Answer sheet

Exercise 1

1. (i) $\frac{7}{4}$ (ii) $\frac{-19}{30}$ (iii) $\frac{-2}{3}$ (iv) $\frac{34}{15}$ (v) $\frac{-107}{35}$ (vi) $\frac{-28}{57}$

2. (i) $\frac{23}{12}$ (ii) $\frac{44}{9}$ (iii) $\frac{-1}{2}$ (iv) $\frac{-22}{63}$ (v) $\frac{-27}{91}$ (vi) $\frac{-104}{15}$

3. (i) $\frac{13}{3}$ (ii) 1 (iii) $\frac{6}{35}$ (iv) $\frac{35}{12}$ (v) $\frac{9}{10}$ (vi) $\frac{-133}{18}$

4. (i) -10 (ii) 1 (iii) $\frac{-3}{2}$ (iv) $\frac{91}{36}$ (v) $\frac{-19}{55}$ (vi) $\frac{-3}{4}$

5. (i) $\frac{59}{30}$ (ii) $\frac{-11}{9}$ (iii) $\frac{7}{9}$ (iv) $\frac{-3}{7}$

6. (i) $\frac{-181}{315}$ (ii) 0

7. (i) $\frac{-7}{19}$ (ii) $\frac{9}{5}$ (iii) $\frac{-3}{7}$ (iv) $\frac{5}{9}$ (v) $\frac{-13}{17}$ (vi) $\frac{21}{31}$

8. (i) $\frac{-1}{17}$ (ii) $\frac{-17}{11}$ (iii) $\frac{5}{3}$ (iv) $\frac{-19}{13}$

9. $\frac{-75}{49}$

10. (i) rational (ii) positive (iii) not defined (iv) zero (v) one
(vi) reciprocal (vii) left (viii) right (ix) zero (x) one

11. (i) $\frac{-21}{8}, \frac{-9}{4}, \frac{-3}{2}, \frac{-3}{4}, \frac{-3}{8}$ etc. (ii) $\frac{5}{12}, \frac{5}{24}, \frac{5}{8}, \frac{25}{48}$ etc.

(iii) $\frac{-17}{48}, \frac{1}{24}, \frac{21}{48}$ etc.

Exercise 2.1

1. 243, 100, 2700

2. (i) 2 (ii) 2 (iii) 5 (iv) 7

3. (i) 3 (ii) 2 (iii) 3 (iv) 5 4. 6

Exercise 2.2

1. (i) Correct (ii) Correct (iii) wrong (iv) Correct (v)wrong (vi) Correct

2. (i) 4 (ii) 7 (iii) 18 (iv) 42 (v) 15 (vi) 22 (vii) 36 (viii) 45

Exercise 3.1

1. (i) $\frac{1}{343}$ (ii) $\frac{16}{25}$ (iii) -5 (iv) $\frac{16}{9}$

2. (i) -125 (ii) $\frac{1}{8}$ (iii) $\frac{16}{81}$

3. (i) $\frac{1}{2^6}$ (ii) $\frac{2^4}{5^3}$ (iii) $\left(\frac{-2}{3}\right)^3$ (iv) $\left(\frac{-1}{2}\right)^3$ (v) $-\left(\frac{5}{7}\right)^2$

4. (i) 243 (ii) $\frac{1}{32}$ (iii) $\frac{243}{32}$ (iv) $\frac{-1}{128}$ (v) $\frac{-32}{3125}$

5. (i) 4^3 (ii) $(-5)^3$ (iii) $\frac{2}{3}$ (iv) $\left(\frac{-1}{5}\right)^5$

6. (i) 729 (ii) 64 (iii) 625 (iv) 256 (v) $\frac{1}{256}$ (vi) $\frac{1}{729}$

7. (i)1 (ii) 1 (iii) 1 (iv) 1 (v) 1 (vi) 2 (vii) 2

8. (i) $\frac{1}{2^3}$ (ii) $\frac{1}{3^5}$ (iii) $\frac{1}{a^4}$ (iv) $\frac{1}{(-2)^5}$ (v) $\frac{1}{(-x)^3}$ (vi) 5^3 (vii) y^3 (viii) $\left(\frac{2}{3}\right)^3$

9. (i)11664 (ii) $\frac{375}{576}$ (iii) $\frac{243}{1372}$ (iv) $\frac{1}{256}$ (v) $\frac{625}{81}$ (vi) $\frac{1}{64}$

10. 29

Exercise 3.2

1. (i) $\frac{3}{5}$ (ii) $\frac{25}{36}$ (iii) $\frac{125}{512}$ (iv) 15

2. (i) 125 (ii) $625t^4$ (iii) $\frac{614656}{3}$ (iv) $\frac{1}{20}$ (v) $\frac{1458}{625}$

3. (i) 3 (ii) 2 (iii) 2

4. (i) $\frac{80}{243}$ (ii) $\frac{8}{3}$

Exercise 3.3

1. (i)1.28×10^8 (ii) 1.68×10^9 (iii) 5×10^{-4} (iv) 1.7×10^{-7}
   (v) 3.97×10^{-10} (vi) 4.358×10^{-8}

2. (i)4000000000 (ii) 2450000000 (iii) 56172900 (iv) 0.0000085
   (v) 0.00000302 (vi) 0.0007

3. (i)2×10^{-4} (ii) 1.6×10^{-19} (iii) 1×10^{-6} (iv) 1.6×10^{-3}

Exercise 4.1

1. 3 2. 1

3. 0,9 4. 0, 3, 6, 9

5. (i) divisible by 3. (ii) divisible by 3.9,11 (iii) divisible by 3.9

6. Not completely divisible by 11.

7. 0, 3, 6, 9

Exercise 4.2

1. (i) A= 8 B= 9 (ii) A= 4 B= 3 C= 1 (iii) A= 2 B= 5
   (iv) A= 2 B= 7 (v) A= 8 B= 1 (vi) A= 6
   (vii) A= 2 B= 5 C= 1 (viii) A= 7 B= 4

2. (i) 4 (ii) 3 (iii) 1 (iv) 9 (v) 6 (vi) 4 (vii) 7 (viii) 3

Exercise 5

1. (i) 10605 (ii) 165 (iii) 1458 (iv) 15609

2. (i) 2448 (ii)783 (iii) 1224 (iv) 378 (v) 10626

   (vi) 23436 (vii) 884640 (viii) 5832 (ix) 970299

3. (i) Quotient = 142
   Remainder = 11
   (ii) Quotient = 74
   Remainder = 14
   (iii) Quotient = 90
   Remainder = 16

Exercise 6.1

1. (1) (iii), (iv), (v), (vi).
   (2) (i),(ii).
   (3) (i) concave (ii) concave (iii) convex (iv) convex (v) convex (vi) convex

2. (i) a, b, c, d, e (ii) p, q, r, s, t

3. Closed figure with 3 or more similar sides.
   (i) Pentagon (ii) Hexagon (iii) Octagon

4. (i) 60° (ii) 140° (iii) 108° (iv) x =90° y =120° z =150°
   (v) x = 60°, y =100°, z =120°, w = 80°

5. 8 6. 24 7. 15 8. 144

9. No 10. 111° 11. 135° 12. 900°

Exercise 6.2

1. (i) supplementary (ii) equal (iii) 80° (iv) rhombus (v) similar

2. x = 70°, y = 70°, z = 110°

3. (i) x = 90°, y = 45°, z = 45° (ii) x = 28° y = 112° z = 28°

4. 30°, 150°, 30°, 150°

5. (i) x = 6, y = 9 (ii) x = 3, y = 13

6. x = 3 7. x = 5cm , y = 12cm , z = 13cm 8. x = 90°, y = 50°

Exercise 7.1 to 7.6

Methodology based

Exercise 8.1

1 (i) Triangle (ii) congruent (iii) 15 (iv) prism

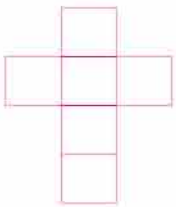
4. (i) and (ii) are polyhedron

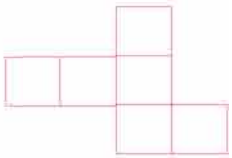
(i) cuboid and pyramid

(ii) prism and pyramid

Exercise 8.2

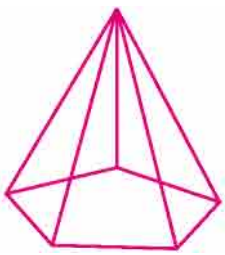
1.



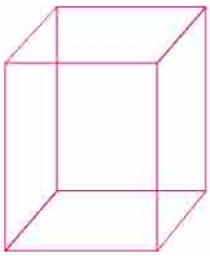


2.

3. (i)

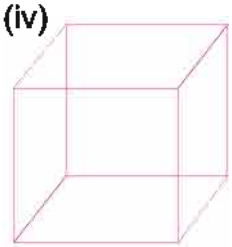


(ii)



(iii)

(iv)



Exercise 9.1

1. (i) $15x$ (ii) $10pq$ (iii) $-21l^2n^2$ (iv) $18mn$ (v) $10x^3$

2.

X	7	x	y	2z	a	-5b	c
7	49	$7x$	7y	14z	7a	-35b	7c
x	$7x$	x^2	xy	$2zx$	ax	$-5bx$	cx
2y	14y	$2xy$	$2y^2$	4yz	2ay	-10by	2cy
-3a	-21a	$-3ax$	-3ay	-6az	$-3a^2$	15ab	3ac
b	7b	bx	by	2bz	ab	$-5b^2$	bc
y	7y	xy	y^2	2yz	ay	-5by	cy
$2x^3$	$14x^3$	$2x^4$	$2x^3y$	$4x^3z$	$2x^3a$	$-10x^3b$	$2x^3c$
a^4	$7a^4$	a^4x	a^4y	$2a^4z$	a^5	$-5a^4b$	a^4c
z^2	$7z^2$	xz^2	yz^2	$2z^3$	az^2	$-5bz^2$	cz^2

3. (i) x^5y^3 (ii) m^6n^6 (iii) $k^3l^3m^3$ 4. x^3y

Exercise 9.2

1. (i) $6x^2+x-35$ (ii) $3xy+5x-24y-40$ (iii) $2.25p^2-0.25q^2$ (iv) $ax+5a+3bx+15b$
   (v) $6l^2m^2-lm^2-15m^4$ (vi) $3a^4+\frac{43}{4}a^2b^2-5b^4$
2. (i) $-6x^2-x+40$ (ii) $3x^2+8xy-3y^2$ (iii) $a^3+a^2b^2+ab+b^3$ (iv) $2p^3+p^2q-2pq^2-q^3$
3. (i) x^2-2x (ii) $3a^2+a^2b^2-3b^2-4$ (iii) $t^3-s^3+s^2t^2-ts$ (iv) $4ab+2bc+2bd$
   (v) a^3+b^3 (vi) $a^2+2ab+b^2-c^2$ (vii) 0

Exercise 9.3

1. (i)$x^2+10x+25$ (ii)$9x^2+12x+4$ (iii) $25a^2-70a+49$ (iv) $9p^2-3p+\frac{1}{4}$
   (v) $1.44m^2-0.72m+0.09$ (vi) x^4-y^4 (vii) $49-36y^2$ (viii) $49a^2-81b^2$
2. (i) x^2+3x+2 (ii) $9x^2+18x+5$ (iii) $16x^2-24x+5$ (iv) $9a^2-9a-40$ (v) $x^2y^2z^2-3xyz+2$
3. (i) $b^2-14b+49$ (ii) $x^2y^2+6xyz+9z^2$ (iii) $36m^4-60m^2n+25n^2$ (iv) $\frac{9}{4}x^2+2xy+\frac{4}{9}y^2$

4. (i) $a^4-2a^2b^2+b^4$ (ii) 40n (iii) $98m^2+128n^2$ (iv) $m^4+n^4m^2$

6. (i) 9801 (ii) 10609 (iii) 89991 (iv) 6396

7. (i) 400 (ii) 12 (iii) 1800

8. (i) 10506 (ii) 51.83 (iii) 10098 (iv) 94.08

Exercise 10.1

1. (i) 12 (ii) 14pq (iii) 6ab (iv) $4x$ (v) 10 (vi) x^2y^2

2. (i) 6(p-2q) (ii) 7a(a+2) (iii) $5(2a^2-3b^2+4c^2)$ (iv) $xy(ax+by+cz)$

(v) $xyz(x+y+z)$ (vi) $4z(-8+5z^2)$

3. (i) $(x+1)(2y+3)$ (ii) $(xy+1)(z-7)$ (iii) $(2y-3)(3x-2)$ (iv) $(5p+3)(3q+5)$

Exercise 10.2

1. (i) (a+2)(a-2) (ii) (a+7b)(a-7b) (iii) p(p+11)(p-11) (iv) (a-b+c)(a-b-c)

(v) $(a^2+b^2)(a+b)(a-b)$ (vi) $5x(x+5)(x-5)$ (vii) 7(3a+4b)(3a-4b)

(viii) $(3xy+4)(3xy-4)$ (ix) 4lm

2. (i) $x(lx+m)$ (ii) $2x(x^2+y^2+z^2)$ (iii) (a+b)(a+4) (iv) $(x+1)(y+1)$

(v) (a-3)(5a+2c) (vi) $(a+b)(m^2+n^2)$

3. (i) $(x+2)(x+3)$ (ii) (q+8)(q+3) (iii) (m-7)(m-3) (iv) $(x+8)(x-2)$

(v) $(x-9)(x+2)$ (vi) $(x-17)(x+6)$ (vii) (y+8)(y-6) (viii) (d-9)(d+5)

(ix) (m+9)(m+7) (x) (n-23)(n+4) (xi) (p-8)(p-2) (xii) $(x+9)(x-5)$

Exercise 10.3

1. (i) $\frac{1}{2}x^3$ (ii) -4y (iii) $\frac{2}{3}x^2y$ (iv) $-2a^2b^4$

2. (i) $(\frac{5}{3})x-2$ (ii) $(\frac{x^2}{2})+x+\frac{3}{2}$ (iii) q^3-p^3 (iv) $3x^4-4x^2+5$

3. (i) 6y (ii) xy (iii) 5y+7 (iv) 3

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

Exercise 11.1

(1) 4 (2) 6 (3) 3 (4) 13 (5) 4

(6) 2 (7) 3 (8) 10 (9) $(\frac{-4}{5})$ (10) 8

Exercise 11.2

(1) $\frac{4}{7}$ (2) 7 (3) 5 (4) Rs 300000 (5) 16

(6) 32, 13 (7) 8, 24 years (8) 19 m, 13 m (9) 39 (10) 28 or 82

Exercise 12.1

(1) (i) 3 (ii) -2 (iii) -3 (iv) four (v) - 4

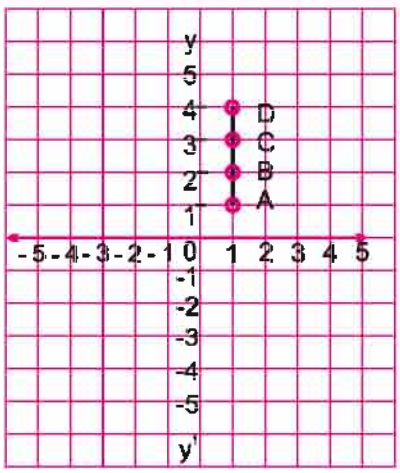
(2) (i) x-coordinate = 2, y-coordinate = 1, coordinates (2, 1)
(ii) x-coordinate = -3, y-coordinate = 2, coordinates (-3, 2)

(iii) -4,-3, (-4,-3)

(iv) 3,-2, (3,-2)

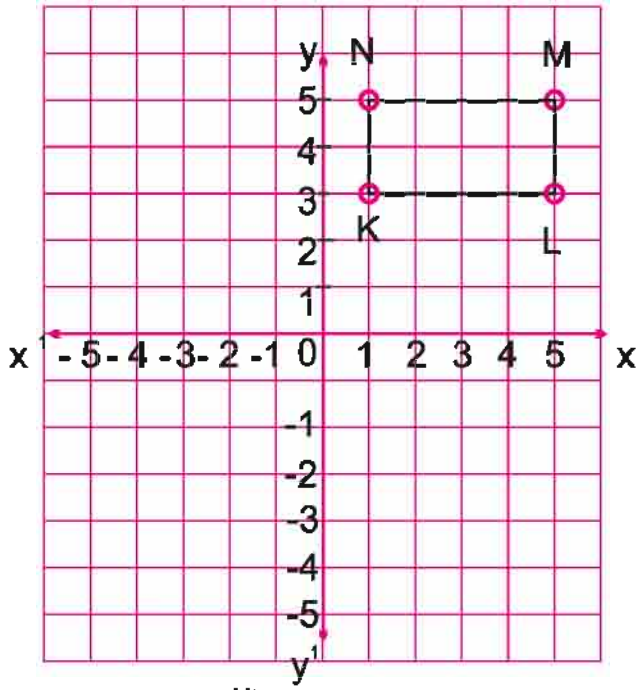
(3)

(i)



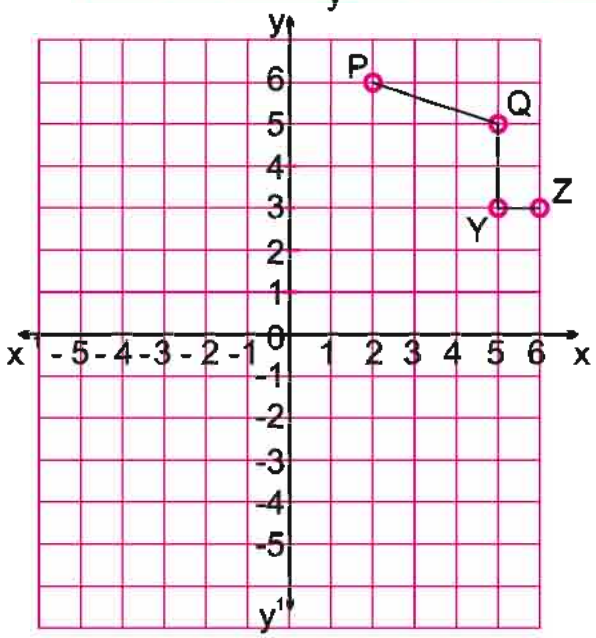
Yes

(ii)



No

(iii)



No

(4) (i) A (1, 5), B (5, 5), C (6, 8), D (2, 8)

Length of AB = 4 units, Length of DC = 4 units

(ii) P (1, 1), Q (4, 1), R (1, 3) ; Length of PQ = 3 units

(5) (i) true (ii) true (iii) true (iv) false (v) false

Exercise 12.2

(1) Equilateral triangle

Length	1	2	3	4	5	6
Perimeter	3	6	9	12	15	18

Square

Length	1	2	3	4	5	6
Perimeter	4	8	12	16	20	24

(2)

Breadth of Rectangle	1	2	3	4	5	
Area	2	8	18	32	50	

(3), (4), (5) Draw the graph as per the given table.

Exercise 13.1

(1) (i) 25% (ii) 75%

(2) (i) 3:2 (ii) 2:3 (iii) 3:5 (iv) 2:5

(3) 51 students

(4) 20 matches (5) 459 trees

(6) Rs. 2400 (7) 15%

Exercise 13.2

(1) 16% loss (2) Rs 23000 (3) 16% loss (4) Rs 61560 (5) Rs. 15225

(6) 4% loss (7) 6.25% (8) 2 years 6 months (9) 7476

Exercise 13.3

(1) 20% (2) Rs 19200 (3) Rs 62,684.16 (4) 6400 (5) Rs 1,664

(6) Rs 16,686.86 (7) 2837.25 (8) (i) Rs 85,600 (ii) Rs 91,592

(9) Rs 95.31

Exercise 13.4

(1) Rs 450 (2) 216 metre (3) 15 books (4) 5 hours

(5) 60 litres (6) 400 litres (7) 12 days (8) 12 days

(9) 20 (10) 20 students (11) 400 kilograms

Exercise 14.1

1. 104 sq. cm 2. 224 sq. cm

3. 7 cm 4. 119 sq. m

5. Rs. 11,700 6. 40.5 sq. cm

7. 23100 sq. m

8. (i) half (ii) different (iii) Trapezium (iv) Rhombus

Exercise 14.2

1. 10450 sq. m
2. 64 sq. cm
3. 19550 sq. m

Exercise 15.1

1. 384 sq. cm, 174 sq. cm, 38600 sq. cm
2. 10 cm
3. Cylinder: 231 sq. m. Cube: 294 sq. m. Surface area of cube is more than that of cylinder.
4. 5280 sq. cm
5. 0.52 sq. m
6. 145 paint boxes.
7. Rs. 1408
8. 322 meter
9. 1980 sq. m
10. 96 sq. cm

Exercise 15.2

1. 450 cubes
2. 24 wood pieces
3. Cylinder A.
   (i) 1078 cubic cm (ii) 539 cubic cm
4. 49500
5. 1925 minutes
6. 27 kg
7. (i) 4 times (ii) 8 times
8. 20 m

Exercise 16.1

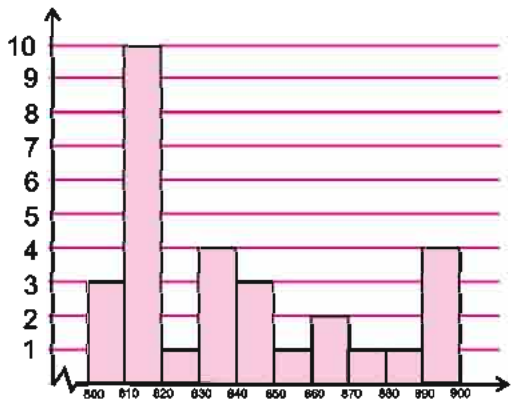
1. The data of situations of (ii), (iv) and (v) can be divided in class intervals.

2.

Colour	Tally Marks	No. of clothes
W	𝍸 III	8
R	𝍸 𝍸	10
B	𝍸 I	6
Y	𝍸 II	7
X	𝍸 IIII	9
	Total	40

3.

Weekly wages	Tally Marks	No. of workers
800-810	III	3
810-820	𝍸 𝍸	10
820-830	I	1
830-840	IIII	4
840-850	III	3
850-860	I	1
860-870	II	2
870-880	I	1
880-890	I	1
890-900	IIII	4
	Total	30



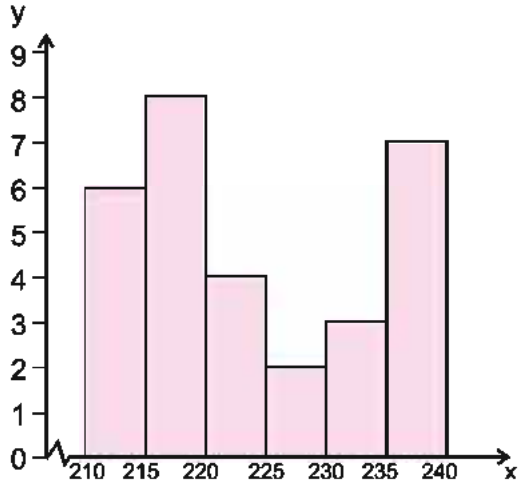
4.

No. of mobiles	Tally Marks	No. of days
210-215	𝍸 I	6
215-220	𝍸 III	8
220-225	IIII	4
225-230	II	2
230-235	III	3
235-240	𝍸 II	7
	Total	30

(i) 215-220

(ii) 10 days

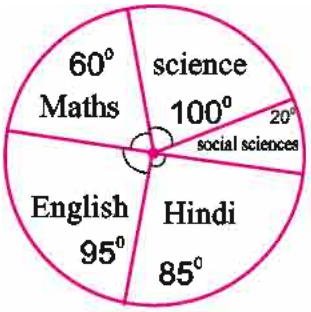
(iii) 20 days



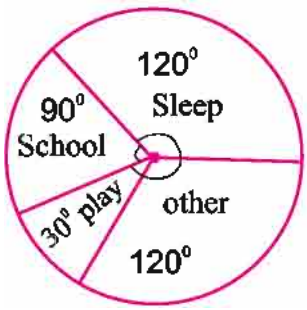
5. (i) 4 – 5 hours (ii) 60 students (iii) 100 students (iv) 4 – 5

Exercise 16.2

(1)

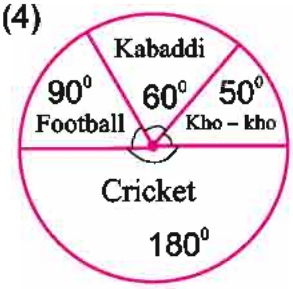


(2)



(3) (i) Maths
(ii) 250-180 = 70 number
(iii) Yes

(4)



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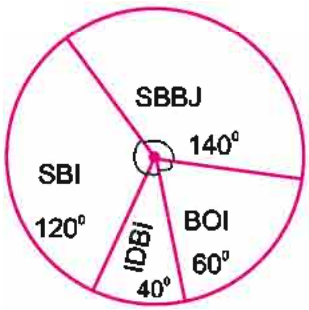

6. (i) 26.7% (ii) 29.9% (iii) 0.3% (iv) 10.4%

Exercise 16.3

(1) $\frac{1}{2}$ (2) $\frac{6}{24} = \frac{1}{4}$ (3) $\frac{1}{13}$

(4) (i) (a) $\frac{1}{2}$ (ii) $\frac{3}{6} = \frac{1}{2}$

(iii) (a) $\frac{3}{6} = \frac{1}{2}$ (iv) $\frac{5}{6}$

(v) $\frac{1}{2}$

(5) (i) $\frac{1}{15}$ (ii) $\frac{6}{15} = \frac{2}{5}$ (iii) $\frac{9}{15} = \frac{3}{5}$

Brahmagupta

Brahmagupta was an Indian mathematician, born in 598 AD in Bhinmal in Jalore district. He became the head of the astronomical observatory at Ujjain. At the age of 30, he composed the theoretical treatise 'Brāhmasphuṭasiddhānta' on astronomy. The book consists of 24 chapters.

The 12th chapter of the book is '*Ganitadhyaya*'. It is named "Mathematics," because the arithmetic operations and proportions, and the "practical mathematics," such as mixture and series, treated there occupied the major part of the mathematics of Brahmagupta's milieu.

The 18th chapter of the book is '*Kuttakaadhyaya*'. In this chapter, Brahmagupta gave the solution of the general linear equation. He also introduced new methods for solving quadratic equations and gave equations to solve systems of simultaneous indeterminate equations.

The 2nd chapter of the book deals with trigonometry.

His other well known work is mathematical treatise '*Khanda-khādyaka*', a more practical text. Of particular interest to mathematics in this second work by Brahmagupta is the interpolation formula he uses to compute values of sines. It this book, rules of sines (*Jya*) and cosines (*Cojya*) are available for plane trigonometry and spherical trigonometry.

These manuscripts are available at 'The Bhandarkar Oriental Research Institute', Pune, Maharashtra. These books had been translated into Arabic and Persian and the knowledge was transitioned to Arabic countries. From there, it was conveyed to western Europe through Arabs.

Some of the important contributions made by Brahmagupta in mathematics are-

(1) Easy methods to find square roots and cube-roots.

(2) Defining the rules and properties of *Zero*.

(3) Providing two equivalent solutions to the general quadratic equation.

(4) To find the area of triangle and cyclic quadrilaterals.

स्थूलफलं त्रिचतुर्भुजबाहु प्रतिबाहु योग दसघातः।
भुजयोगार्घचतुष्टय भुजोनघातात् पदं सूक्ष्मतम्।।

The area is the square root from the product of the halves of the sums of the sides diminished by each side of the quadrilateral.

$$\text{Area of a cyclic quadrilateral} = \sqrt{(s-a)(s-b)(s-c)(s-d)}$$

[where a, b, c, d are the sides of the cyclic quadrilateral and $2s = a + b + c + d$]

$$\text{Area of a triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$

[where a, b, c are the sides of the triangle and $2s = a + b + c$]

(5) To construct a cyclic quadrilateral with integer sides, etc are considered as great achievement even in today's world of mathematics.