  cm.

**Exercise 14**

1. (a) (i)  $3 : 4$  (ii)  $2\frac{1}{7}$  cm (b)  $3.2$  cm,  $4.8$  cm (c)  $1.5$  cm,  $2.25$  cm.
2. (a)  $20$  cm,  $4.8$  cm (b)  $7.5$  cm. 3. (a)  $6$  cm<sup>2</sup> (b)  $10$ . 4.  $10.5$  cm,  $12$  cm.
5. (a)  $4$  cm,  $10$  cm (b) (ii)  $4.8$  cm,  $6$  cm (c) (i)  $3$  cm (ii)  $4.5$  cm.
6. (a) (ii)  $2.25$  cm (b) (ii)  $10$  cm (c)  $16$  cm.
8. (a) (ii)  $2.9$  cm. 9. (b) (ii)  $4\frac{1}{3}$  cm (iii)  $3 : 5$ .

10. (a) 12.5 cm,  $\frac{5}{2}x$  (b) 1.5 cm (c) 22 cm.

14. (b) 6 cm.

15. (b) (i) 15 cm (ii)  $\Delta QLP$ ;  $\frac{32}{3}$  cm.

18. 7.8 m.

19. 22.5 m.

20. (a) (i) 9 cm (ii) 25 cm (b)  $x = 2\frac{13}{16}$  cm,  $y = 5$  cm.

22. (a) (ii) 1 : 3

(b) 5 cm.

23. (b) 15 cm.

## Chapter Test

1. (a)  $CE = 3\frac{1}{3}$  cm,  $DE = 2\frac{5}{8}$  cm (b)  $x = 5$ ,  $y = 5$  (c) 13.5 cm.

## Exercise 15

1. (i) 13 cm (ii)  $2\sqrt{7}$  cm (iii) 8 cm. 2. 16 cm, 12 cm. 4. 10 m, 24 m, 26 m.

5.  $4\sqrt{3}$  cm,  $16\sqrt{3}$  cm<sup>2</sup>. 6.  $8\sqrt{2}$  cm,  $32\sqrt{2}$  cm<sup>2</sup>. 7. 50 cm<sup>2</sup>,  $20\sqrt{2}$  cm.

8. (a) 4 cm (b)  $5\sqrt{2}$  cm, 25 cm<sup>2</sup>. 9. (a) 13 cm (b) 17 cm (c)  $3\frac{1}{6}$  cm.

10. (a) 4 cm, 8 cm, 20 cm,  $5\sqrt{17}$  cm. 11. 13 cm. 12. 100 cm.

13. (a) 12 cm (b) 26 cm (c) (ii) 24 cm<sup>2</sup>,  $14\sqrt{2}$  cm.

27. (a) 12 cm,  $6\sqrt{3}$  cm (b) 36 cm (c) (i) 13 cm (ii)  $EF = 7.8$  cm,  $BF = 7.2$  cm.

## Chapter Test

1. (a) 28 cm (b) (i) 10 cm (ii) 24 cm (iii) 96 cm<sup>2</sup> (c) (i) 12 cm (ii) 13.5 cm<sup>2</sup>.

6.  $DC = 4.5$  cm,  $AC = 7.5$  cm. 7. 60 cm.

8. (i) 8 cm (ii) 14 cm (iii) 22 cm. 9.  $3\sqrt{2}$  cm.

## Exercise 16.1

1. (i) 900° (ii) 1440° (iii) 1800°. 2. (i) 120° (ii) 135° (iii) 156°.

3. (i) 10 (ii) 9 (iii) 8 (iv) 7. 4. (i) 5 (ii) 18 (iii) 8 (iv) 11.

5. (i) 16 (ii) 21 (iii) 10. 6. (i) Yes (ii) No (iii) No.

7. (i) Yes (ii) Yes (iii) No. 8. (i) No (ii) No (iii) Yes.

9. (i) 40° (ii) 9. 10.  $x = 36^\circ$ ,  $y = 36^\circ$ ,  $z = 72^\circ$ . 11. 6. 12. 9.

13. 14. 14. 84°. 15. 60°, 90°, 150°, 60°; one.

16. 80°, 100°, 120°, 140°, 100°. 17. 92. 18. 61. 19. 50.

20. 123. 21. 11. 22. 69. 23.  $\angle C = 100^\circ$ ,  $\angle D = 120^\circ$ .

24.  $\angle BCD = 128^\circ$ ,  $\angle E = 80^\circ$ . 25. 8. 26. (i) 5 (ii) 9 (iii) 20.

27. (i) 5 (ii) 7 (iii) 9. 28. 6 and 8. 29. 5, 10.

33.  $\angle EAP = 72^\circ$ ,  $\angle BPA = 108^\circ$ .

## Exercise 16.2

1. 90°, 120°. 2. 54°, 90°, 108°, 108°. 12. 72°, 108°, 72°, 108°.

13. (a)  $\angle CDB = 30^\circ$ ,  $\angle ADB = 80^\circ$

(b)  $\angle OAD = 35^\circ$ ,  $\angle AOD = 68^\circ$ ,  $\angle ADO = 77^\circ$  (c)  $x = 54$ .

14. (a)  $x = 4, y = 5$  (b)  $x = 30^\circ, y = 95^\circ$  (c)  $x = 6, y = 21$ . 15.  $80^\circ$ .  
 16. (a)  $45^\circ$  (b)  $\angle OAB = \angle OBA = 34^\circ, \angle AOB = 112^\circ$   
 (c)  $\angle OAD = 54^\circ, \angle ADO = 36^\circ, \angle AOD = 90^\circ$ .  
 17. (a)  $x = 50^\circ, y = 88^\circ$  (b)  $x = 36^\circ, y = 108^\circ$  (c)  $\angle ODC = 58^\circ, \angle OBA = 34^\circ$ .  
 32.  $\sqrt{3} : 1$ .

### Exercise 16.3

1.  $63^\circ$ . 9. 7.2 cm. 10. 5.6 cm. 11. 6.1 cm. 12. 3.1 cm.  
 13.  $61^\circ$ . 17. 3.5 cm. 18.  $106^\circ$ . 19.  $78^\circ$ .

### Chapter Test

1. 26. 2. 12. 3.  $120^\circ$ .  
 5. (i)  $x = 29^\circ$  (ii)  $x = 39^\circ, y = 111^\circ$  (iii)  $x = 64^\circ, y = 96^\circ$ .  
 6. (i)  $x = 37^\circ, y = 106^\circ, z = 37^\circ$  (ii)  $x = 110^\circ$  (iii)  $x = 70^\circ, y = 120^\circ, z = 85^\circ$ .  
 7. (i)  $17^\circ$  (ii)  $73^\circ$  (iii)  $45^\circ$  (iv)  $73^\circ$ . 18. 8 cm,  $8\sqrt{3}$  cm.

### Exercise 17

10. (b) 5 : 9 (c) (i) 2 : 1 (ii) 1 : 6.  
 11. (a) 5 cm (b) 6 units (c) (i)  $18 \text{ cm}^2$  (ii) AEFD.  
 12. (a) (i)  $40 \text{ cm}^2$  (ii)  $120 \text{ cm}^2$ .  
 19. (a)  $AB = 12 \text{ cm}, BC = 9 \text{ cm}$  (b)  $BC = 12 \text{ cm}, CA = 10 \text{ cm}, AB = 15 \text{ cm}$   
 (c) (i)  $80 \text{ cm}^2$  (ii) 5 : 3. 20. 25 sq. units.

### Exercise 18.1

1.  $12 \text{ cm}^2$ . 2. (i)  $6 \text{ cm}^2$  (ii)  $210 \text{ cm}^2$  (iii)  $34.56 \text{ cm}^2$ .  
 3.  $336 \text{ cm}^2; 33.6 \text{ cm}$ . 4. Rs 47250. 5.  $30 \text{ cm}^2, 30 \text{ cm}$ . 6.  $27.71 \text{ m}^2$ .  
 7. 54 cm. 8.  $62.4 \text{ cm}^2; 10.4 \text{ cm}$ . 9. (i)  $96 \text{ cm}^2$  (ii)  $2598 \text{ m}^2$ .  
 10.  $8 \text{ cm}^2; 2.83 \text{ cm}$ . 11.  $34.86 \text{ cm}^2$ . 12.  $12 \text{ cm}^2$ . 13. 17 cm.  
 14. 40 cm. 15.  $150 \text{ cm}^2$ . 16.  $210 \text{ cm}^2; 70 \text{ cm}$ .  
 17. Base = 16 cm, each of other sides = 12 cm. 18. 24 cm or 10 cm.  
 19. 1200 m, 400 m. 20. (a)  $19.3 \text{ cm}^2$  (b)  $12.5 \text{ cm}^2$ .

### Exercise 18.2

1. (i)  $240 \text{ cm}^2$  (ii)  $108 \text{ cm}^2$ . 2.  $306 \text{ m}^2$ . 3.  $92.35 \text{ cm}^2$ . 4.  $84 \text{ cm}^2$ .  
 5. 30 cm,  $540 \text{ cm}^2$ . 6. 98 m. 7. (a)  $400 \text{ m}^2$  (b)  $28 \text{ cm}^2$ .  
 8.  $160 \text{ m}^2$ . 9. (i) 26 m, 10 m (ii)  $100 \text{ m}^2$ . 10. 3 m.  
 11.  $8000 \text{ m}^2$ . 12.  $960; \frac{7}{20}$ . 13.  $16x = 5y; 60 \text{ m}^2$ .  
 14.  $x^2 + 13x - 30 = 0, x = 2$  metres. 15.  $75.6 \text{ m}^2$ . 16.  $278 \text{ m}^2$ .  
 17. (a) 23 m,  $17 \text{ m}^2$  (b) 50 m,  $51 \text{ m}^2$  (c)  $50 \text{ cm}^2, 54 \text{ cm}$ .  
 18. 8 cm. 19. 22 m, 31.11 m. 20.  $196 \text{ m}^2, 19.80 \text{ m}$ .

21. (i)  $81 \text{ cm}^2$  (ii)  $80 \text{ cm}^2$ .  
 22.  $120 \text{ cm}^2$ ,  $12 \text{ cm}$ .  
 23.  $119.8 \text{ cm}^2$ ,  $11.98 \text{ cm}$ .  
 24.  $18 \text{ cm}^2$ .  
 25.  $96 \text{ cm}^2$ .  
 26.  $\frac{pq}{p+qr} \text{ cm}$ .  
 27.  $96 \text{ cm}^2$ .  
 28.  $14 \text{ cm}$ .  
 29.  $90 \text{ cm}^2$ .  
 30.  $7.5 \text{ cm}^2$ .  
 31.  $20 \text{ cm}$ .  
 32. (i)  $6 \text{ cm}$  (ii)  $24 \text{ cm}^2$ .  
 33. (a)  $5 \text{ cm}$ ,  $26 \text{ cm}^2$  (b)  $8 \text{ units}$ ,  $40 \text{ sq. units}$  (c)  $2.4 \text{ m}$ .  
 34.  $216 \text{ cm}^2$ .  
 35.  $35 \text{ cm}$ ,  $25 \text{ cm}$ .  
 36.  $40 \text{ cm}$ .  
 37. Base =  $14 \text{ cm}$ , altitude =  $7 \text{ cm}$ .  
 38.  $24 \text{ m}$ ,  $12 \text{ m}$ .  
 39.  $240 \text{ m}^2$ .  
 40.  $96 \text{ cm}$ .  
 41.  $48 \text{ cm}$ .  
 42.  $(130 + 32\sqrt{3}) \text{ cm}^2$ ,  $4(8 + 5\sqrt{2}) \text{ cm}$ .  
 43. (a)  $51.59 \text{ cm}^2$  (b)  $32 \text{ cm}^2$  (c)  $192 \text{ cm}^2$ .  
 44. (a)  $4.5 \text{ m}^2$  (b)  $1087.5 \text{ m}^2$  (c)  $72 \text{ cm}^2$ .  
 45.  $40 \text{ metres}$ .  
 46.  $12 \text{ cm}$   
 47.  $\frac{105}{x} \text{ cm}$ ,  $44 = 2\left(x + \frac{105}{x}\right)$ ;  $15 \text{ cm}$ ,  $7 \text{ cm}$ .  
 48.  $(90 - x) \text{ m}$ ;  $x(90 - x) = 1800$ ;  $60 \text{ m}$ ,  $30 \text{ m}$ .

### Exercise 18.3

1. (i)  $44 \text{ cm}$ ;  $154 \text{ cm}^2$  (ii)  $132 \text{ cm}$ ;  $1386 \text{ cm}^2$  (iii)  $22 \text{ cm}$ ;  $38.5 \text{ cm}^2$ .  
 2.  $346.5 \text{ m}^2$ .  
 3.  $8.8 \text{ m}$ .  
 4.  $40216 \text{ km}$ .  
 5.  $14 \text{ cm}$ .  
 6.  $9 \text{ cm}$ ;  $81\pi \text{ cm}^2$ .  
 7.  $12 \text{ cm}$ ;  $24\pi \text{ cm}$ .  
 8.  $105.6 \text{ m}$ .  
 9.  $5000$ .  
 10. (i)  $44 \text{ cm}$  (ii)  $154 \text{ cm}^2$  (iii)  $42 \text{ cm}^2$ .  
 11.  $126 \text{ cm}^2$ .  
 12.  $33$ ;  $28.38 \text{ cm}^2$ .  
 13.  $962.5 \text{ m}^2$ .  
 14.  $88 \text{ m}^2$ .  
 15.  $14 \text{ cm}$ .  
 16.  $17.5 \text{ cm}$ .  
 17.  $2618 \text{ m}^2$ ; ₹  $130900$ .  
 18.  $346.5 \text{ cm}^2$ ,  $154 \text{ cm}^2$ .  
 19.  $44 \text{ cm}$ .  
 20.  $44 \text{ m}$ .  
 21. (i)  $22 \text{ cm}$  (ii)  $77 \text{ cm}^2$ .  
 22.  $77 \text{ cm}^2$ .  
 23. (i)  $38 \text{ cm}$ ;  $50.75 \text{ cm}^2$  (ii)  $88 \text{ cm}$ ;  $504 \text{ cm}^2$ .  
 24.  $44 \text{ cm}$ ;  $42 \text{ cm}^2$ .  
 25. (i)  $88 \text{ cm}$  (ii)  $308 \text{ cm}^2$ .

### Exercise 18.4

1.  $294 \text{ cm}^2$ ,  $343 \text{ cm}^3$ .  
 2.  $94 \text{ m}^2$ ;  $60 \text{ m}^3$ ;  $7.07 \text{ m}$ .  
 3.  $14 \text{ cm}$ .  
 4.  $40$ ;  $6$ .  
 5. (a)  $12 \text{ cm}$  (b)  $150 \text{ cm}^2$ ,  $125 \text{ cm}^3$ .  
 6.  $7$ .  
 7.  $70 \text{ cm}$ .  
 8.  $486 \text{ cm}^2$ ,  $15.57 \text{ cm}$ .  
 9.  $9 \text{ cm}$ .  
 10.  $504000 \text{ cm}^3$ ;  $38200 \text{ cm}^2$ .  
 11.  $120$ .  
 12.  $60$ .  
 13.  $0.729 \text{ m}^3$ ;  $0.9 \text{ m}$ .  
 14.  $7.39 \text{ cm}$ .  
 15.  $38 \text{ cm}^3$ .  
 16. (a)  $1440 \text{ cm}^2$  (b)  $6 \text{ cm}$ ;  $1 : 2$ .  
 17.  $3 \text{ cm}$ .  
 18. ₹  $12480$ .  
 19.  $13.95 \text{ cm}$ .  
 20.  $\frac{8}{13} \text{ metre}$ .  
 21. ₹  $1350$ .  
 22. ₹  $2596.80$ .  
 23.  $75 \text{ cm}$ .  
 24.  $6 \text{ cm}$ .  
 25.  $8.4 \text{ litres}$ .  
 26. (a)  $80 \text{ cm}^3$  (b) (i)  $16.5 \text{ m}^2$  (ii)  $6600 \text{ m}^3$  (c)  $1000 \text{ m}^3$ .  
 27.  $2250 \text{ m}^3$ .

### Exercise 18.5

1.  $150 \pi \text{ cm}^2$ .  
 2. (i)  $13200 \text{ cm}^2$  (ii)  $115.5 \text{ litres}$ .  
 3.  $4620 \text{ cm}^3$ ;  $1260 \text{ cm}^3$ .  
 4.  $616 \text{ cm}^3$ .  
 5. (i)  $62\frac{6}{7} \text{ m}^3$  (ii) ₹  $6285.70$ .  
 6.  $2000$ .

7.  $112 \pi \text{ cm}^2$ ;  $240 \pi \text{ cm}^2$ .      8. 49.5 kg.  
 9. (i) 40 cm (ii)  $38500 \text{ cm}^3$ .      10. (i) 15.9 cm (ii)  $4998.9 \text{ cm}^3$ .  
 11. 45100.      12. 22 : 15.      13. 1 : 2.      14. 30 cm ;  $4620 \text{ cm}^3$ .  
 15.  $1078 \text{ cm}^3$ .      16. 16 : 9.      17. 31.2 cm.      18.  $3 \frac{19}{77} \text{ cm}$ .  
 19. 60.      20. 30 cm.      21. (i) 1155 litres (ii) 24 minutes.  
 22.  $\frac{1}{6}$  minutes.      23. 5 : 3.      24.  $306.24 \text{ cm}^3$ .  
 25. (i)  $968 \text{ cm}^2$  (ii)  $1064.8 \text{ cm}^2$  (iii)  $2038.08 \text{ cm}^2$ .  
 26. Wood :  $5.28 \text{ cm}^3$ ; graphite :  $0.11 \text{ cm}^3$       27. Cylinder by  $85 \text{ cm}^3$ .  
 28.  $1478.4 \text{ kg}$ .      29. 3.6 m.      30. 74.1 cm.      31.  $22 \text{ cm}^2$ .

### Chapter Test

1. (a)  $54 \text{ cm}^2$  (b) 32 cm.      2.  $529.89 \text{ cm}^2$ .      3. (a)  $51 \text{ cm}^2$  (b)  $144 \text{ cm}^2$  (c)  $54 \text{ m}^2$ .  
 4.  $19.3 \text{ cm}^2$ .      5. 31.4 cm.      6.  $196 \text{ cm}^2$ .      7. ₹ 20790.  
 8.  $1480.5 \text{ m}^2$ .      9. 59.4 cm;  $61.1 \text{ cm}^2$ .      11. No.      12. 378 km.  
 13. 75 cm.      14. (i) 8 cm (ii)  $448 \text{ cm}^3$ .      16.  $152000 \text{ cm}^3$ ;  $16800 \text{ cm}^2$ .  
 17. (i)  $564000 \text{ cm}^3$  (ii)  $69864 \text{ cm}^3$  (iii) 55.9 kg.  
 18. (i) 450 (ii) ₹ 54000.      19. ₹ 756.      20.  $44 \text{ m}^2$ .  
 21. 30.69 hours (approx.)      22. ₹ 29700.      23. 22 cm.      24.  $162 \text{ cm}^3$ .  
 25. 7 cm ; 5 cm      26.  $\frac{7}{19} \text{ cm}$ .

### Exercise 19

1. (a) (i)  $\frac{3}{5}$  (ii)  $\frac{4}{5}$  (iii)  $\frac{3}{4}$  (iv)  $\frac{4}{3}$  (v)  $\frac{5}{4}$  (vi)  $\frac{5}{3}$   
 (b) (i)  $\frac{5}{13}$  (ii)  $\frac{12}{13}$  (iii) 1 (iv) 1.  
 2. (a) (i)  $\frac{4}{5}$  (ii)  $\frac{4}{5}$  (iii)  $\frac{7}{5}$  (iv) 1 (b) (i)  $\frac{5}{12}$  (ii)  $\frac{4}{5}$  (iii) 1 (iv) 14.  
 3. (a) (i)  $\frac{4}{5}$  (ii)  $\frac{3}{4}$  (iii) -1 (iv)  $\frac{3}{2\sqrt{2}}$  (v) -1 (b) (i)  $\frac{2}{3}$  (ii)  $\frac{2}{\sqrt{13}}$  (iii) 1.  
 4. (a) (i)  $\frac{2}{5}$  (ii)  $\frac{2}{5}$  (iii)  $\frac{6}{5}$  (iv)  $\frac{14}{5}$  (b) (i)  $\frac{3}{5}$  (ii) 4 units.  
 5. (i)  $\frac{12}{13}$  (ii)  $\frac{1}{5}$ .      6. (a) (i)  $\frac{7}{25}$  (ii)  $\frac{24}{7}$  (b) (i)  $\frac{9}{41}$  (ii)  $\frac{40}{41}$  (iii)  $\frac{40}{9}$ .  
 7. (i)  $\frac{3}{5}$  (ii)  $\frac{4}{5}$ .  
 8. (a) (i)  $\frac{4}{5}$  (ii)  $\frac{4}{3}$  (iii)  $\frac{7}{12}$  (b)  $4\frac{4}{5}$   
 (c) (i) AD = 20 cm, AB = 25 cm, DC = 20 cm, AC =  $20\sqrt{2}$  cm.  
 9. (i)  $\frac{4}{5}$  (ii)  $\frac{3}{4}$ .      10.  $\frac{5}{13}$ ;  $\frac{12}{13}$ .      11.  $1\frac{11}{20}$ .      12.  $1\frac{2}{5}$ .  
 13.  $\frac{2(\sqrt{5}-1)}{\sqrt{5}}$ .      14.  $\frac{p+\sqrt{q^2-p^2}}{q}$ .      15.  $3\frac{31}{120}$ .      16.  $\frac{12}{65}$ .      17. 8.



18.  $\frac{3}{5}$ .      19.  $2\frac{3}{7}$ .      20.  $\frac{17}{19}$ .      21.  $\frac{p^2 - q^2}{p^2 + q^2}$ .      22.  $\frac{1}{9}$ .
23. (i)  $\frac{17}{19}$  (ii) 3.      24.  $\frac{1}{4}$ .      25.  $\frac{3}{2}$ .
28. (a) (i)  $\frac{6}{5}$  (ii)  $\frac{5}{13}$  (b) (i)  $\frac{12}{13}$  (ii)  $\frac{5}{12}$ .      29.  $\frac{150}{\sqrt{13}}$  cm ;  $103\frac{11}{13}$  cm<sup>2</sup>.
30. (a) (i)  $\frac{5}{13}$  (ii)  $\frac{4}{3}$  (b)  $\frac{12}{\sin \theta}$  or  $\frac{9}{\cos \theta}$ .      32.  $\cot \theta$ .      33. 2.

### Chapter Test

1. (a)  $\sin A = \frac{2}{3}$ ,  $\cos A = \frac{\sqrt{5}}{3}$ ,  $\tan A = \frac{2}{\sqrt{5}}$ ,  $\cot A = \frac{\sqrt{5}}{2}$ ,  $\sec A = \frac{3}{\sqrt{5}}$ ,  
 $\operatorname{cosec} A = \frac{3}{2}$ ;  $\sin C = \frac{\sqrt{5}}{3}$ ,  $\cos C = \frac{2}{3}$ ,  $\tan C = \frac{\sqrt{5}}{2}$ ,  $\cot C = \frac{2}{\sqrt{5}}$ ,  
 $\sec C = \frac{3}{2}$ ,  $\operatorname{cosec} C = \frac{3}{\sqrt{5}}$ .  
 (b)  $x = 10 \cot \theta$ ,  $y = 10 \operatorname{cosec} \theta$ .

2. (a) (i)  $\frac{4}{5}$  (ii)  $3\frac{2}{15}$  (b) (i) 3 (ii)  $5\frac{1}{4}$  (iii)  $-4\frac{3}{4}$ .      3.  $\frac{q^2 - 2p^2}{p\sqrt{q^2 - p^2}}$ .
4. (i)  $\frac{3}{5}$  (ii)  $\frac{4}{5}$  (iii) -1.      6.  $\frac{3}{5}$ .      7.  $9\frac{1}{9}$ .      8.  $12\frac{8}{15}$  m.

### Exercise 20.1

1. (i)  $\frac{7}{4}$  (ii) 2 (iii)  $\frac{3}{2}$  (iv)  $\frac{1}{4}$ .      2. (i)  $\frac{1}{3}$  (ii)  $\frac{3}{2}$  (iii)  $\frac{25}{36}$ .
3. (i) 0 (ii) 3 (iii)  $-5\frac{17}{20}$ .      6. (i)  $\frac{1}{\sqrt{3}}$  (ii)  $\frac{1}{3}$ .      8.  $2 : \sqrt{3}$ .
11.  $60^\circ$ .      12.  $45^\circ$ ;  $\frac{3}{2}$ .      13. (i)  $\sqrt{3}$  (ii) 60 (iii)  $\frac{1}{2}$  (iv) 2.
14. (i)  $30^\circ$  (ii)  $20^\circ$  (iii)  $15^\circ$  (iv)  $30^\circ$ .      15.  $15^\circ$ .      16. (i) 60 (ii) 1 (iii)  $-\frac{1}{2}$ .
17. (i)  $45^\circ$  (ii)  $45^\circ$ .      18. (i)  $\frac{1}{2}$  (ii)  $\frac{1}{2}$  (iii) -1.      19.  $\frac{1}{2}$ .      20.  $60^\circ$ .
21.  $A = 45^\circ$ ,  $B = 15^\circ$ .      22. (i)  $90^\circ$  or  $60^\circ$  (ii)  $30^\circ$  or  $15^\circ$  (iii)  $60^\circ$  or  $15^\circ$ .
23. 8 cm,  $8\sqrt{3}$  cm.      24.  $2\sqrt{3}$  cm,  $4\sqrt{3}$  cm.      25.  $12\sqrt{3}$  m.      26.  $4(3 - \sqrt{3})$  m.

### Exercise 20.2

1. (i) 1 (ii)  $\frac{1}{2}$ .      2. (i) 0 (ii) 0.      3. (i) 0 (ii) 1.
4. (i) 0 (ii) 1.      5. (i)  $\frac{2}{3}$  (ii)  $\frac{7}{4}$ .      6.  $\frac{2}{3}$ .      7.  $\frac{3}{\sqrt{13}}$ .

### Chapter Test

1. (i)  $1\frac{1}{4}$  (ii) 1 (iii)  $3\frac{1}{2}$ .      5.  $\frac{4}{3}$ .      6. (i)  $45^\circ$ ,  $30^\circ$  (ii)  $10^\circ$ ,  $22\frac{1}{2}^\circ$ .
7.  $A = 52\frac{1}{2}^\circ$ ,  $B = 7\frac{1}{2}^\circ$ .      8. (i) 5 (ii) -1.      9.  $6\sqrt{3}$  cm.

**Exercise 21.1**

1. (i)  $(3, -4)$  (ii)  $\left(-\frac{3}{2}, 5\right)$  (iii)  $\left(-1\frac{2}{3}, -2\frac{1}{4}\right)$  (iv)  $(-2, 5)$   
 (v)  $(-2, 0)$  (vi)  $\left(0, \frac{3}{2}\right)$ .
3. A(2, 2), B(-3, 0), C(-2, -4), D(3, -1), E(-4, 4), F(0, -2), G(2, -3), H(0, 3).
4. A lies in the first quadrant, B lies on x-axis, C lies in the third quadrant and D in the fourth quadrant.
7. (i) collinear (ii) non-collinear (iii) collinear.
8. M (-3, 0) and N (0, 4). 9. Rectangle; 15 sq. units.
10. Rhombus; 12 sq. units. 11. (2, -2); 25 square units.
12. (0, 0), (6, 0), (6, 4), (0, 4). 13. (0, 0), (-6, 0), (-6, -4), (0, -4).
14. O (0, 0), A  $(a, \sqrt{3}a)$ , B  $(2a, 0)$ .

**Exercise 21.2**

4. (i)  $m = 2, c = 0$  (ii)  $m = -5, c = 0$ . 5. (i)  $m = -3, c = 0$  (ii)  $m = \frac{3}{2}, c = 0$ .
6. (i)  $m = -\frac{5}{3}, c = 0$  (ii)  $m = -\frac{2}{5}, c = 0$ . 7. (i)  $m = 2, c = 3$  (ii)  $m = -1, c = -1$ .
8. (i)  $m = -3, c = 5$  (ii)  $m = 5, c = 7$ . 9. (i)  $m = -1, c = \frac{3}{2}$  (ii)  $m = -\frac{1}{2}, c = -\frac{1}{2}$ .
10. (i)  $m = \frac{2}{3}, c = \frac{5}{3}$  (ii)  $m = -\frac{3}{4}, c = 3$ .
11. (i)  $m = \frac{5}{3}, c = -2$  (ii)  $m = -\frac{4}{3}, c = \frac{7}{3}$  (iii)  $m = 0, c = \frac{4}{5}$ .
12.  $(-3, 0), (0, 2)$ . 13. (i) 0, 8 (ii) 0, -6.
14. (i) parallel (ii) not parallel (iii) parallel.
15. (i)  $(-2, 5)$ , perpendicular (ii)  $(1, 1)$ , perpendicular. 16. 28 sq. units.

**Chapter Test**

1. -2; 15 sq. units. 2.  $(4, -1)$ ; (i)  $(3, 7)$  (ii)  $(4, 3)$  (iii)  $(3, 3)$ ; 16 sq. units.
3.  $(-1, 3)$ ;  $(-1, 0)$ ; 24 sq. units.
4. (i)  $m = 2, c = -1$  (ii)  $m = -\frac{2}{3}, c = 2$  (iii)  $m = \frac{2}{3}, c = -\frac{4}{3}$ . 5. 6;  $-\frac{5}{3}$ .
6. (i) 1,  $45^\circ$ , 2 (ii)  $\sqrt{3}$ ,  $60^\circ$ , 5 (iii)  $\frac{1}{\sqrt{3}}$ ,  $30^\circ$ ,  $-\frac{4}{\sqrt{3}}$ . 7. (i) -6 (ii) 8.
8.  $(2, -1)$ ; not perpendicular.

**Exercise 22.1**

1. 6. 2. 13 hours. 3. 2780. 4. 6.5. 5. (i)  $\frac{41}{6}$  (ii)  $10\frac{5}{7}$ .
6. (i) 82 (ii) Vijay : 12 years, Rahul : 15 years; Rakhi : 18 years. 7. 8. 8. 27.
9. 18. 10. 13. 11. 45.9 kg. 12. 42. 13. 5.
14. Mean = 2.4, median = 2.5.
15. Mean time = 25 minutes, media time = 24 minutes.
16. Mean = 54.8, median = 52. 17. Mean = 15.5 points, median = 12 points.
18. 45. 19. 11.

## Exercise 22.2

1. (i) Discrete (ii) continuous (iii) discrete (iv) continuous (v) continuous.

2.

Classes	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24
Frequency	2	7	8	6	2

3. (i)

Classes	1 – 10	11 – 20	21 – 30	31 – 40
Frequency	8	7	6	6

(ii) Range = 38 (iii) 25.5.

5. (i) frequency (ii) size (iii) 14 (iv) class mark (v) 6.5.

6. (i)

Classes	1 – 10	11 – 20	21 – 30	31 – 40	41 – 50
Frequency	7	8	7	10	8

(ii)

Classes	0.5 – 10.5	10.5 – 20.5	20.5 – 30.5	30.5 – 40.5	40.5 – 50.5
Frequency	7	8	7	10	8

(iii) lower limit = 20.5; upper limit = 30.5 (iv) 35.5.

7. (i) upper limit = 52; lower limit = 48  
 (ii) upper limit = 52.5; lower limit = 47.5  
 (iii) 37.5 and 42.5 (iv) 45 (v) 5.

8.

Marks % (classes)	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 – 89
Frequency	7	11	20	46	57	37	15	7
C. frequency	7	18	38	84	141	178	193	200

9.

Classes	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	5	5	7	10	8
C. frequency	5	10	17	27	35

Number of students obtaining below 20 marks = 10.

10. (i)

Classes	Tally marks	Frequency	Cumulative frequency
0 – 10		3	3
10 – 20		2	5
20 – 30	⌘ ⌘	11	16
30 – 40	⌘ ⌘ ⌘	18	34
40 – 50	–	–	34
50 – 60		3	37
60 – 70		2	39
70 – 80		3	42
80 – 90	⌘	5	47
90 – 100		3	50

(ii) 30 – 40

(iii) 34

(iv) 13.

11.	<i>Classes</i>	0 - 4	4 - 7	7 - 10	10 - 13	13 - 16
	<i>Frequency</i>	7	31	137	73	52

Number of children in the age group 10 - 13 = 73.

12.	<i>Classes</i>	0 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60
	<i>Frequency</i>	2	5	11	14	11	7

13.	<i>Classes</i>	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100	100 - 110
	<i>Frequency</i>	2	1	4	4	9	5	3	4

14.	<i>Classes</i>	23.5 - 27.5	27.5 - 31.5	31.5 - 35.5	35.5 - 39.5	39.5 - 43.5
	<i>Frequency</i>	4	7	4	4	11

15. (i) 10 ; lower limit = 119 ; upper limit = 129

(ii) 7 ; lower limit = 20 ; upper limit = 27.

### Exercise 22.3

17.	<i>Class intervals</i>	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100	100 - 110
	<i>No. of houses</i>	3	1	4	5	9	3	3	4

18.	<i>Class intervals</i>	40 - 42	42 - 44	44 - 46	46 - 48	48 - 50	50 - 52	52 - 54
	<i>Frequency</i>	2	12	7	6	7	4	2

19. (i) 18      (ii) 475 - 500      (iii) 34

(iv)

<i>Classes</i>	<i>Frequency</i>	<i>Cumulative frequency</i>
375 - 400	6	6
400 - 425	18	24
425 - 450	10	34
450 - 475	20	54
475 - 500	4	58

### Chapter Test

1. Mean = 4.25, median = 4.5.

2. Mean = 12.4, median = 7.

3. 51 kg.

4. 14.6 years.

5. 10.

6. 150.25 cm.

7. 35.5.

8. 62.

12.	<i>Class intervals</i>	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100	100 - 110	110 - 120	120 - 130
	<i>No. of houses</i>	2	6	5	8	5	7	3	4

13.	<i>Class intervals</i>	19 - 20	21 - 22	23 - 24	25 - 26	27 - 28	29 - 30
	<i>No. of students</i>	3	5	10	10	5	2

14. (i) 6      (ii) 45 - 51      (iii) 51 - 57

	<i>Classes</i>	27 - 33	33 - 39	39 - 45	45 - 51	51 - 57	57 - 63
	<i>Frequency</i>	4	12	18	6	20	8