Answers

EXERCISE 1.1

1. a. $-5, \frac{22}{7}, \frac{-2013}{2014}$

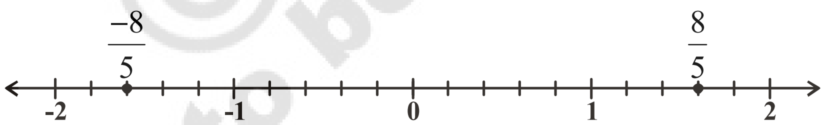
   b. A number which can be written in the form $\frac{p}{q}$ where $q \neq 0$; p, q are integers, called a rational number.

2. (i) $\frac{3}{7}$ (ii) 0 (iii) -5

   (iv) 7 (v) -3

3. $\frac{3}{2}, \frac{5}{4}, \frac{9}{8}, \frac{17}{16}, \frac{33}{32}$ 4. $\frac{19}{30}, \frac{13}{20}, \frac{79}{120}$

5.



6. I. (i) 0.242 (ii) 0.708 (iii) 0.4 (iv) 28.75

   II. (i) $0.\overline{6}$ (ii) $-0.69\overline{4}$ (iii) $3.\overline{142857}$ (iv) $1.\overline{2}$

7. (i) $\frac{9}{25}$ (ii) $\frac{77}{5}$ (iii) $\frac{41}{4}$ (iv) $\frac{13}{4}$

8. (i) $\frac{5}{9}$ (ii) $\frac{35}{9}$ (iii) $\frac{12}{33}$ (iv) $\frac{563}{180}$

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

EXERCISE - 1.2

1. (i) Irrational (ii) Rational (iii) Irrational

   (iv) Rational (v) Rational (vi) Irrational

2. Rational numbers : -1, $\frac{13}{7}$, 1.25, $21.\bar{8}$, 0

   Irrational numbers : $\sqrt{2}$, $\sqrt{7}$, π, 2.131415....., 1.1010010001.....

3. Infinite, $\frac{\sqrt{5}}{3}$

4. 0.71727374....., 0.761661666.....   5. $\sqrt{5} = 2.236$

6. 2.645751.....   8. $\sqrt{6}$, $\sqrt{2\sqrt{6}}$

9. (i) True   (ii) True   (iii) False $\sqrt{3}$ (iv) False $\sqrt{6}$

   (v) True $\sqrt{8}$ (vi) False $\frac{3}{7}$

EXERCISE - 1.4

1. (i) $10 + 5\sqrt{5} + 2\sqrt{7} + \sqrt{35}$ (ii) 20

   (iii) $10 + 2\sqrt{21}$ (iv) 4

2. (i) Irrational   (ii) Irrational   (iii) Irrational   (iv) Rational

   (v) Irrational   (vi) Irrational   (vii) Rational

3. (i) Irrational   (ii) Rational   (iii) Irrational   (iv) Irrational

   (v) Irrational   (vi) Rational

4. Because either *c* or *d* is irrational number.

5. (i) $\frac{3-\sqrt{2}}{7}$ (ii) $\sqrt{7}+\sqrt{6}$ (iii) $\frac{\sqrt{7}}{7}$ (iv) $3\sqrt{2}+2\sqrt{3}$

6. (i) $1-12\sqrt{2}$ (ii) $1-\sqrt{35}$ 7. 0.55725

8. (i) 2   (ii) 2   (iii) 5   (iv) 64

   (v) 9   (vi) $\frac{1}{6}$ 9. -8

10. (i) a = 5, b = 2   (ii) $a = \frac{-19}{7}$, $b = \frac{5}{7}$

EXERCISE - 2.1

1. (i) 5   (ii) 2   (iii) 0   (iv) 6

   (v) 2   (vi) 1

2. (i) Polynomial (ii) Polynomial (iii) No because it has two variables
(iv) Not polynomial because exponent is negative.
(v) Not polynomial because exponent of x is not a non negative integers.
(vi) Not polynomial in one variable because it has two variables.

3. (i) 1 (ii) -1 (iii) $\sqrt{2}$ (iv) 0
(v) $\frac{\pi}{2}$ (vi) -1 (vii) 0 (viii) 0

4. (i) Quadratic (ii) Cubic (iii) Quadratic (iv) Linear
(v) Linear (vi) Quadratic

5. (i) True (ii) False (iii) False (iv) False
(v) True (vi) True

EXERCISE - 2.2

1. (i) 3 (ii) 12 (iii) 9 (iv) $\frac{3}{2}$

2. (i) 1, 1, 3 (ii) 2, 4, 4 (iii) 0, 1, 8 (iv) -1, 0, 3
(v) 2, 0, 0

3. (i) No (ii) No (iii) Yes (iv) Yes
(v) Yes (vi) Yes (vii) Yes, No (viii) No, Yes

4. (i) -2 (ii) 2 (iii) $\frac{-3}{2}$ (iv) $\frac{3}{2}$
(iv) 0 (vi) 0 (vii) $\frac{-q}{p}$

5. $a = \frac{-2}{7}$

6. $a = 1, b = 0$

EXERCISE - 2.3

1. (i) 0 (ii) $\frac{27}{8}$ (iii) 1
(iv) $-\pi^3+3\pi^2-3\pi+1$ (v) $\frac{-27}{8}$

2. $5a$

3. Not a factor

4. -3

5. $\frac{-13}{3}$

6. $\frac{-13}{3}$

7. 8

8. $\frac{21}{8}$

9. $a = 7, b = 12$

EXERCISE - 2.4

1. (i) Yes (ii) No (iii) No (iv) Yes
2. (i) Yes (ii) No (iii) Yes (iv) Yes
   (v) Yes
7. (i) $(x-1)(x+1)(x-2)$ (ii) $(x+1)^2(x-5)$
   (iii) $(x+1)(x+2)(x+10)$ (iv) $(y+1)(y+1)(y-1)$
9. a = 3 10. $(y-2)(y+3)$

EXERCISE - 2.5

1. (i) $x^2 + 7x + 10$ (ii) $x^2 - 10x + 25$
   (iii) $9x^2 - 4$ (iv) $x^4 - \frac{1}{x^4}$ (v) $1 + 2x + x^2$
2. (i) 9999 (ii) 998001 (iii) $\frac{9999}{4} = 2499\frac{3}{4}$
   (iv) 251001 (v) 899.75
3. (i) $(4x+3y)^2$ (ii) $(2y-1)^2$ (iii) $\left(2x+\frac{y}{5}\right)\left(2x-\frac{y}{5}\right)$
   (iv) $2(3a+5)(3a-5)$ (v) $(x+3)(x+2)$
   (vi) $3(P-6)(P-2)$
4. (i) $x^2 + 4y^2 + 16z^2 + 4xy + 16yz + 8xz$
   (ii) $8a3 - 36a^2b + 54ab^2 - 27b^3$
   (iii) $4a^2 + 25b^2 + 9c^2 - 20ab - 30bc + 12ac$
   (iv) $\frac{a^2}{16} + \frac{b^2}{4} + 1 - \frac{ab}{4} - b + \frac{a}{2}$
   (v) $p^3 + 3p^2 + 3p + 1$ (vi) $x^3 - 2x^2y + \frac{4}{3}xy^2 - \frac{8}{27}y^3$
5. (i) $(-5x + 4y + 2z)^2$ (ii) $(3a + 2b - 4c)^2$
6. 29
7. (i) 970299 (ii) 1,0,61,208 (iii) 99,40,11992 (iv) 100,30,03,001
8. (i) $(2a+b)^3$ (ii) $(2a-b)^3$ (iii) $(1-4a)^3$ (iv) $\left(2p+\frac{1}{5}\right)^3$
10. (i) $(3a+4b)(9a^2 - 12ab + 16b^2)$ (ii) $(7y-10)(49y^2 + 70y + 100)$
11. $(3x+y+z)(9x^2 + y^2 + z^2 - 3xy - yz - 3xz)$

14. (i) -630 (ii) 16380 (iii) $\frac{-5}{12}$ (iv) -0.018

15. (i) $(2a + 3)(2a - 1)$ (ii) $(5a - 3)(5a - 4)$

16. (i) $3x(x - 2)(x + 2)$ (ii) $4(3y + 5)(y - 1)$

EXERCISE - 3.1

1. (i) 3 (ii) 13 (iii) Surface (iv) 180°
   (v) Defined
2. a) False b) True c) True d) True
   e) True
9. $\angle 1 + \angle 2 = 180°$

EXERCISE - 4.1

2. (i) Reflex angle (ii) Right angle (iii) Acute angle
3. (i) False (ii) True (iii) False (iv) False
   (v) True (vi) True (vii) False (viii) True
4. (i) Right angle (ii) Straight angle (iii) Obtuse angle

EXERCISE - 4.2

1. $x = 36°$ $y = 54°$ $z = 90°$
2. (i) $x = 23°$ (ii) $x = 59°$ (iii) $x = 20°$ (iv) $x = 8°$
3. $\angle BOE = 30°$; Reflex angle of $\angle COE = 250°$
4. $\angle C = 126°$
8. $\angle XYQ = 122°$ $\angle QYP = 302°$

EXERCISE - 4.3

2. $x = 126°$
3. $\angle AGE = 126°$ $\angle GEF = 360°$ $\angle FGE = 54°$
4. $\angle QRS = 60°$ 5. $\angle ACB = \angle z = \angle x + \angle y$
6. $a = 40°$; $b = 100°$
7. (i) $\angle 3, \angle 5, \angle 7, \angle 9, \angle 11, \angle 13, \angle 15$
   (ii) $\angle 4, \angle 6, \angle 8, \angle 10, \angle 12, \angle 14, \angle 16$

8. $x = 60°$ $y = 59°$
9. $x = 40°$ $y = 40°$
10. $x = 60°$ $y = 28°$
11. $x = 68°$ $y = 11°$
13. $x = 50°$ $y = 77°$
15. (i) $x = 36°$; $y = 180°$ (ii) $x = 35°$ (iii) $x = 29°$
16. $\angle 1 = \angle 3 = \angle 5 = \angle 7 = 80°$; $\angle 2 = \angle 4 = \angle 6 = \angle 8 = 100°$
17. $x = 20°$ $y = 60°$ $z = 120°$
18. $x = 55°$ $y = 35°$ $z = 105°$
19. (i) $x = 140°$ (ii) $x = 100°$ (iii) $x = 250°$

EXERCISE - 4.4

1. (i) $x = 110°$ (ii) $z = 130°$ (iii) $y = 80°$
2. $\angle 1 = 60°$ 3. $x = 35°, y = 51°$ 5. $x = 40°$ $y = 10°$
6. $x = 70°$ $y = 40°$ 7. $x = 30°$ $y = 75°$
8. $\angle PRQ = 65°$ 9. $\angle OZY = 32°$; $\angle YOZ = 121°$
10. $\angle DCE = 92°$ 11. $\angle SQT = 60°$ 12. $z = 60°$
13. $x = 37°$ $y = 53°$ 14. $\angle A = 50°$; $\angle B = 75°$
15. (i) 78° (ii) $\angle ADE = 67°$ (iii) $\angle CED = 78°$
16. (i) $\angle ABC = 72°$ (ii) $\angle ACB = 72°$
    (iii) $\angle DAB = 27°$ (iv) $\angle EAC = 32°$
17. $x = 96°$ $y = 120°$

EXERCISE - 5.1

1. (i) Water Tank (ii) Mr. 'J' house
   (iii) In street-2, last house on right side while going in east directioni.
   (iv) In street 4, first building on right side while going in east direction.
   (v) In street 4, the last building on left side while going in east direction

EXERCISE - 5.2

1. (i) Q_2 (ii) Q_4 (iii) Q_1 (iv) Q_3
   (v) Y-axis (vi) X-axis (vii) X-axis (viii) Y-axis

2. (i) abscissa : 4, ordinate : -8 (ii) abscissa : -5, ordinate : 3 (iii) abscissa : 0, ordinate : 0 (iv) abscissa : 5, ordinate : 0
   (v) abscissa : 0, ordinate : -8
3. (ii) (0, 13) : Y-axis (iv) (-2, 0) : X-axis
   (v) (0, -8) : Y-axis (vi) (7, 0) : X-axis
   (vii) (0, 0) : on both the axis.
4. (i) -7 (ii) 7 (iii) P (iv) Q
   (v) 4 (vi) -3
5. (i) False (ii) True (iii) True (iv) False
   (v) False (vi) True

EXERCISE - 5.3

2. No. (5, -8) lies in Q_4 and (-8, 5) lies in Q_2
3. All given points lie on a line parallel to Y-axis at a distance of 1 unit.
4. All points lie on a line parallel to X-axis at a distance of 4 units.

EXERCISE - 6.1

1. (i) $a = 8$ $b = 5$ $c = -3$
   (ii) $a = 28$ $b = -35$ $c = 7$
   (iii) $a = 93$ $b = 15$ $c = -12$
   (iv) $a = 2$ $b = 5$ $c = 0$
   (v) $a = \frac{1}{3}$ $b = \frac{1}{4}$ $c = -7$
   (vi) $a = \frac{3}{2}$ $b = 1$ $c = 0$
   (vii) $a = 3$ $b = 5$ $c = -7.\overline{2}$
2. (i) $a = 2$ $b = 0$ $c = -5$
   (ii) $a = 0$ $b = 1$ $c = -2$
   (iii) $a = 0$ $b = \frac{1}{7}$ $c = -3$
   (iv) $a = 1$ $b = 0$ $c = \frac{14}{13}$
3. (i) $x + y = 34$ (ii) $2x - y + 10 = 0$

(iii) $x - 2y - 10 = 0$ (iv) $2x + 15y - 100 = 0$
(v) $x + y - 200 = 0$ (vi) $x + y - 11 = 0$

EXERCISE - 6.2

2. (i) $(0, -34); (\frac{17}{4}, 0)$ (ii) $(0, 3); (-7, 0)$
   (iii) $(0, \frac{3}{2}); (\frac{-3}{5}, 0)$
3. (i) Not a solution (ii) Solution (iii) Solution
   (iv) Not a solution (v) Not a solution
4. K = 7
5. $\alpha = \frac{8}{5}$
6. 3

EXERCISE - 6.3

2. (i) Yes (ii) Yes
3. 3
4. (i) 6 (ii) -5
5. (i) $(\frac{3}{2}, 3)$ (ii) $(-3, 6)$
6. (i) (2, 0) : (0, -4) (ii) (-8, 0) ; (0, 2)
   (iii) (-2, 0) ; (0, -3)
7. $x + y = 1000$
8. $x + y = 5000$
9. $f = 6a$
10. 39.2
11. $5x = 3y$; 2000 ; 480 (No. of voters who cast their vote = x, Total no. of voters = y)
12. x - y = 25; 50; 15 (Father age = x, Rupa's age = y)
13. $y = 8x + 7$
14. $x + 4y = 27$; 5, 11
15. $y = 10x + 30$; 60; 90; 5 hr. (No. of hours = x ; Parking charges = y)
16. d = 60 t (d = distance, t = time); 90 km.; 120 km.; 210 km.
17. $y = 8x$; $\frac{3}{2}$ or $1\frac{1}{2}$; 12
18. $y = \frac{5}{7}x$ (Quantity of mixture = x; Quantity of milk = y) ; 20
19. (ii) 86° F (iii) 35° C (iv) -40

EXERCISE - 6.4

4. (i) $y = -3$ (ii) $y = 4$ (iii) $y = -5$ (iv) $y = 4$
5. (i) $x = -4$ (ii) $x = 2$ (iii) $x = 3$ (iv) $x = -4$

EXERCISE - 7.4

6. 7
7. No.

EXERCISE - 8.1

1. (i) True (ii) True (iii) False (iv) True
   (v) False (vi) False
2. (a) Yes, No, No, No, No (b) No, Yes, Yes, Yes, Yes
   (c) No, Yes, Yes, Yes, Yes (d) No, Yes, Yes, Yes, Yes
   (e) No, Yes, Yes, Yes, Yes (f) No, Yes, Yes, Yes, Yes
   (g) No, No, No, Yes, Yes (h) No, No, Yes, No, Yes
   (i) No, No, No, Yes, Yes (j) No, No, Yes, No, Yes.
4. Four angles = 36°, 72°, 108°, 144°

EXERCISE - 8.3

1. Angles of parallelogram = 73°, 107°, 73°, 107°
2. Angles of parallelogram = 52°, 128°, 52°, 128°

EXERCISE - 8.4

1. BC = 8 cm.

EXERCISE - 9.1

1.

Marks	5	6	7	8	9	10
Frequency (f)	5	6	8	12	9	5

2.

Blood Group	A	B	AB	O
Frequency (f)	10	9	2	15

Most common blood group = O ; Most rarest blood group = AB

3.

No. of Heads	0	1	2	3
Frequency (f)	3	10	10	7

4.

Options	A	B	C
Frequency (f)	19	35	10

Total appropriate answers = 64

Majority of people's opinion = B (Prohibition in public place only)

5.

Type of Vehicles	Car	Bikes	Autos	Cycles
No. of Vehicles (f)	25	45	30	40

6. Scale : on X-axis = 1 cm. = 1 class interval

on X-axis = 1 cm. = 10 number of students

Class	I	II	III	IV	V	VI
No. of students (f)	40	55	65	50	30	15

7.

Marks (Class interval)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of students (f)	1	4	3	7	7	7	1	0

8.

Electricity Bills (in ₹) (Class Interval)	No. of Houses (f)
150 - 225	4
225 - 300	3
300 - 375	7
375 - 450	7
450 - 525	0
525 - 600	1
600 - 675	1
675 - 750	2

9.

Life time (in years) (Class Interval)	2-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
No. of Batteries	2	6	14	11	4	3

EXERCISE - 9.2

1. $\bar{x} = 85$ 2. $\bar{x} = 1.71 \approx 2$ 3. K = 10
4. $\bar{x} = 17.7$
5. (i) ₹ 359, ₹ 413, ₹ 195, ₹ 228, ₹ 200, ₹ 837
   (ii) ₹444 saving per school.
6. Boy's height = 152 cm. ; Girl's height = 152 cm.
7. $\bar{x}$ = 11.18 ; Mode = 5 ; Median = 10
8. $\bar{x}$ = 80 ; Median = 75 ; Mode = 50
9. 37 kgs 10. ₹11.25, Median = ₹ 10; Mode = ₹ 10
11. $1^{st} = 2$; $2^{nd} = 6$; $3^{rd} = 19$; $4^{th} = 33$

EXERCISE - 10.1

1. (i) 96 cm^2 (ii) 236 cm^2
2. 3375 m^2 3. 330 m^2 4. 8 m.
5. (i) 4 times of original area (ii) 9 times of original area
6. 60 cm^3 7. 16 m^3 8. 3750 liters

EXERCISE - 10.2

1. 6.90 m^2 2. 4851 cm^2 3. 176 cm^2; 253 cm^2
4. r = 7.5 cm. 5. h = 25 m.
6. (i) 968 cm^2 (ii) 1064.8 cm^2 (iii) 2032.8 cm^2
7. ₹338. 80 8. 1584 m^2
9. (i) 110 m^2 (ii) ₹4400
10. (i) 59.4 m^2 (ii) 64.8 m^2 11. 517.44 liters 12. h = 20 cm.

EXERCISE - 10.3

1. h = 6cm. 2. h = 9 cm.
3. (i) 7 cm. (ii) 462 cm^2 4. 1232 cm^3
5. 1018.3 cm^3 6. ₹7920 7. $3394\frac{2}{7}$ cm^3
8. 241.89 m^2 (approximate)

EXERCISE - 10.4

1. $154\ cm^2$; $179.67\ cm^3$ 2. $3054.86\ cm^3$
3. $616\ cm^2$ 4. $6930\ cm^2$ 5. 4 : 9 ; 8 : 27
6. $942\ cm^2$ 7. 1 : 4   8. 121 : 100   9. 4.4 kg.
10. 5 cm.   11. $303.19\ cm^3$ 12. No. of bottles = 9

EXERCISE - 11.1

1. $19.5\ cm^2$ 2. $131\ cm^2$ 3. $36\ cm^2$

EXERCISE - 11.2

1. 8.57 cm   2. 6.67 cm

EXERCISE - 12.1

1. (i) Radius   (ii) Diametre   (iii) Minor arc
(iv) Chord   (v) Major arc   (vi) Semi-circle
(vii) Minor arc   (viii) Minor segment
2. (i) True   (ii) True   (iii) True   (iv) False
(v) False   (vi) True   (vii) True

EXERCISE - 12.2

1. 90°   2. 48°, 84°

EXERCISE - 12.4

1. 130°   2. 40°   3. 60°, 120°   5. 5 cm.
6. 6 cm.   7. 4 cm.   9. 70°, 55°, 55°

EXERCISE 12.5

1. (i) $x° = 75°$; $y° = 75°$ (ii) $x° = 70°$; $y° = 95°$
(ii) $x° = 90°$; $y° = 40°$
4. (a), (b), (e), (f) = Possible ;   (c) = Not possible

EXERCISE - 14.1

1. (a) 1, 2, 3, 4, 5 and 6 (b) Yes (c) $\frac{1}{3}$

2. (a) $\frac{45}{100}$; $\frac{55}{100}$ (b) 1

3. (a) Red (b) Yellow (c) Blue and Green (d) No chance

   (e) No (It is random experiment)

4. (a) No.

   (b) P (green) = $\frac{5}{12}$; P (blue) = $\frac{1}{4}$; P (red) = $\frac{1}{6}$; P (yellow) = $\frac{1}{6}$

   (c) 1

5. (a) P(E) = $\frac{5}{26}$ (b) P(E) = $\frac{5}{13}$ (c) 1 (d) $\frac{21}{26}$

6. P(E) = $\frac{7}{11}$

7. (i) P = $\frac{61}{2000}$ (ii) P = $\frac{9}{80}$ (iii) P = $\frac{261}{400}$

8. 21.5%

EXERCISE - 15.1

1. (i) Always false. There are minimum 27 days in a month. Usually we have months of 30 and 31 days.
   (ii) Ambiguous. In a given year, Makara Sankranthi may or may not fall on friday.
   (iii) Ambiguous. At some time in winter, there can be a possibility that Hyderabad have 2°C temperature.
   (iv) True, to the known fact, so far we can say this but it can be changed if scientists find evidances of life on other planets.
   (v) Always false. Dogs cannot fly.
   (vi) Ambiguous. In a leap year, February has 29 days.
2. (i) False, the sum of the interior angles of a quadrilateral is 360°.
   (ii) False - eg. all negative numbers.
   (iii) True- Rhombus has opposite side parallel to each other therefore rhombus is parallelogram.
   (iv) True
   (v) No, all square number can not be written as a sum of two odd numbers, eg. 9 = 4+5 (But we can write all square numbers as a sum of odd, eg. 9 = 1 + 3 + 5 numbers)

3. (i) Only natural number

(ii) Two time a natural number is always even.

[eg. $2\times\frac{5}{2}=5$ (odd number)]

(iii) For any $x > 1$, $3x + 1 > 4$ (iv) For any $x \geq 0$, $x^3 \geq 0$

(v) In an equilateral triangle, a median is also an angle bisector.

4. Take any negative number x y

$-2 > -3$

$x^2 = -2 \times -2 = 4$ (here $x^2 < y^2$)

$y^2 = -3 \times -3 = 9$

Exercise - 15.2

1. (i) Jeevan is mortal

(ii) No, X could be any other state person lke marathi, gujarati, punjabi etc.

(iii) Gulag has red tongue.

(iv) All smarts need not be a president. Here we have given only that all presidents are smart. There could be some other people like some of the teachers, students who are smart too.

2. You need to turn over B and 8. If 8 has an even number on the other side, then the rule has been broken. Similarly, if 8 has a consonant on the other side, then the rule has been broken.

3. The answer is 35.

- Statement 'a' does not help because by following the other clues you can tell that you need more than on digit.
- Statement 'b' does not help because the one digit has to be larger than the tens-digit and the only multiple of 7 and 10 is 70 and 0 is smaller than the 7.
- Statement 'c' helps because being a multiple of 7 concels out a lot of numbers that could have been possibilities.
- Statement 'd' helps because being an odd number it too ancels out a lot of other possibilities.
- Statement 'e' does not help because the only multiple of 7 and 11 is 77 and the ones digit has to bigger than the tens digit.
- Statement 'f' does not help.
- Statement 'g' helps because by using it there will be few numbers left.
- Statement 'h' helps by using it only 35 remains.

So - 3, 4, 7 and 8 heops and they only are enough to get the number.

EXERCISE - 15.3

1. (i) The possible three conjucture are:
   a) The product of any three consecutive odd number is odd.
   b) The product of any three consecutive odd number is divisible by 3.
   c) The sum of all the digits present in product of three consecutive odd numbers is even.

   (ii) The possible three conjuctures are:
   a) The sum of any three consecutive number is always even.
   b) The sum of any three consecutive number is always divided by 3.
   c) The sum of any three consecutive number is always divided by 6.

4. $111111^2 = 12345654321$ $\quad\quad$ $1111111^2 = 1234567654321$

   Conjecture is true

6. Conjecture is false because you can not find a composite number for $x = 41$.

EXERCISE - 15.4

1. (i) No $\quad$ (ii) Yes $\quad$ (iii) No
   (iv) Yes $\quad$ (v) No

2. (i) A rectangle has equal angles but may not be a square.
   (ii) For $x = 2; y = 3$, the statement is not true.
   (It is only true for $x = 0; y = 1$ or $x = 0, y = 0$)
   (iii) For $n = 11, 2n^2 + 11 = 253$ which is not a prime number.
   (iv) You can give any two triangles with the same angles but of different sides.
   (v) A rhombus has equal sides but may not be a square.

3. Let x and y be two odd numbers. Then $x = 2m + 1$ for some natural number m and $y = 2n + 1$ for some natural number n.
   $x + y = 2(m + n + 1)$. Therefore, $x + y$ is divisible by 2 and is even.

4. Let $x = 2m$ and $y = 2n$
   Product $xy = (2m)(2n)$
   $= 4\ mn$

6. (i) Let your original number be n. Then we are doing the following operations:

$$n \to 2n \to 2n+9 \to +n = 3n+9 \to \frac{3n+9}{3} = n+3 \to n+3+4 = n+7 \to n+7-n = 7$$

   (ii) Note that $7 \times 11 \times 13 = 1001$. Take any three digit number say, abc. Then abc $\times$ $1001 = abcabc$. Therefore, the six digit number $abcabc$ is divisible by 7, 11 and 13.

SYLLABUS

Number System (50 hrs) **(i) Real numbers**	**(i) Real numbers** • Review of representation of natural numbers, integers, and rational numbers on the number line. • Representation of terminating / non terminating recurring decimals, on the number line through successive magnification. • Rational numbers as recurring / terminating decimals. • Finding the square root of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ correct to 6-decimal places by division method • Examples of nonrecurring / non terminating decimalssuch as 1.01011011101111— 1.12112111211112— and $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ etc. • Existence of non-rational numbers (irrational numbers) such as $\sqrt{2}$, $\sqrt{3}$ and their representation on the number line. • Existence of each real number on a number line by using Pythogorian result. • Concept of a Surd. • Rationalisation of surds
Algebra (20 hrs) **(i) Polynomials** **(ii) Linear Equations in TwoVariables**	**(i) Polynomials** • Definition of a polynomial in one variable, its coefficients, with examples and counter examples, its terms, zero polynomial. • Constant, linear, quadratic, cubic polynomials; monomials, binomials, trinomials. Zero / roots of a polynomial / equation. • State and motivate the Remainder Theorem with examples and analogy to positive integers (motivate). • Statement and verification of the Factor Theorem. Factorization of $ax^2 + bx + c$, $a \neq 0$ where a, b, c are real numbers and of cubic polynomials using theFactor Theorem.

	• Recall of algebraic expressions and identities. • Further identities of the type: $(x+y+z)^2 \equiv x^2+y^2+x^2+2xy+2yz+2zx$ $(x \pm y)^3 \equiv x^3 \pm y^3 \pm 3xy\,(x \pm y)$ $x^3+y^3+z^3-3xyz \equiv (x+y+z)(x^2+y^2+z^2-xy-yz-zx)$ $x^3+y^3 \equiv (x+y)(x^2-xy+y^2)$ $x^3-y^3 \equiv (x-y)(x^2+xy+y^2)$ and their use in factorization of polynomials. Simple expressions reducible to these polynomials. **(ii) Linear Equations in Two Variables** • Recall of linear equations in one variable. • Introduction to the equation in two variables. • Solution of a linear equation in two variables • Graph of a linear equation in two variables. • Equations of lines parallel to x-axis and y-axis. • Equations of x-axis and y-axis.
Coordinate geometry (5 hrs)	**Coordinate geometry** • Cartesian system • Plotting a point in a plane if its co-ordinates are given.
Geometry (40 hrs) **(i) The Elements of Geometry** **(ii) Lines and Angles** **(iii) Triangles** **(iv) Quadrilaterals** **(v) Area** **(vi) Circles** **(vii) Geometrical Constructions**	**(i) The Elements of Geometry** • History – Euclid and geometry in India. Euclid's method of formalizing observed phenomenon onto rigorous mathematics with definitions, common / obvious notions, axioms / postulates, and theorems. The five postulates of Euclid. Equivalent varies of the fifth postulate. Showing the relationship between axiom and theorem. • Given two distinct points, there exists one and only one line through them. • (Prove) Two distinct lines cannot have more than one point in common.

(ii) Lines and Angles

- (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is 180^0 and the converse.
- (Prove) If two lines intersect, the vertically opposite angles are equal.
- (Motivate) Results on corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines.
- (Motivate) Lines, which are parallel to given line, are parallel.
- (Prove) The sum of the angles of a triangle is 180^0.
- (Motivate) If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

(iii) Triangles

- (Motivate) Two triangles are congruent if any two sides and the included angle of one triangle is equal to any two sides and the included angle of the other triangle (SAS Congruence).
- (Prove) Two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle (ASA Congruence).
- (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence).
- (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are equal respectively to the hypotenuse and a side of the other triangle.
- (Prove) The angles opposite to equal sides of a triangle are equal.
- (Motivate) The sides opposite to equal angles of a triangle are equal.
- (Motivate) Triangle inequalities and relation between 'angle and facing side'; inequalities in a triangle.

(iv) Quadrilaterals

- (Prove) The diagonal divides a parallelogram into two congruent triangles.
- (Motivate) In a parallelogram opposite sides are equal and conversely.
- (Motivate) In a parallelogram opposite angles are equal and conversely.
- (Motivate) A quadrilateral is a parallelogram if one pair of its opposite sides are parallel and equal.
- (Motivate) In a parallelogram, the diagonals bisect each other and conversely.
- (Motivate) In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and (motivate) its converse.

(v) Area

- Review concept of area, area of planar regions.
- Recall area of a rectangle.
- Figures on the same base and between the same parallels.
- (Prove) Parallelograms on the same base and between the same parallels have the same area.
- (Motivate) Triangles on the same base and between the same parallels are equal in area and its converse.

(vi) Circles

- Through examples, arrive at definitions of circle related concepts radius, circumference, diameter, chord, arc, subtended angle.
- (Prove) Equal chords of a circle subtend equal angles at the centre and (motivate) its converse.
- (Motivate) The perpendicular from the centre of a circle to a chord bisects the chord and conversely, the line drawn through the centre of circle to bisect a chord is perpendicular to the chord.

	• (Motivate) There is one and only one circle passing through three given non-collinear points. • (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the centre (s) and conversely. • (Prove) The angle subtended by am arc at the centre is double the angle subtended by it at any point on the remaining part of the circle. • (Motivate) Angles in the same segment of a circle are equal. • (Motivate) A line segment joining any two points subtends equal angles at two other points lying on the same side of it then the four points are concyclic. • (Motivate) The sum of the either pair of the opposite angles of a cyclic quadrilateral is 180^0 and its converse.
	(vii) Constructions • Construction of a triangle given its base, sum / difference of the other two sides and one base angles. • Construction of a triangle when its perimeter and base angles are given. • Construct a circle segment containing given chord and given an angle.
Mensuration (15 hrs) **(i) Surface Areas and Volumes**	**(i) Surface Areas and Volumes** • Revision of surface area and volume of cube, cuboid. • Surface areas of cylinder, cone, sphere, hemi sphere. • Volume of cylinder, cone, sphere. (including hemi spheres) and right circular cylinders/ cones.
Statistics and Probability (15 hrs) **(i) Statistics** **(ii) Probability**	**(i) Statistics** • Revision of ungrouped and grouped frequency distributions. • Mean, Median and Mode of ungrouped frequency distribution (weighted scores).
	(ii) Probability • Feel of probability using data through experiments. Notion of chance in events like tossing coins, dice etc. • Tabulating and counting occurrences of 1through 6 in a number of throws.

	• Comparing the observation with that for a coin. Observing strings of throws, notion of randomness. • Consolidating and generalizing the notion of chance in eventslike tossing coins, dice etc. • Visual representation of frequency outcomes of repeated throws of the same kind of coins or dice. • Throwing a large number of identical dice/coins together and aggregating the result of the throws to get large number of individual events. • Observing the aggregating numbers over a large number of repeated events.Comparing with the data fora coin. Observing strings of throws, notion of randomness.
Proofs in Mathematics **(5 hrs)** **(i) Proofs in Mathematics**	**(i) Proofs in Mathematics** • Mathematical statements, verifying them. • Reasoning Mathematics, deductive reasoning • Theorems, conjectures and axioms. • What is a mathematical proof.

Academic Standards

Academic standards are clear statements about what students must know and be able to do. The following are categories on the basis of which we lay down academic standards

Problem Solving

Using concepts and procedures to solve mathematical problems

(a) Kinds of problems:

Problems can take various forms- puzzles, word problems, pictorial problems, procedural problems, reading data, tables, graphs etc.

(b) Problem Solving

- Reads problems
- Identifies all pieces of information/data
- Separates relevant pieces of information
- Understanding what concept is involved
- Recalling of (synthesis of) concerned procedures, formulae etc.
- Selection of procedure
- Solving the problem
- Verification of answers of raiders, problem based theorems.

(c) Complexity:

The complexity of a problem is dependent on

- Making connections(as defined in the connections section)
- Number of steps
- Number of operations
- Context unraveling
- Nature of procedures

Reasoning Proof

- Reasoning between various steps (involved invariably conjuncture).
- Understanding and making mathematical generalizations and conjectures
- Understands and justifies procedures· Examining logical arguments.

- Understanding the notion of proof
- Uses inductive and deductive logic
- Testing mathematical conjectures

Communication

- Writing and reading, expressing mathematical notations (verbal and symbolic forms)

  Ex: $3 + 4 = 7$, $3 < 5$, $n_1+n_2= n_2+n_1$, Sum of angles = 180^0
- Creating mathematical expressions
- Explaining mathematical ideas in her own words like- a square is closed figure having four equal sides and all equal angles
- Explaining mathematical procedures like adding two digit numbers involves first adding the digits in the units place and then adding the digits at the tens place/ keeping in mind carry over.
- Explaining mathematical logic

Connections

- Connecting concepts within a mathematical domain- for example relating adding to multiplication, parts of a whole to a ratio, to division. Patterns and symmetry, measurements and space
- Making connections with daily life
- Connecting mathematics to different subjects
- Connecting concepts of different mathematical domains like data handling and arithmetic or arithmetic and space
- Connecting concepts to multiple procedures

Visualization & Representation

- Interprets and reads data in a table, number line, pictograph, bar graph, 2-D figures, 3-D figures, pictures
- Making tables, number line, pictograph, bar graph, pictures.
- Mathematical symbols and figures.