ANSWERS/HINTS

EXERCISE 1.1

1. (i) 45 (ii) 196 (iii) 51

2. An integer can be of the form $6q$, $6q + 1$, $6q + 2$, $6q + 3$, $6q + 4$ or $6q + 5$.

3. 8 columns

4. An integer can be of the form $3q$, $3q + 1$ or $3q + 2$. Square all of these integers.

5. An integer can be of the form $9q$, $9q + 1$, $9q + 2$, $9q + 3$, . . ., or $9q + 8$.

EXERCISE 1.2

1. (i) $2^2 \times 5 \times 7$ (ii) $2^2 \times 3 \times 13$ (iii) $3^2 \times 5^2 \times 17$

(iv) $5 \times 7 \times 11 \times 13$ (v) $17 \times 19 \times 23$

2. (i) LCM = 182; HCF = 13 (ii) LCM = 23460; HCF = 2 (iii) LCM = 3024; HCF = 6

3. (i) LCM = 420; HCF = 3 (ii) LCM = 11339; HCF = 1 (iii) LCM = 1800; HCF = 1

4. 22338 **7.** 36 minutes

EXERCISE 1.4

1. (i) Terminating (ii) Terminating

(iii) Non-terminating repeating (iv) Terminating

(v) Non-terminating repeating (vi) Terminating

(vii) Non-terminating repeating (viii) Terminating

(ix) Terminating (x) Non-terminating repeating

2. (i) 0.00416 (ii) 2.125 (iv) 0.009375

(vi) 0.115 (viii) 0.4 (ix) 0.7

3. (i) Rational, prime factors of q will be either 2 or 5 or both only.

(ii) Not rational

(iii) Rational, prime factors of q will also have a factor other than 2 or 5.

EXERCISE 2.1

1. (i) No zeroes (ii) 1 (iii) 3 (iv) 2 (v) 4 (vi) 3

EXERCISE 2.2

1. (i) $-2, 4$ (ii) $\frac{1}{2}, \frac{1}{2}$ (iii) $-\frac{1}{3}, \frac{3}{2}$

(iv) $-2, 0$ (v) $-\sqrt{15}, \sqrt{15}$ (vi) $-1, \frac{4}{3}$

2. (i) $4x^2 - x - 4$ (ii) $3x^2 - 3\sqrt{2}x + 1$ (iii) $x^2 + \sqrt{5}$

(iv) $x^2 - x + 1$ (v) $4x^2 + x + 1$ (vi) $x^2 - 4x + 1$

EXERCISE 2.3

1. (i) Quotient $= x - 3$ and remainder $= 7x - 9$

(ii) Quotient $= x^2 + x - 3$ and remainder $= 8$

(iii) Quotient $= -x^2 - 2$ and remainder $= -5x + 10$

2. (i) Yes (ii) Yes (iii) No **3.** $-1, -1$ **4.** $g(x) = x^2 - x + 1$

5. (i) $p(x) = 2x^2 - 2x + 14, g(x) = 2, q(x) = x^2 - x + 7, r(x) = 0$

(ii) $p(x) = x^3 + x^2 + x + 1, g(x) = x^2 - 1, q(x) = x + 1, r(x) = 2x + 2$

(iii) $p(x) = x^3 + 2x^2 - x + 2, g(x) = x^2 - 1, q(x) = x + 2, r(x) = 4$

There can be several examples in each of (i), (ii) and (iii).

EXERCISE 2.4 (Optional)*

2. $x^3 - 2x^2 - 7x + 14$ **3.** $a = 1, b = \pm\sqrt{2}$

4. $-5, 7$ **5.** $k = 5$ and $a = -5$

EXERCISE 3.1

1. Algebraically the two situations can be represented as follows:

$x - 7y + 42 = 0; x - 3y - 6 = 0$, where x and y are respectively the present ages of Aftab and

his daughter. To represent the situations graphically, you can draw the graphs of these two linear equations.

2. Algebraically the two situations can be represented as follows:

$x + 2y = 1300$; $x + 3y = 1300$, where x and y are respectively the costs (in ₹) of a bat and a ball. To represent the situations graphically, you can draw the graphs of these two linear equations.

3. Algebraically the two situations can be represented as follows:

$2x + y = 160$; $4x + 2y = 300$, where x and y are respectively the prices (in ₹ per kg) of apples and grapes. To represent the situations graphically, you can draw the graphs of these two linear equations.

EXERCISE 3.2

1. (i) Required pair of linear equations is

$x + y = 10$; $x - y = 4$, where x is the number of girls and y is the number of boys.

To solve graphically draw the graphs of these equations on the same axes on graph paper.

Girls = 7, Boys = 3.

(ii) Required pair of linear equations is

$5x + 7y = 50$; $7x + 5y = 46$, where x and y represent the cost (in ₹) of a pencil and of a pen respectively.

To solve graphically, draw the graphs of these equations on the same axes on graph paper.

Cost of one pencil = ₹ 3, Cost of one pen = ₹ 5

2. (i) Intersect at a point (ii) Coincident (iii) Parallel

3. (i) Consistent (ii) Inconsistent (iii) Consistent

(iv) Consistent (v) Consistent

4. (i) Consistent (ii) Inconsistent (iii) Consistent (iv) Inconsistent

The solution of (i) above, is given by $y = 5 - x$, where x can take any value, i.e., there are infinitely many solutions.

The solution of (iii) above is $x = 2$, $y = 2$, i.e., unique solution.

5. Length = 20 m and breadth = 16 m.

6. One possible answer for the three parts:

(i) $3x + 2y - 7 = 0$ (ii) $2x + 3y - 12 = 0$ (iii) $4x + 6y - 16 = 0$

7. Vertices of the triangle are (–1, 0), (4, 0) and (2, 3).

EXERCISE 3.3

1. (i) $x = 9,\ y = 5$ (ii) $s = 9,\ t = 6$ (iii) $y = 3x - 3$,

where x can take any value, i.e., infinitely many solutions.

(iv) $x = 2,\ y = 3$ (v) $x = 0,\ y = 0$ (vi) $x = 2,\ y = 3$

2. $x = -2,\ y = 5;\ m = -1$

3. (i) $x - y = 26,\ x = 3y$, where x and y are two numbers ($x > y$); $x = 39, y = 13$.

(ii) $x - y = 18,\ x + y = 180$, where x and y are the measures of the two angles in degrees; $x = 99,\ y = 81$.

(iii) $7x + 6y = 3800,\ 3x + 5y = 1750$, where x and y are the costs (in ₹) of one bat and one ball respectively; $x = 500, y = 50$.

(iv) $x + 10y = 105,\ x + 15y = 155$, where x is the fixed charge (in ₹) and y is the charge (in ₹ per km); $x = 5,\ y = 10$; ₹ 255.

(v) $11x - 9y + 4 = 0,\ 6x - 5y + 3 = 0$, where x and y are numerator and denominator of the fraction; $\frac{7}{9}$ ($x = 7,\ y = 9$).

(vi) $x - 3y - 10 = 0, x - 7y + 30 = 0$, where x and y are the ages in years of Jacob and his son; $x = 40, y = 10$.

EXERCISE 3.4

1. (i) $x = \frac{19}{5},\ y = \frac{6}{5}$ (ii) $x = 2,\ y = 1$ (iii) $x = \frac{9}{13}, y = -\frac{5}{13}$

(iv) $x = 2,\ y = -3$

2. (i) $x - y + 2 = 0, 2x - y - 1 = 0$, where x and y are the numerator and denominator of the fraction; $\frac{3}{5}$.

(ii) $x - 3y + 10 = 0,\ x - 2y - 10 = 0$, where x and y are the ages (in years) of Nuri and Sonu respectively. Age of Nuri (x) = 50, Age of Sonu (y) = 20.

(iii) $x + y = 9,\ 8x - y = 0$, where x and y are respectively the tens and units digits of the number; 18.

(iv) $x + 2y = 40,\ x + y = 25$, where x and y are respectively the number of ₹ 50 and ₹ 100 notes; $x = 10, y = 15$.

(v) $x + 4y = 27,\ x + 2y = 21$, where x is the fixed charge (in ₹) and y is the additional charge (in ₹) per day; $x = 15,\ y = 3$.

EXERCISE 3.5

1. (i) No solution (ii) Unique solution; $x = 2,\ y = 1$

(iii) Infinitely many solutions (iv) Unique solution; $x = 4,\ y = -1$

2. (i) $a = 5, b = 1$ (ii) $k = 2$ **3.** $x = -2,\ y = 5$

4. (i) $x + 20y = 1000,\ x + 26y = 1180$, where x is the fixed charges (in ₹) and y is the charges (in ₹) for food per day; $x = 400,\ y = 30$.

(ii) $3x - y - 3 = 0,\ 4x - y - 8 = 0$, where x and y are the numerator and denominator of the fraction; $\frac{5}{12}$.

(iii) $3x - y = 40,\ 2x - y = 25$, where x and y are the number of right answers and wrong answers respectively; 20.

(iv) $u - v = 20,\ u + v = 100$, where u and v are the speeds (in km/h) of the two cars; $u = 60$, $v = 40$.

(v) $3x - 5y - 6 = 0,\ 2x + 3y - 61 = 0$, where x and y are respectively the length and breadth (in units) of the rectangle; length $(x) = 17$, breadth $(y) = 9$.

EXERCISE 3.6

1. (i) $x = \frac{1}{2},\ y = \frac{1}{3}$ (ii) $x = 4,\ y = 9$ (iii) $x = \frac{1}{5},\ y = -2$

(iv) $x = 4,\ y = 5$ (v) $x = 1,\ y = 1$ (vi) $x = 1,\ y = 2$

(vii) $x = 3,\ y = 2$ (viii) $x = 1,\ y = 1$

2. (i) $u + v = 10,\ u - v = 2$, where u and v are respectively speeds (in km/h) of rowing and current; $u = 6, v = 4$.

(ii) $\frac{2}{n} + \frac{5}{m} = \frac{1}{4},\ \frac{3}{n} + \frac{6}{m} = \frac{1}{3}$, where n and m are the number of days taken by 1 woman and 1 man to finish the embroidery work; $n = 18, m = 36$.

(iii) $\frac{60}{u} + \frac{240}{v} = 4,\ \frac{100}{u} + \frac{200}{v} = \frac{25}{6}$, where u and v are respectively the speeds (in km/h) of the train and bus; $u = 60,\ v = 80$.

EXERCISE 3.7 (Optional)*

1. Age of Ani is 19 years and age of Biju is 16 years or age of Ani 21 years and age of Biju 24 years.

2. ₹ 40, ₹ 170. Let the money with the first person (in ₹) be x and the money with the second person (in ₹) be y.

$x + 100 = 2(y - 100), y + 10 = 6(x - 10)$

3. 600 km **4.** 36 **5.** $\angle A = 20°,\ \angle B = 40°,\ \angle C = 120°$

6. Coordinates of the vertices of the triangle are (1, 0), (0, –3), (0, –5).

7. (i) $x = 1,\ y = -1$ (ii) $x = \frac{c(a-b)-b}{a^2-b^2},\ y = \frac{c(a-b)+a}{a^2-b^2}$

(iii) $x = a,\ y = b$ (iv) $x = a + b,\ y = -\frac{2ab}{a+b}$ (v) $x = 2,\ y = 1$

8. $\angle A = 120°,\ \angle B = 70°,\ \angle C = 60°,\ \angle D = 110°$

EXERCISE 4.1

1. (i) Yes (ii) Yes (iii) No (iv) Yes

(v) Yes (vi) No (vii) No (viii) Yes

2. (i) $2x^2 + x - 528 = 0$, where x is breadth (in metres) of the plot.

(ii) $x^2 + x - 306 = 0$, where x is the smaller integer.

(iii) $x^2 + 32x - 273 = 0$, where x (in years) is the present age of Rohan.

(iv) $u^2 - 8u - 1280 = 0$, where u (in km/h) is the speed of the train.

EXERCISE 4.2

1. (i) $-2, 5$ (ii) $-2, \frac{3}{2}$ (iii) $-\frac{5}{\sqrt{2}}, -\sqrt{2}$

(iv) $\frac{1}{4}, \frac{1}{4}$ (v) $\frac{1}{10}, \frac{1}{10}$

2. (i) 9, 36 (ii) 25, 30

3. Numbers are 13 and 14. **4.** Positive integers are 13 and 14.

5. 5 cm and 12 cm **6.** Number of articles = 6, Cost of each article = ₹ 15

EXERCISE 4.3

1. (i) $\frac{1}{2}, 3$ (ii) $\frac{-1-\sqrt{33}}{4}, \frac{-1+\sqrt{33}}{4}$ (iii) $-\frac{\sqrt{3}}{2}, -\frac{\sqrt{3}}{2}$

(iv) Do not exist

2. Same as 1 **3.** (i) $\frac{3-\sqrt{13}}{2}, \frac{3+\sqrt{13}}{2}$ (ii) 1, 2 **4.** 7 years

5. Marks in mathematics = 12, marks in English = 18;
or, Marks in mathematics = 13, marks in English = 17

6. 120 m, 90 m **7.** 18, 12 or 18, –12

8. 40 km/h **9.** 15 hours, 25 hours

10. Speed of the passenger train = 33 km/h, speed of express train = 44 km/h

11. 18 m, 12 m

EXERCISE 4.4

1. (i) Real roots do not exist (ii) Equal roots; $\frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}$ (iii) Distinct roots; $\frac{3 \pm \sqrt{3}}{2}$

2. (i) $k = \pm 2\sqrt{6}$ (ii) $k = 6$

3. Yes. 40 m, 20 m **4.** No **5.** Yes. 20 m, 20 m

EXERCISE 5.1

1. (i) Yes. 15, 23, 31, . . . forms an AP as each succeeding term is obtained by adding 8 in its preceding term.

(ii) No. Volumes are V, $\frac{3V}{4}, \left(\frac{3}{4}\right)^2 V, \cdots$ (iii) Yes. 150, 200, 250, . . . form an AP.

(iv) No. Amounts are $10000\left(1+\frac{8}{100}\right), 10000\left(1+\frac{8}{100}\right)^2, 10000\left(1+\frac{8}{100}\right)^3, \cdots$

2. (i) 10, 20, 30, 40 (ii) $-2, -2, -2, -2$ (iii) $4, 1, -2, -5$

(iv) $-1, -\frac{1}{2}, 0, \frac{1}{2}$ (v) $-1.25, -1.50, -1.75, -2.0$

3. (i) $a = 3,\ d = -2$ (ii) $a = -5,\ d = 4$

(iii) $a = \frac{1}{3}, d = \frac{4}{3}$ (iv) $a = 0.6,\ d = 1.1$

4. (i) No (ii) Yes. $d = \frac{1}{2}; 4, \frac{9}{2}, 5$

(iii) Yes. $d = -2; -9.2, -11.2, -13.2$ (iv) Yes. $d = 4;\ 6, 10, 14$

(v) Yes. $d = \sqrt{2}; 3 + 4\sqrt{2}, 3 + 5\sqrt{2}, 3 + 6\sqrt{2}$ (vi) No

(vii) Yes. $d = -4;\ -16, -20, -24$ (viii) Yes. $d = 0; -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}$

(ix) No (x) Yes. $d = a; 5a, 6a, 7a$

(xi) No (xii) Yes. $d = \sqrt{2}; \sqrt{50}, \sqrt{72}, \sqrt{98}$

(xiii) No (xiv) No (xv) Yes. $d = 24; 97, 121, 145$

EXERCISE 5.2

1. (i) $a_n = 28$ (ii) $d = 2$ (iii) $a = 46$ (iv) $n = 10$ (v) $a_n = 3.5$

2. (i) C (ii) B

3. (i) $\boxed{14}$ (ii) $\boxed{18}, \boxed{8}$ (iii) $\boxed{6\frac{1}{2}}, \boxed{8}$

(iv) $\boxed{-2}, \boxed{0}, \boxed{2}, \boxed{4}$ (v) $\boxed{53}, \boxed{23}, \boxed{8}, \boxed{-7}$

4. 16th term **5.** (i) 34 (ii) 27

6. No **7.** 178 **8.** 64

9. 5th term **10.** 1 **11.** 65th term

12. 100 **13.** 128 **14.** 60

15. 13 **16.** 4, 10, 16, 22, . . .

17. 20th term from the last term is 158.

18. –13, –8, –3 **19.** 11th year **20.** 10

EXERCISE 5.3

1. (i) 245 (ii) –180 (iii) 5505 (iv) $\frac{33}{20}$

2. (i) $1046\frac{1}{2}$ (ii) 286 (iii) -8930

3. (i) $n = 16, S_n = 440$ (ii) $d = \frac{7}{3}, S_{13} = 273$ (iii) $a = 4, S_{12} = 246$

(iv) $d = -1, a_{10} = 8$ (v) $a = -\frac{35}{3}, a_9 = \frac{85}{3}$ (vi) $n = 5, a_n = 34$

(vii) $n = 6, d = \frac{54}{5}$ (viii) $n = 7, a = -8$ (ix) $d = 6$

(x) $a = 4$

4. 12. By putting $a = 9, d = 8, S = 636$ in the formula $S = \frac{n}{2}[2a + (n-1)d]$, we get a quadratic equation $4n^2 + 5n - 636 = 0$. On solving, we get $n = -\frac{53}{4}, 12$. Out of these two roots only one root 12 is admissible.

5. $n = 16,\ d = \frac{8}{3}$ **6.** $n = 38,\ S = 6973$ **7.** Sum = 1661

8. $S_{51} = 5610$ **9.** n^2 **10.** (i) $S_{15} = 525$ (ii) $S_{15} = -465$

11. $S_1 = 3, S_2 = 4;\ a_2 = S_2 - S_1 = 1;\ S_3 = 3,\ a_3 = S_3 - S_2 = -1,$
$a_{10} = S_{10} - S_9 = -15;\ a_n = S_n - S_{n-1} = 5 - 2n.$

12. 4920 **13.** 960 **14.** 625 **15.** ₹ 27750

16. Values of the prizes (in ₹) are 160, 140, 120, 100, 80, 60, 40.

17. 234 **18.** 143 cm

19. 16 rows, 5 logs are placed in the top row. By putting $S = 200, a = 20, d = -1$ in the formula $S = \frac{n}{2}[2a + (n-1)d]$, we get, $41n - n^2 = 400$. On solving, $n = 16, 25$. Therefore, the number of rows is either 16 or 25. $a_{25} = a + 24d = -4$
i.e., number of logs in 25th row is – 4 which is not possible. Therefore $n = 25$ is not possible. For $n = 16$, $a_{16} = 5$. Therefore, there are 16 rows and 5 logs placed in the top row.

20. 370 m

EXERCISE 5.4 (Optional)*

1. 32nd term **2.** $S_{16} = 20, 76$ **3.** 385 cm

4. 35 **5.** 750 m^3

EXERCISE 6.1

1. (i) Similar (ii) Similar (iii) Equilateral
(iv) Equal, Proportional **3.** No

EXERCISE 6.2

1. (i) 2 cm (ii) 2.4 cm

2. (i) No (ii) Yes (iiii) Yes

9. Through O, draw a line parallel to DC, intersecting AD and BC at E and F respectively.

EXERCISE 6.3

1. (i) Yes. AAA, $\Delta ABC \sim \Delta PQR$ (ii) Yes. SSS, $\Delta ABC \sim \Delta QRP$

(iii) No (iv) Yes. SAS, $\Delta MNL \sim \Delta QPR$

(v) No (vi) Yes. AA, $\Delta DEF \sim \Delta PQR$

2. 55°, 55°, 55°

14. Produce AD to a point E such that AD = DE and produce PM to a point N such that PM = MN. Join EC and NR.

15. 42 m

EXERCISE 6.4

1. 11.2 cm **2.** 4 : 1 **5.** 1 : 4 **8.** C **9.** D

EXERCISE 6.5

1. (i) Yes, 25 cm (ii) No (iii) No (iv) Yes, 13 cm

6. $a\sqrt{3}$ **9.** 6 m **10.** $6\sqrt{7}$ m **11.** $300\sqrt{61}$ km

12. 13 m **17.** C

EXERCISE 6.6 (Optional)*

1. Through R, draw a line parallel to SP to intersect QP produced at T. Show PT = PR.

6. Use result (iii) of Q.5 of this Exercise. **7.** 3 m, 2.79 m

EXERCISE 7.1

1. (i) $2\sqrt{2}$ (ii) $4\sqrt{2}$ (iii) $2\sqrt{a^2+b^2}$

2. 39; 39 km **3.** No **4.** Yes **5.** Champa is correct.

6. (i) Square (ii) No quadrilateral (iii) Parallelogram

7. $(-7, 0)$ **8.** $-9, 3$ **9.** ± 4, QR = $\sqrt{41}$, PR = $\sqrt{82}$, $9\sqrt{2}$

10. $3x + y - 5 = 0$

EXERCISE 7.2

1. $(1, 3)$ **2.** $\left(2, -\frac{5}{3}\right); \left(0, -\frac{7}{3}\right)$

3. $\sqrt{61}$ m; 5th line at a distance of 22.5 m **4.** 2 : 7

5. $1:1; \left(-\frac{3}{2}, 0\right)$ **6.** $x=6,\ y=3$ **7.** $(3, -10)$

8. $\left(-\frac{2}{7}, -\frac{20}{7}\right)$ **9.** $\left(-1, \frac{7}{2}\right), (0,5), \left(1, \frac{13}{2}\right)$ **10.** 24 sq. units

EXERCISE 7.3

1. (i) $\frac{21}{2}$ sq. units (ii) 32 sq. units **2.** (i) $k=4$ (ii) $k=3$

3. 1 sq. unit; 1 : 4 **4.** 28 sq. units

EXERCISE 7.4 (Optional)*

1. 2 : 9 **2.** $x+3y-7=0$ **3.** $(3, -2)$ **4.** $(1,0), (1,4)$

5. (i) (4, 6), (3, 2), (6, 5); taking AD and AB as coordinate axes

(ii) (12, 2), (13, 6), (10, 3); taking CB and CD as coordinate axes. $\frac{9}{2}$ sq. units, $\frac{9}{2}$ sq. units; areas are the same in both the cases.

6. $\frac{15}{32}$ sq. units; 1 : 16

7. (i) $D\left(\frac{7}{2}, \frac{9}{2}\right)$ (ii) $P\left(\frac{11}{3}, \frac{11}{3}\right)$

(iii) $Q\left(\frac{11}{3}, \frac{11}{3}\right), R\left(\frac{11}{3}, \frac{11}{3}\right)$ (iv) P, Q, R are the same point.

(v) $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$ **8.** Rhombus

EXERCISE 8.1

1. (i) $\sin A = \frac{7}{25}, \cos A = \frac{24}{25}$ (ii) $\sin C = \frac{24}{25}, \cos C = \frac{7}{25}$

2. 0 **3.** $\cos A = \frac{\sqrt{7}}{4}, \tan A = \frac{3}{\sqrt{7}}$ **4.** $\sin A = \frac{15}{17}, \sec A = \frac{17}{8}$

5. $\sin\theta = \frac{5}{13}, \cos\theta = \frac{12}{13}, \tan\theta = \frac{5}{12}, \cot\theta = \frac{12}{5}, \operatorname{cosec}\theta = \frac{13}{5}$

7. (i) $\frac{49}{64}$ (ii) $\frac{49}{64}$ **8.** Yes

9. (i) 1 (ii) 0 **10.** $\sin P = \frac{12}{13}, \cos P = \frac{5}{13}, \tan P = \frac{12}{5}$

11. (i) False (ii) True (iii) False (iv) False (v) False

EXERCISE 8.2

1. (i) 1 (ii) 2 (iii) $\frac{3\sqrt{2} - \sqrt{6}}{8}$ (iv) $\frac{43 - 24\sqrt{3}}{11}$ (v) $\frac{67}{12}$

2. (i) A (ii) D (iii) A (iv) C **3.** $\angle A = 45°, \angle B = 15°$

4. (i) False (ii) True (iii) False (iv) False (v) True

EXERCISE 8.3

1. (i) 1 (ii) 1 (iii) 0 (iv) 0

3. $\angle A = 36°$ **5.** $\angle A = 22°$ **7.** $\cos 23° + \sin 15°$

EXERCISE 8.4

1. $\sin A = \frac{1}{\sqrt{1 + \cot^2 A}}, \tan A = \frac{1}{\cot A}, \sec A = \frac{\sqrt{1 + \cot^2 A}}{\cot A}$

2. $\sin A = \frac{\sqrt{\sec^2 A - 1}}{\sec A}, \cos A = \frac{1}{\sec A}, \tan A = \sqrt{\sec^2 A - 1}$

$\cot A = \frac{1}{\sqrt{\sec^2 A - 1}}, \operatorname{cosec} A = \frac{\sec A}{\sqrt{\sec^2 A - 1}}$

3. (i) 1 (ii) 1 **4.** (i) B (ii) C (iii) D (iv) D

EXERCISE 9.1

1. 10 m **2.** $8\sqrt{3}$ m **3.** 3 m, $2\sqrt{3}$ m **4.** $10\sqrt{3}$ m

5. $40\sqrt{3}$ m **6.** $19\sqrt{3}$ m **7.** $20\left(\sqrt{3}-1\right)$ m **8.** $0.8\left(\sqrt{3}+1\right)$ m

9. $16\frac{2}{3}$ m **10.** $20\sqrt{3}$ m, 20 m, 60 m **11.** $10\sqrt{3}$ m, 10 m **12.** $7\left(\sqrt{3}+1\right)$ m

13. $75(\sqrt{3}-1)$m **14.** $58\sqrt{3}$ m **15.** 3 seconds

EXERCISE 10.1

1. Infinitely many

2. (i) One (ii) Secant (iii) Two (iv) Point of contact **3.** D

EXERCISE 10.2

1. A **2.** B **3.** A **6.** 3 cm

7. 8 cm **12.** AB = 15 cm, AC = 13 cm

EXERCISE 12.1

1. 28 cm **2.** 10 cm

3. Gold : 346.5 cm^2; Red : 1039.5 cm^2; Blue : 1732.5 cm^2; Black : 2425.5 cm^2; White : 3118.5 cm^2.

4. 4375 **5.** A

EXERCISE 12.2

1. $\frac{132}{7}$ cm^2 **2.** $\frac{77}{8}$ cm^2 **3.** $\frac{154}{3}$ cm^2

4. (i) 28.5 cm^2 (ii) 235.5 cm^2

5. (i) 22 cm (ii) 231 cm^2 (iii) $\left(231-\frac{441\sqrt{3}}{4}\right)cm^2$

6. 20.4375 cm^2; 686.0625 cm^2 **7.** 88.44 cm^2

8. (i) 19.625 m^2 (ii) 58.875 cm^2 **9.** (i) 285 mm (ii) $\frac{385}{4}$ mm^2

10. $\frac{22275}{28}$ cm^2 **11.** $\frac{158125}{126}$ cm^2 **12.** 189.97 km^2

13. ₹ 162.68 **14.** D

EXERCISE 12.3

1. $\frac{4523}{28}\text{ cm}^2$ **2.** $\frac{154}{3}\text{ cm}^2$ **3.** 42 cm^2

4. $\left(\frac{660}{7}+36\sqrt{3}\right)\text{ cm}^2$ **5.** $\frac{68}{7}\text{ cm}^2$ **6.** $\left(\frac{22528}{7}-768\sqrt{3}\right)\text{ cm}^2$

7. 42 cm^2 **8.** (i) $\frac{2804}{7}\text{ m}$ (ii) 4320 m^2

9. 66.5 cm^2 **10.** 1620.5 cm^2 **11.** 378 cm^2

12. (i) $\frac{77}{8}\text{ cm}^2$ (ii) $\frac{49}{8}\text{ cm}^2$ **13.** 228 cm^2

14. $\frac{308}{3}\text{ cm}^2$ **15.** 98 cm^2 **16.** $\frac{256}{7}\text{ cm}^2$

EXERCISE 13.1

1. 160 cm^2 **2.** 572 cm^2 **3.** 214.5 cm^2

4. Greatest diameter = 7 cm, surface area = 332.5 cm^2

5. $\frac{1}{4}l^2(\pi+24)$ **6.** 220 mm^2 **7.** 44 m^2, ₹ 22000

8. 18 cm^2 **9.** 374 cm^2

EXERCISE 13.2

1. $\pi\text{ cm}^3$

2. 66 cm^3. Volume of the air inside the model = Volume of air inside (cone + cylinder + cone)

$= \left(\frac{1}{3}\pi r^2h_1+\pi r^2h_2+\frac{1}{3}\pi r^2h_1\right)$, where r is the radius of the cone and the cylinder, h_1 is the height (length) of the cone and h_2 is the height (length) of the cylinder.

Required Volume $= \frac{1}{3}\pi r^2(h_1+3h_2+h_1)$.

3. 338 cm^3 **4.** 523.53 cm^3 **5.** 100 **6.** 892.26 kg

7. 1.131 m^3 (approx.) **8.** Not correct. Correct answer is 346.51 cm^3.

EXERCISE 13.3

1. 2.74 cm **2.** 12 cm **3.** 2.5 m

4. 1.125 m **5.** 10 **6.** 400

7. 36 cm; $12\sqrt{13}$ cm **8.** 562500 m^2 or 56.25 hectares. **9.** 100 minutes

EXERCISE 13.4

1. $102\frac{2}{3}\,cm^3$ **2.** 48 cm^2 **3.** $710\frac{2}{7}\,cm^2$

4. Cost of milk is ₹ 209 and cost of metal sheet is ₹ 156.75. **5.** 7964.4 m

EXERCISE 13.5 (Optional)*

1. 1256 cm; 788g (approx) **2.** 30.14 cm^3; 52.75 cm^2

3. 1792 **5.** $782\frac{4}{7}\,cm^2$

EXERCISE 14.1

1. 8.1 plants. We have used direct method because numerical values of x_i and f_i are small.

2. ₹ 545.20 **3.** $f = 20$ **4.** 75.9

5. 57.19 **6.** ₹ 211 **7.** 0.099 ppm

8. 12.48 days **9.** 69.43 %

EXERCISE 14.2

1. Mode = 36.8 years, Mean = 35.37 years. Maximum number of patients admitted in the hospital are of the age 36.8 years (approx.), while on an average the age of a patient admitted to the hospital is 35.37 years.

2. 65.625 hours

3. Modal monthly expenditure = ₹ 1847.83, Mean monthly expenditure = ₹ 2662.5.

4. Mode : 30.6, Mean = 29.2. Most states/U.T. have a student teacher ratio of 30.6 and on an average, this ratio is 29.2.

5. Mode = 4608.7 runs **6.** Mode = 44.7 cars

EXERCISE 14.3

1. Median = 137 units, Mean = 137.05 units, Mode = 135.76 units.

The three measures are approximately the same in this case.

2. $x = 8, y = 7$ **3.** Median age = 35.76 years

4. Median length = 146.75 mm **5.** Median life = 3406.98 hours

6. Median = 8.05, Mean = 8.32, Modal size = 7.88

7. Median weight = 56.67 kg

EXERCISE 14.4

1.

Daily income (in ₹)	Cumulative frequency
Less than 120	12
Less than 140	26
Less than 160	34
Less than 180	40
Less than 200	50

Draw ogive by plotting the points : (120, 12), (140, 26), (160, 34), (180, 40) and (200, 50)

2. Draw the ogive by plotting the points : (38, 0), (40, 3), (42, 5), (44, 9), (46, 14), (48, 28), (50, 32) and (52, 35). Here $\frac{n}{2} = 17.5$. Locate the point on the ogive whose ordinate is 17.5. The x-coordinate of this point will be the median.

3.

Production yield (kg/ha)	Cumulative frequency
More than or equal to 50	100
More than or equal to 55	98
More than or equal to 60	90
More than or equal to 65	78
More than or equal to 70	54
More than or equal to 75	16

Now, draw the ogive by plotting the points : (50, 100), (55, 98), (60, 90), (65, 78), (70, 54) and (75, 16).

EXERCISE 15.1

1. (i) 1 (ii) 0, impossible event (iii) 1, sure or certain event
(iv) 1 (v) 0, 1

2. The experiments (iii) and (iv) have equally likely outcomes.

3. When we toss a coin, the outcomes head and tail are equally likely. So, the result of an individual coin toss is completely unpredictable.

4. B **5.** 0.95 **6.** (i) 0 (ii) 1

7. 0.008 **8.** (i) $\frac{3}{8}$ (ii) $\frac{5}{8}$

9. (i) $\frac{5}{17}$ (ii) $\frac{8}{17}$ (iii) $\frac{13}{17}$ **10.** (i) $\frac{5}{9}$ (ii) $\frac{17}{18}$

11. $\frac{5}{13}$ **12.** (i) $\frac{1}{8}$ (ii) $\frac{1}{2}$ (iii) $\frac{3}{4}$ (iv) 1

13. (i) $\frac{1}{2}$ (ii) $\frac{1}{2}$ (iii) $\frac{1}{2}$

14. (i) $\frac{1}{26}$ (ii) $\frac{3}{13}$ (iii) $\frac{3}{26}$ (iv) $\frac{1}{52}$ (v) $\frac{1}{4}$ (vi) $\frac{1}{52}$

15. (i) $\frac{1}{5}$ (ii) (a) $\frac{1}{4}$ (b) 0 **16.** $\frac{11}{12}$

17. (i) $\frac{1}{5}$ (ii) $\frac{15}{19}$ **18.** (i) $\frac{9}{10}$ (ii) $\frac{1}{10}$ (iii) $\frac{1}{5}$

19. (i) $\frac{1}{3}$ (ii) $\frac{1}{6}$ **20.** $\frac{\pi}{24}$ **21.** (i) $\frac{31}{36}$ (ii) $\frac{5}{36}$

22. (i)

Sum on 2 dice	2	3	4	5	6	7	8	9	10	11	12
Probability	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

(ii) No. The eleven sums are not equally likely.

23. $\frac{3}{4}$; Possible outcomes are : HHH, TTT, HHT, HTH, HTT, THH, THT, TTH. Here, THH means tail in the first toss, head on the second toss and head on the third toss and so on.

24. (i) $\frac{25}{36}$ (ii) $\frac{11}{36}$

25. (i) Incorrect. We can classify the outcomes like this but they are not then 'equally likely'. Reason is that 'one of each' can result in two ways — from a head on first coin and tail on the second coin or from a tail on the first coin and head on the second coin. This makes it twicely as likely as two heads (or two tails).

(ii) Correct. The two outcomes considered in the question are equally likely.

EXERCISE 15.2 (Optional)*

1. (i) $\frac{1}{5}$ (ii) $\frac{8}{25}$ (iii) $\frac{4}{5}$

2.

	1	2	2	3	3	6
1	2	3	3	4	4	7
2	3	4	4	5	5	8
2	3	4	4	5	5	8
3	4	5	5	6	6	9
3	4	5	5	6	6	9
6	7	8	8	9	9	12

(i) $\frac{1}{2}$ (ii) $\frac{1}{9}$ (iii) $\frac{5}{12}$

3. 10 **4.** $\frac{x}{12}$, $x = 3$ **5.** 8

EXERCISE A1.1

1. (i) Ambiguous (ii) True (iii) True (iv) Ambiguous (v) Ambiguous

2. (i) True (ii) True (iii) False (iv) True (v) True

3. Only (ii) is true.

4. (i) If $a > 0$ and $a^2 > b^2$, then $a > b$.

(ii) If $xy \geq 0$ and $x^2 = y^2$, then $x = y$.

(iii) If $(x + y)^2 = x^2 + y^2$ and $y \neq 0$, then $x = 0$.

(iv) The diagonals of a parallelogram bisect each other.

EXERCISE A1.2

1. A is mortal **2.** ab is rational

3. Decimal expansion of $\sqrt{17}$ is non-terminating non-recurring.

4. $y = 7$ **5.** $\angle A = 100°, \angle C = 100°, \angle D = 180°$

6. PQRS is a rectangle.

7. Yes, because of the premise. No, because $\sqrt{3721} = 61$ which is not irrational. Since the premise was wrong, the conclusion is false.

EXERCISE A1.3

1. Take two consecutive odd numbers as $2n + 1$ and $2n + 3$ for some integer n.

EXERCISE A1.4

1. (i) Man is not mortal.

(ii) Line l is not parallel to line m.

(iii) The chapter does not have many exercises.

(iv) Not all integers are rational numbers.

(v) All prime numbers are not odd.

(vi) Some students are lazy.

(vii) All cats are black.

(viii) There is at least one real number x, such that $\sqrt{x} = -1$.

(ix) 2 does not divide the positive integer a.

(x) Integers a and b are not coprime.

2. (i) Yes (ii) No (iii) No (iv) No (v) Yes

EXERCISE A1.5

1. (i) If Sharan sweats a lot, then it is hot in Tokyo.

(ii) If Shalini's stomach grumbles, then she is hungry.

(iii) If Jaswant can get a degree, then she has a scholarship.

(iv) If a plant is alive, then it has flowers.

(v) If an animal has a tail, then it is a cat.

2. (i) If the base angles of triangle ABC are equal, then it is isosceles. True.

(ii) If the square of an integer is odd, then the integer is odd. True.

(iii) If $x = 1$, then $x^2 = 1$. True.

(iv) If AC and BD bisect each other, then ABCD is a parallelogram. True.

(v) If $a + (b + c) = (a + b) + c$, then a, b and c are whole numbers. False.

(vi) If $x + y$ is an even number, then x and y are odd. False.

(vii) If a parallelogram is a rectangle, its vertices lie on a circle. True.

EXERCISE A1.6

1. Suppose to the contrary $b \leq d$.

3. See Example 10 of Chapter 1.

6. See Theorem 5.1 of Class IX Mathematics Textbook.

EXERCISE A2.2

1. (i) $\frac{1}{5}$ (ii) 160

2. Take 1 cm^2 area and count the number of dots in it. Total number of trees will be the product of this number and the area (in cm^2).

3. Rate of interest in instalment scheme is 17.74 %, which is less than 18 %.

EXERCISE A2.3

1. Students find their own answers.