

Understanding 3D and 2D Shapes

14.1 INTRODUCTION

Pictures of some objects are given below.



Carefully study the shape of these objects. Classify them according to their shape in this table:

Table - 14.1

Shape	Object
Like a match box	
Like a ball	
Like a wooden log	
Like a dice	
Like a cone	

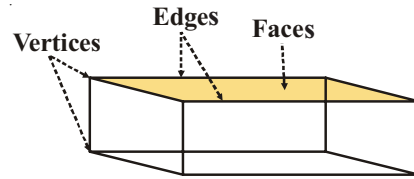
14.2 3D-SHAPES

We have learnt about triangles, squares, rectangles etc. in the previous classes. All these shapes spread in two directions only and thus called two-dimensional or 2D shapes.

All solid objects like above, have a length, breadth and height or depth. They are thus called three dimensional or 3D-shapes. Now, we will learn about various 3 dimensional or 3D shapes.

14.2.1 Cuboid

The shapes like a closed match box are examples of a cuboid. Touch your hand on the top of the match box. This plane surface is the face of match box. How many faces does a match box have?



The sides of the faces are the edges. How many edges does a match box have?

The corners of the edges are the vertices of the match box. How many vertices does a match box have?

Now take an eraser, whose shape is similar to that of a match box. Touch your hand along its faces, edges and vertices.

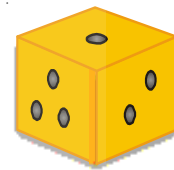
Does the eraser have the same number of faces, edges and vertices as that of match box? You will find this to be true.

Objects like match boxes, erasers etc. are in the shape of a cuboid and have 6 faces, 12 edges and 8 vertices.

14.2.2 Cube

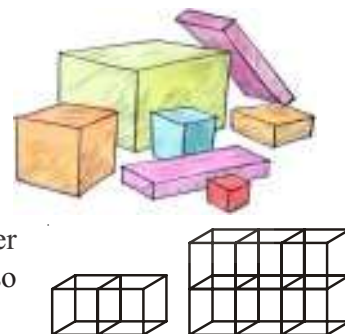
A dice is an example of a cube. Take a dice. Locate its faces, edges and vertices. Count them. How many faces, edges and vertices does a dice have?

You will find that a die has 6 faces, 12 edges and 8 vertices, same as that of a cuboid. Then what is the difference between a cube and a cuboid? You will find that the length, breadth and height of a cube are all same, but in a cuboid they are different. Verify this by measuring the length, breadth and height of an eraser and a die.



TRY THESE

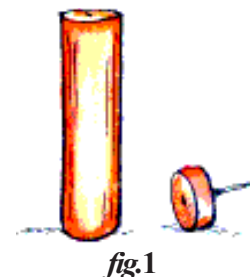
- (i) What is the shape of the face of a cube?
(ii) What is the shape of the face of a cuboid?
- Ramesh has collected some boxes in his room. Pictures of these are given here. How many are cubes and how many are cuboids.
- Ajith has made a cuboid by arranging cubes of 2 centimeter each. What is the length, breadth and height of the cuboid so formed?

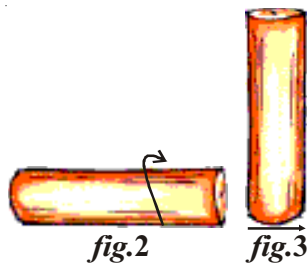


14.2.3 Cylinder

Objects like a wooden log, a piece of pipe, a candle, tube light are in the shape of a cylinder. Take a candle. Slice it on the top as shown in the fig.1. Lay it down horizontally (fig.2). Can you roll it?

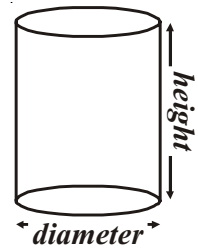
Now erect candle up vertically (fig.3). Does it roll?





The surface on which the candle rolls is called its curved surface. The surface on which the candle does not roll, but stands on vertically is the base, which is circular in shape.

Now what is the height and width of the candle? Look at the height and width of the cylinder shown in the figure.

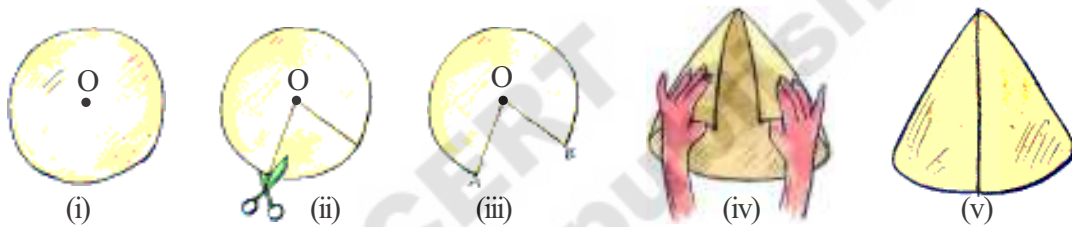


14.2.4 Cone

Raju wants to buy a special cap for his birthday. He asked Leela to come along with him. Leela said that there is no need to go to the market as they can make the cap on their own.

Would you like to make a cap? Let us try.

Draw a circle on a thick paper using a compass. Draw two lines from the centre to the circumference as shown in the *fig. (ii)*



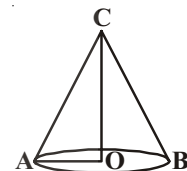
Cut this part with scissors it will look like. (*fig. iii*)

Now join \overline{OA} and \overline{OB} with adhesive tape. Your cap is ready now. Decorate it as you wish.



Raju inverted the cap and said "oh! it looks like an ice-cream cone."

Here is a figure of a cone. \overline{OA} is the radius of the circular part and OC is the height of the cone.



THINK, DISCUSS AND WRITE

What is the difference between a cylinder and a cone with respect to the number of faces, vertices and edges? Discuss with your friends.



14.2.5 Sphere

Balls, laddoos, marbles etc. are all in the shape of a sphere. They roll freely on all sides.

Can you call a coin a sphere? Does it roll on all its sides? Is the case with a bangle?

You may have seen lemon in your daily life.

When we cut it horizontally it looks like the shape shown in the figure. The shape of such an object is called semisphere.



Do This



Fill the table accordingly:

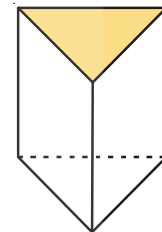
S. No.	Object	Shape	Slides only	Roll only	Slides and rolls
1.	Cell	Cylindrical	×	×	✓
2.	Ball				
3.	Oil can				
4.	Biscuit packet				
5.	Coin				
6.	Marble				
7.	Orange				

The cylinder, the cone and the sphere have no straight edges. What is the base of a cone? Is it a circle? The cylinder has two bases. What shape is the base? Of course, a sphere has no face! Think about it.

14.2.6 Prism

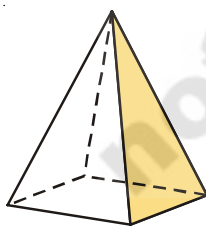
Here is a diagram of a **prism**.

Have you seen it in the laboratory? Two of its faces is in the shape of triangle. Other faces are either in the shape of rectangle or parallelogram. It is a triangular prism. If the prism has a rectangular base, it is a rectangular prism. Can you recall another name for a rectangular prism?



Prism

14.2.7 Pyramid



Pyramid

A **pyramid** is a solid shape with a base and a point vertex, the other faces are triangles. All the triangular faces meet at vertex of the prism.

Here is a square pyramid. Its base is a square. Can you imagine a triangular pyramid? Attempt a rough sketch of it.

ACTIVITY

Take a sheet of chart. Draw a triangle with equal sides on the chart, cut it. Then using this triangle cut out three more triangles of exactly same size from the chart. Join the edges of the four triangles, thus formed in order to make a closed object. This object is in the shape of a tetrahedron or triangular pyramid.





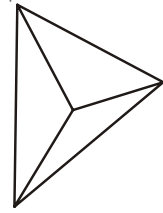
EXERCISE-14.1

1. A triangular pyramid has a triangle at its base. It is also known as a tetrahedron. Find the number of

Faces : _____

Edges : _____

Vertices : _____



2. A square pyramid has a square at its base. Find the number of




Faces : _____

Edges : _____

Vertices : _____



3. Fill the table

Shape	No. of curved surfaces	No. of plane surfaces	No. of Vertices
			
			
			

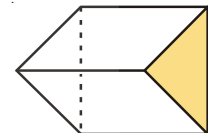
4. A triangular prism is often in the shape of a kaleidoscope. It has triangular faces.

No. of triangular Faces : _____

No. of rectangular Faces : _____

No. of Edges : _____

No. of Vertices : _____

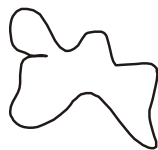


14.3 POLYGONS

We have learnt about open and closed figures in the chapter 'Basic Geometrical Ideas'. See the figures given below. Which of the following figures are open and which are closed?



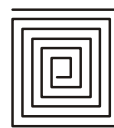
(i)



(ii)



(iii)

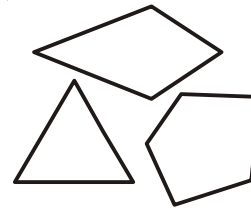


(iv)



(v)

A figure is a polygon if it is a closed figure, formed with a definite number of straight lines. Some examples are shown here.

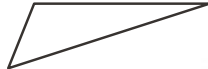







Do This

- Draw ten polygons with different shapes in your notebook.
 - Use match-sticks or broom-sticks and form closed figures using:
 - Six sticks
 - Five sticks
 - Four sticks
 - Three sticks
 - Two sticks
- In which case was it not possible to form a polygon? Why?

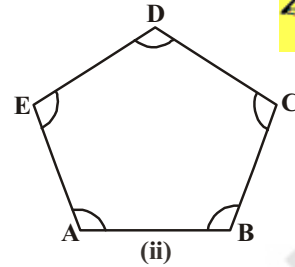
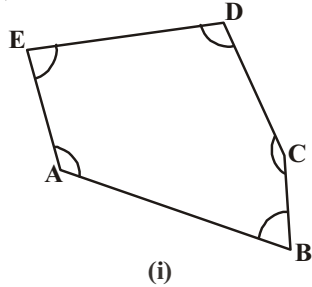


You will find that you could not form a polygon using two sticks. A polygon must have at least three sides. A polygon with three sides is called a triangle. Study the table given below and learn the names of the various types of polygons.

Figure	No. of sides	Name
	3	Triangle
	4	Quadrilateral
	-	Pentagon
	-	Hexagon
	7	Septagon
	-	Octagon

TRY THIS

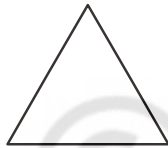
Find out the differences:



Measure the lengths of the sides and angles of (i) and (ii). What did you find?

14.3.1 Regular Polygon

A polygon with all equal sides, and all equal angles is called a regular polygon. Equilateral triangles and squares are examples of regular polygons.



Equilateral triangle : A triangle with all sides and all angles equal



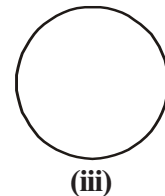
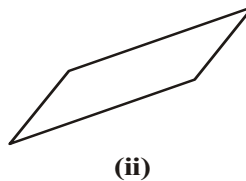
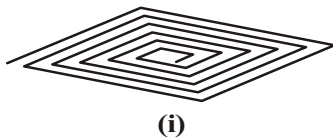
Square : A quadrilateral with all sides and all angles equal.

Similarly, if all the sides and all the angles of a pentagon, hexagon, septagon and octagon are equal they are called regular pentagon, regular hexagon, regular septagon and regular octagon respectively.

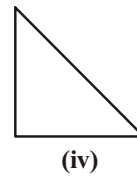
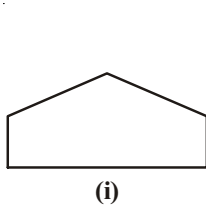


EXERCISE - 14.2

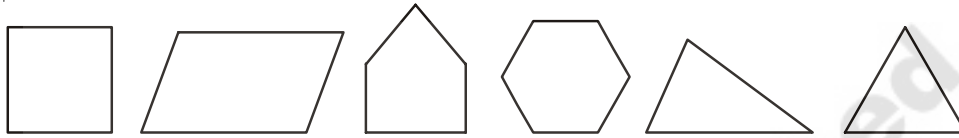
1. Examine whether the following are polygons if not why?



2. Count the number of sides of the polygons given below and name them:

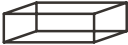



3. Identify the regular polygons among the figures given below:



WHAT HAVE WE DISCUSSED?

1. Various boxes are normally in the shapes of cubes and cuboids:

Shapes	Faces	Edges	Vertices
	6	12	8
	6	12	8

- Ice-cream cones, joker's caps etc. are in the shape of cone.
- Tins, oil drums, wooden logs are in the shape of a cylinder.
- Balls, laddoos etc. are in the shape of a sphere.
- A polygon is a closed figure made up of line segments.
- If all the sides and angles of a polygon are equal, it is called a regular polygon.



Answers



EXERCISE - 1.1

- | 1. | Greatest number | Smallest number | | |
|----|-----------------------------|--|------------------------------|----------|
| | i 15892 | 15370 | | |
| | ii 25800 | 25073 | | |
| | iii 44687 | 44602 | | |
| | iv 75671 | 75610 | | |
| | v 34899 | 34891 | | |
| 2. | i 375, 1475, 4713, 15951 | | ii 9347, 12300, 19035, 22570 | |
| 3. | i 89715, 89254, 45321, 1876 | | ii 18500, 8700, 3900, 3000 | |
| 4. | i < | ii > | iii > | iv > |
| 5. | i | Seventy two thousand six hundred forty two | | |
| | ii | Fifty five thousand three hundred forty five | | |
| | iii | Sixty six thousand six hundred | | |
| | iv | Thirty thousand three hundred one | | |
| 6. | i 40270 | ii 14064 | iii 9700 | iv 60000 |
| 8. | i 1000 | ii 9999 | iii 10000 | iv 99999 |



EXERCISE - 1.2

- | | | | | |
|----|---------------------------------|----------|--------------------------|----------|
| 1. | i 90 | ii 420 | iii 3950 | iv 4410 |
| 2. | i 700 | ii 36200 | iii 13600 | iv 93600 |
| 3. | i 3000 | ii 70000 | iii 9000 | iv 4000 |
| 4. | i 3407 | ii 12351 | iii 30525 | iv 99999 |
| 5. | i 4000 + 300 + 40 + 8 | | ii 30000 + 200 + 10 + 4 | |
| | iii 20000 + 2000 + 200 + 20 + 2 | | iv 70000 + 5000 + 20 + 5 | |



EXERCISE - 1.3

- | | | |
|----|------------------------------------|-----------------|
| 1. | i 1,12,45,670 | ii 2,24,02,151 |
| | iii 3,06,08,712 | iv 19,03,08,020 |
| 2. | i Thirty four thousand twenty five | |

- i Seven lakh nine thousand one hundred fifteen
 iii Forty seven crore sixty lakh three hundred seventeen
 iv Six crore eighteen lakh seven thousand
3. i 4,57,400 i 60,02,775
 iii 2,50,40,303 iv 60,60,60,600
4. i 600000 + 40000 + 100 + 50 + 6
 i 6000000+300000+20000+500
 iii 10000000 + 2000000 + 500000 + 30000 + 200 + 70 + 5
 iv 700000000 + 50000000 + 8000000 + 10000 + 9000 + 200 + 2
5. i 54, 28, 524 i 6, 43, 20, 501
 iii 3, 03, 07, 881 iv 7, 70, 07, 070
6. i 18, 71, 964 > 4, 67, 612 i 14, 35, 10, 300 > 14, 25, 10, 300
7. i 99, 999 < 2, 00, 015 i 13, 49, 785 < 13, 50, 050



EXERCISE - 1.4

1. i 97, 645, 315 i 20, 048, 421
 iii 476, 356 iv 9, 490, 026, 834
3. Indian system
 i Twelve crore thirty one lakh fifteen thousand twenty seven
 ii Eight crore ninety six lakh forty three thousand ninety two
 International system
 i One hundred twenty three million one hundred fifteen thousand twenty seven
 ii Eight nine million six hundred forty three thousand ninety two
4. i 2 i 4
 iii 0 iv Three hundred two



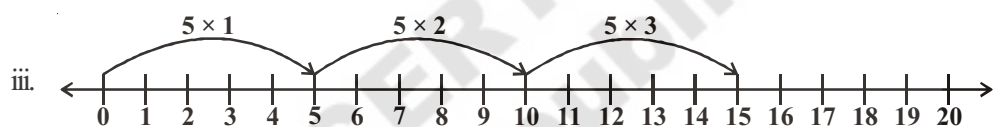
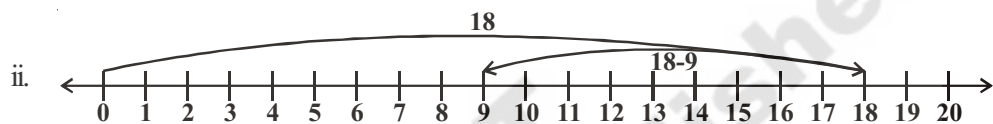
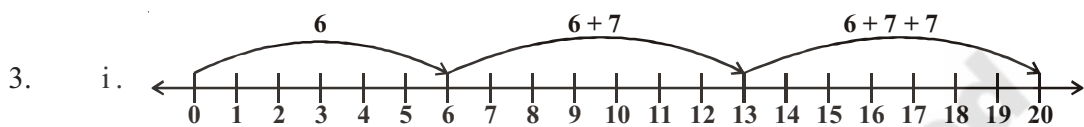
EXERCISE - 1.5

1. 54,284 2. 2, 34, 732
3. Greatest number = 75430
 Smallest number = 30457
 Difference = 44,973
4. 96875 bicycles 5. 31,200
 6. 1680 grams 7. 22 km 500 m
 8. 22 shirts ; 40 cm cloth will be left
 9. ₹ 45000



EXERCISE - 2.1

1. i T ii T
 iii F [All natural numbers are whole number] iv T
 v F [The whole number on the left of another number on the number line, is smaller]
 vi F [We can show the smallest whole number on the number line.]
 vii F [We can't check the greatest whole number on the number line]
2. 18



4. i 895 is on the right of 239 ii 10001 is on the right of 1001
 iii 10015678 is on the right of 284013
6. i > ii > iii < iv >



EXERCISE 2.2

1. i 532 ii 47 iii C iv 100 v 85 vi d
2. i. 1095 ii 600
3. i 196300 ii 1530000
4. i 11040 ii 388710
5. i 407745 ii 2000955
6. ₹3000 7. ₹330
8. i c ii e iii b iv a v d



EXERCISE 2.3

1. $123456 \times 8 + 6 = 987654$
 $1234567 \times 8 + 7 = 9876543$
 $12345678 \times 8 + 8 = 98765432$
 $123456789 \times 8 + 9 = 987654321$



2. $91 \times 11 \times 4 = 4004$
 $91 \times 11 \times 5 = 5005$
 $91 \times 11 \times 6 = 6006$
 $91 \times 11 \times 7 = 7007$
 $91 \times 11 \times 8 = 8008$
 $91 \times 11 \times 9 = 9009$
 $91 \times 11 \times 10 = 10010$



EXERCISE 3.1

1. Divisible by 2 -- ii, iii, iv, v, vi, viii
 Divisible by 3 -- i, ii, iii, iv, v, vii
 Divisible by 6 -- ii, iii, iv, v
2. Divisible by 5 -- 25, 125, 250, 1250, 10205, 70985, 45880
 Divisible by 10 -- 250, 1250, 45880
5. 12345 is divisible by 3, 5
 54321 is also divisible by 3, 5
7. i. 2, 8 ii. 0, 9 iii. 1, 7
8. 2 9. 6

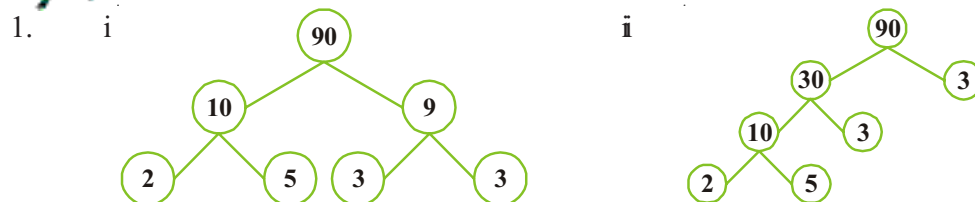


EXERCISE 3.2

1. i. 1, 2, 3, 4, 6, 9, 12, 18, 36 ii. 1, 23
 iii. 1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 96 iv. 1, 5, 23, 115
2. i, ii 3. 19
4. Prime number- 11, 13, 17, 19, 23, 29
 Composite number- 12, 14, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27, 28
5. 13-31, 79-97 6. (3, 5), (5, 7), (11, 13), (17, 19)
7. 5 and 7 8. 13, 23
9. 90 to 96 10. (31, 11, 11); (13, 17, 23); (3, 19, 31) etc
11. (3, 13); (7, 17); (23, 13)... 12. (2, 3); (3, 7); (7, 13) etc



EXERCISE 3.3



2. $2 \times 2 \times 3 \times 7$
3. Greatest 4 digit number - 9999
Prime factors are- $101 \times 11 \times 3 \times 3$
4. It is 210 because $210 = 2 \times 3 \times 5 \times 7$



EXERCISE 3.4

1. i 9 ii 53 iii 5 iv 32
2. 4 3. 3 4. No; 1



EXERCISE 3.5

1. i 60 ii 75 iii 42 iv 54 v 1008 vi 182
2. i 2352 ii 2142 iii 1980
3. 247
4. i 900 ii 904
5. 576 6. 8 7. 13th day



EXERCISE 3.6

1. i LCM = 120 ii LCM = 200
 HCF = 3 HCF = 1
- iii LCM = 48
 HCF = 12
2. 25 3. 546 4. 18



EXERCISE 3.7

1. i, ii, iii, iv 2. ii, iv, v
3. i No ii Yes iii Yes
4. Divisible by 4- i, ii, iii
Divisible by 8 - i, ii, iii
5. 1 6. 1
7. 1001, 1012, 1023, 1034, 1045, 1056, 1067, 1078, 1089
8. 1243 9. 104



EXERCISE - 4.1

- i. $\overline{AB}, \overline{BC}, \overline{AC}$ ii. $\overline{PQ}, \overline{QR}, \overline{RS}, \overline{ST}, \overline{PT}$
- Do yourself
- i. uncalculated/many ii. one
- iii. line segment
- i. two ii. one iii. none
- i. T ii. T iii. F iv. F v. T
- Do yourself



EXERCISE - 4.2

- i., ii, iv,
- Open (i., v) closed (ii., iii., iv)
- Interior (A, B, E, G, I), boundary (K, F, C), exterior (J, D)
- Do yourself



EXERCISE - 4.3

- ii. $\angle BOC, O, \overline{OB}, \overline{OC}$ iii. $\angle COD, O, \overline{OC}, \overline{OD}$
iv. $\angle AOD, O, \overline{OA}, \overline{OD}$
- $\angle BAD, \angle ABC, \angle BCD, \angle ADC$
- Do yourself
- i., iii.



EXERCISE - 4.4

- Do yourself
- i. \overline{PS} ii. $\angle R$ iii. \overline{PS} and \overline{QR} iv. $\angle P$ and $\angle R$
- i. S, R ii. A, B, C, D, E iii. T, P, Q



EXERCISE - 4.5

- Do yourself
- Do yourself
- i. T ii. T iii. T iv. F v. F
- Do yourself



EXERCISE 5.1

3. Largest line segment in AE.
4. 5 Reshma located correct.



EXERCISE 5.2

1.
 - i True
 - ii False A right angle measure 90°
 - iii False A straight angle measure 180°
 - iv True
 - v True
2. Acute angle $\angle 1, \angle 3$
Obtuse angle $\angle 2, \angle 4$
3. $\angle ABC = 60^\circ$
 $\angle DEF = 120^\circ$
 $\angle PQR = 90^\circ$
 $\angle DEF$ is the largest angle
4.

i right angle	ii straight angle
iii zero angle	iv obtuse angle
v reflex angle	
5. Acute angle, 45°
Right angle, 90°
Obtuse angle, 150°
Reflex angle, 270°
Straight angle, 180°



EXERCISE 5.3

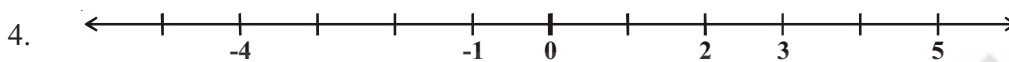
1.

i Parallel lines	ii Parallel lines	iii neither of them
iv parallel lines	v perpendicular	
3. parallel lines $AB \parallel CD, AD \parallel BC$
perpendicular $AD \perp AB, AB \perp BC, BC \perp CD, CD \perp DA$
pair of intersecting line AC, BD



EXERCISE - 6.1

- +3000 meters
 - 10 meters
 - +35°C
 - 0°C
 - 36°C
 - 500 meters
 - 19°C
 - +18°C
- (-1, -2, -3, -4, -5 etc.)
- (1, 2, 3, 4, 5 etc.)



- [False, left side]
 - [False]
 - [True]
 - [True]



EXERCISE - 6.2

- <
 - >
 - <
 - >
 - <
 - <
- (-7, -3, 5)
 - (-1, 0, 3)
 - (5, -3, -7)
 - (3, 0, -1)
 - (-6, 1, 3)
 - (-5, -3, -1)
 - (3, 1, -6)
 - (-1, -3, -5)
- (True)
 - (False, -12 is negative integer and +12 is positive integer)
 - (True)
 - (True)
 - (False, $-100 < +100$)
 - (False, $-1 > -8$)
- 0
 - 4, -3, -2, -1
 - 7
 - 1, -2



- Kufri, $-6^\circ\text{C} < 4^\circ\text{C}$



EXERCISE - 6.3

- 1
 - 10
 - 9
 - 0
 - 16
 - 3
- 7
 - 6
 - 0
 - 115
 - 132
 - 6
- 154
 - 40
 - 199
 - 140
- 6
 - 78
 - 64
 - 25



EXERCISE - 6.4

1. i. 18 ii. -14 iii. -33
 iv. -33 v. 44 vi. 19
2. i. < ii. > iii. > iv. =
3. i. 13 ii. 0 iii. -9 iv. -6
4. i. -13 ii. 21 iii. -33 iv. 88



EXERCISE - 7.1

1. ii, iii
2. iv, v
- $\left[\begin{array}{l} \frac{13}{2} \text{ between 6 and 7} \\ \frac{7}{3} \text{ between 2 and 3} \end{array} \right]$
3. ii, iv
4. i. $2\frac{1}{3}$ ii. $\frac{26}{8} = \frac{13}{4}$ iii. $\frac{92}{9}$ iv. $\frac{79}{9}$ 5. i. $\frac{9}{7}$ ii. $5\frac{1}{2}$ iii. $2\frac{1}{4}$ iv. $6\frac{3}{4}$



EXERCISE 7.2

1. i, ii
3. i. $\left(\frac{2}{3}, \frac{5}{3}, \frac{1}{3}, \frac{4}{6} = \frac{2}{3}\right)$ ii. $\left(\frac{3}{5} \text{ and } \frac{2}{5}\right)$ iii. $\left(\frac{7}{8}, \frac{2}{8}\right)$



EXERCISE 7.3

1. Ascending Descending
- i. $\frac{1}{8} < \frac{3}{8} < \frac{4}{8} < \frac{6}{8}$ or $\frac{6}{8} > \frac{4}{8} > \frac{3}{8} > \frac{1}{8}$
- ii. $\frac{3}{9} < \frac{4}{9} < \frac{6}{9} < \frac{8}{9}$ Write in descending order yourself.



$$\frac{2}{6} < \frac{4}{6} < \frac{5}{6} < \frac{6}{6} < \frac{8}{6}$$

3. i $\frac{1}{6} < \frac{1}{3}$ ii $\frac{3}{4} > \frac{2}{6}$ iii $\frac{2}{3} > \frac{2}{4}$

iv $\frac{6}{6} = \frac{3}{3}$ v $\frac{5}{6} < \frac{5}{5}$

4. i $\frac{1}{2} > \frac{1}{5}$ ii $\frac{2}{4} = \frac{3}{6}$ iii $\frac{3}{5} < \frac{2}{3}$

iv $\frac{3}{4} > \frac{2}{8}$ v $\frac{3}{5} < \frac{6}{5}$ vi $\frac{7}{9} > \frac{3}{9}$

5. i No ; because $\frac{4}{5}$ is greater than $\frac{5}{9}$

ii No ; $\frac{9}{16}$ is greater than $\frac{5}{9}$

iii Yes $\frac{4}{5} = \frac{16}{20}$; $\frac{4}{5} = \frac{4}{5}$

iv No, because $\frac{4}{30}$ is greater than $\frac{1}{15}$; $\frac{4}{30} = \frac{2}{15} > \frac{1}{15}$

6. Varshitha, because Lalita reach $\frac{2}{5}$ of 100 that is 40 pages.

7. i + ii - iii +

8. i $\frac{2}{18} = \frac{1}{9}$ ii $\frac{11}{15}$ iii $\frac{2}{7}$ iv $\frac{22}{22} = 1$

v $\frac{5}{15}$ vi $\frac{8}{8} = 1$ vii $\frac{1}{3}$ viii $\frac{1}{4}$ ix $\frac{3}{5}$

9. i $\frac{4}{10}$ ii $\frac{8}{21}$ iii $\frac{9}{6}$ iv $\frac{7}{27}$

10. Complete wall 11. $\frac{2}{7}$ 12. $\frac{5}{8}$

13. Reshma takes less time she takes $\frac{9}{20}$ minutes less to half across the school ground.



EXERCISE 7.4

- $\frac{8}{10}$
 - 15
 - 9
 - tenth or $\frac{8}{10}$
 - decimal point
- 125.4
 - 20.2
 - 8.6
- .16
 - .278
 - .06
 - 3.69
 - .016
 - 34.5
- 4
 - $\frac{8}{100}$
 - $\frac{9}{10}$
 - $\frac{5}{10}$
 - $\frac{3}{100}$
 - $\frac{7}{10}$
- 0.4
 - 70.7
 - 6.6
 - 7.4
 - 0.8
- $0.04 < 0.14 < 1.04 < 1.14$
 - $.99 < 1.1 < 7 < 9.09$
- $8.8 > 8.6 > 8.59 > 8.09$
 - $8.68 > 8.66 > 8.06 > 6.8$



EXERCISE 7.5

- 1.25 rupees
 - .75
 - 3.75 Rupees
- 28.91
 - 17.09
 - 10.46
 - 21.24
 - 6.32
- 8 km. 323 meter
- 12 m



EXERCISE 9.1

- 3 m
 - 4 m
 - 3 m
- 3 n
- 2s
 - 3s
- 7 n
- 90 m
- ₹ 23
- (x-2)
- 2y+3
- 6 z
- 19
 - 3+2(n-1)



EXERCISE 9.2

- 5 q
 - $\frac{y}{4}$
 - $\frac{pq}{4}$
 - 3z+5
 - 9n+10
 - 2y-16
 - 10y+x



EXERCISE 9.3

1. i, iv, v, viii, x, xi, xii
2. i LHS = $x - 5$ RHS = 6
 ii LHS = $4y$ RHS = 12
 iii LHS = $2z + 3$ RHS = 7
 iv LHS = $3p$ RHS = 24
 v LHS = 4 RHS = $x - 2$
 vi LHS = $20 - 3$ RHS = -5
3. i $x = 2$ ii $y = 9$ iii $a = 8$
 iv $p = 3$ v $n = 5$ vi $z = 9$



EXERCISE 10.1

1. 230 cm., 48 cm., 24 cm., 40 cm.
2. Perimeters are 120, 120 cm., 120 cm., 144 cm. and cost of wire are ₹ 1800, ₹ 1800, ₹ 2160 respectively.
3. So many like (1,6) (2,5) (3,4) (2.5, 4.5) etc. 4. ₹ 840
5. i 20 cm ii 15 cm iii 10 cm iv 12 cm
6. Bunty ; 13000 m 7. length - 16 cm Breadth-8 cm 8. 10 cm
9. i 12 cm ii 27 cm iii 22 cm



EXERCISE 10.2

1. i 1000 cm^2 ii 2925 m^2 iii 400 cm^2 133 km^2
2. i 676 m^2 ii 289 km^2 iii 2704 cm^2 iv 64 cm^2
3. 45 cm 4. 1800 m^2
5. length of side = 10 cm ; Area = 100 cm^2
6. 200 m 7. 24 m^2 ; ₹ 5760
8. Square plot ; 64 m^2 9. 18.7 cm, rectangle
10. The cost of fencing Rahul's field = ₹ 1,20,00,000
 The cost of fencing Ramu's field = ₹ 1,35,00,000
 Ramu can plant more trees ; 1000 trees more
11. 80 m 12. ₹ 26,400
13. ₹ 5,04,000
14. i Area increases by 4 times ii Area increases by 6 times
15. i Area increases by 4 times ii Area become $\frac{1}{4}$ of the original area.



EXERCISE 11.1

- i 7 : 11 iii 2 : 3 iv 5 : 8 v 3 : 5
- i 2 ii $\frac{1}{2}$ iii 2 : 1
- i 1 : 4 ii chilli : pulses,
1 : 80
80 : 1 iii. 1 : 1



EXERCISE 11.2

- Simplest form- i, iii, v, vi
i 16 : 20 \rightarrow 4 : 5
iv 20 : 60 \rightarrow 1 : 3
- Rice : wheat rice : total
1 : 3 1 : 4
- i. 5 : 3 ii. 5 : 8 iii. 3 : 8
- 4 : 1
- 20 : 60, simplest form is 1 : 3 7. 2 : 5



EXERCISE 11.3

- i 15 ii 10
- A X = 6 cm XB = 8 cm
- Geeta = ₹ 450, Laxmi = ₹ 600
- Satya = ₹ 1350, siri = ₹ 2250
- numbers are 60 and 72
- income = 6534, saving = 1188



EXERCISE 11.4

- ₹ 75 2. ₹ 24 3. 525 gram
- 20 chair 5. 12 hrs
- i ₹ 25000 ii 1 year 7 month
- ₹ 210
- i. 480 sheeps ii. 8 : 11 iii. 11 : 3
- Not, By changing order 3, 5, 9, 15 10. 5°
- $\frac{15}{18} = \frac{5}{6} = \frac{10}{12} = \frac{25}{30}$

12.	Breadth	10	20	40
	Length	25	50	100

13. i. 3 : 1 ii. 1 : 4 iii. 3 : 4
14. i. 5 : 4 ii. 4 : 5
15. i. 3 : 1 ii. 24 iii. 8 iv. 30 v. 64
16. i. 4 : 5 ii. 12 iii. 30 iv. 25



EXERCISE 12.2

3. i. 4 ii. 2 iii. 2 iv. 0
v. 4 vi. 2
5. i. 3 ii. 1 iii. 0 iv. 2
v. 6 vi. Un countable lines which passes through the centre of the circle.



EXERCISE 14.1

- | | | | | |
|----|----------|-------|----------|-----|
| 1. | Faces | Edges | Vertices | |
| | 4 | 6 | 4 | |
| 2. | F | E | V | |
| | 5 | 8 | 5 | |
| 3. | Cone | 1 | 1 | 1 |
| | Cylindre | 1 | 2 | |
| | Sphere | 1 | Nil | Nil |
| 4. | Faces | 2 | | |
| | Edges | 9 | | |
| | Vertices | 6 | | |



EXERCISE 14.2

1. i. Not because polygon is a closed figure made by straight lines
iii. not, see the above answer and find.
2. i. pentagon ii. octagon iii. hexagon iv. triangle

INSTRUCTIONS TO TEACHERS

Dear Teachers

Greetings and a hearty welcome to the newly developed textbook Mathematics for class VI.

- The present textbook is developed as per the syllabus and academic standards conceived by the mathematics position paper prepared based on APSCF – 2011 and RTE – 2009 for Upper Primary stage of education.
- The new textbook constitutes 14 chapters with concepts from the main branches of mathematics like Number system, Arithmetic, Algebra, Geometry, Mensuration and Statistics.
- The concepts in these chapters emphasize the prescribed academic standards of Problem Solving, Reasoning-proof, Communication, Connections and representation. These are aimed at to develop the skills of observation of patterns, making generalization through deductive, inductive and logical thinking finding different methods for problem solving, questioning, interaction etc., and the utilization of the same in daily life.
- The situations, examples and activities given in the textbook are based on the competencies acquired by the child at Primary Stage. So the child participates actively in all the classroom activities and enjoys learning of Mathematics.
- Primary objective of teacher should be to achieve the “Academic standards” by involving students in the discussions and activities suggested in the textbook and making them to understand the concepts.
- Mere completion of a chapter by teacher doesn’t make any sense. The skills specified in the syllabus and academic standards prescribed should be exhibited by the student only ensures the completion of the chapter.
- Students should be encouraged to answer the questions given in the chapters. These questions help to improve logical, inductive and deductive thinking of the child.
- Understanding and generalization of properties are essential. Student first finds the need and then proceeds to understand, followed by solving similar problems on his own and then generalises the facts. The strategy in the presentation of concepts followed.

- Clear illustrations and suitable pictures are given wherever it was found connection and corrects the misconnection necessary.
- Exercises of 'Do This' and 'Try This' are given extensively after completion of each concept. Exercises given under 'Do This' are based on the concept taught. After teaching of two or three concepts some exercises are given based on them. Questions given under 'Try This' are intended to test the skills of generalization of facts, ensuring correctness of statements, questioning etc., 'Do This' exercise and other exercises given are supposed to be done by students on their own. This process helps the teacher to know how far the students can fare with the concepts they have learnt. Teacher may assist in solving problem given in 'Try This' sections.
- Students should be made to digest the concepts given in "what have we discussed" completely. The next chapter is to be taken up by the teacher only after satisfactory performance by the students in accordance with the academic standards designated for them (given at the end).
- Teacher should prepare his own problems related to the concepts besides solving the problems given in the exercises. Moreover students should be encouraged to identify problems from day- to-day life or create their own problems.
- Above all the teacher should first study the textbook completely thoroughly and critically. All the given problems should be solved by the teacher well before the classroom teaching.

Syllabus

Area & Chapters

Syllabus Description

<p>Number System (60 hrs)</p> <p>1. Knowing our Numbers:</p> <p>2. Whole Numbers</p> <p>3. Playing with Numbers</p> <p>6. Integers</p> <p>7. Fractions and Decimals</p>	<p>(i) Knowing our Numbers:</p> <ul style="list-style-type: none"> • Consolidating the sense of Number up to 99,999; Estimation of numbers, Comparison of numbers; Place value (recapitulation and extension); connectives: use of symbols =, <, >; Use of brackets. • Word problems on number operations involving large numbers up to a maximum of 6 digits in the answer (This would include conversions of units of length & mass from the larger to the smaller units). • Estimation of outcome of number operations. • Introduction to large numbers (a) up to lakhs and ten lakhs (b) up to crores and ten crores: International system of numbers (Millions..)
	<p>(ii) Whole numbers:</p> <ul style="list-style-type: none"> • Natural numbers, whole numbers. • Properties of numbers (closure, commutative, associative, distributive, additive identity, multiplicative identity). • Number line. Seeing patterns, identifying and formulating rules to be done by children. • Utility of properties in fundamental operations.
	<p>(iii) Playing with Numbers:</p> <ul style="list-style-type: none"> • Consolidating divisibility rules of 2,3,5,6,9,10. • Discovering divisibility rules of 4,8,11 through observing patterns. • Multiples and factors, Even/odd numbers, prime/composite numbers, Co-prime numbers. • Prime factorization, every number can be written as products of prime factors. • HCF and LCM, prime factorization and division method. • Property: $LCM \times HCF = \text{product of two numbers}$. • LCM & HCF of co-primes. • Importance of Zero, and its properties
	<p>(iv) Negative Numbers and Integers:</p> <ul style="list-style-type: none"> • How negative numbers arise, models of negative numbers, connection to daily life, ordering of negative numbers, representation of negative numbers on number line. • Children to see patterns, identify and formulate rules. • Understanding the definition of integers, identification of integers on the number line. • Operation of addition and subtraction of integers, showing the operations on the number line (Understanding that the addition of negative integer reduces the value of the number). • Comparison of integers, ordering of integers.

	<p>(v) Fractions and Decimals:</p> <ul style="list-style-type: none"> • Revision of what a fraction is, Fraction as a part of whole. • Representation of fractions (pictorially and on number line) • Fraction as a division, proper, improper & mixed fractions • Equivalent fractions, like, unlike fractions, comparison of fractions. • Addition and subtraction of fractions. • Word problems (Avoid large and complicated calculations). • Estimates the degree of closeness of a fractions ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ etc.,). • Review of the idea of a decimal fraction • Place value in the context of decimal fraction. • Inter conversion of fractions and decimal fractions (avoid recurring decimals at this stage). • Word problems involving addition and subtraction of decimals (word problems should involve two operations) Contexts: money, mass, length temperature.
<p>Algebra (15 hrs)</p> <p>9. Introduction Algebra</p>	<p>Introduction Algebra:</p> <ul style="list-style-type: none"> • Introduction to variable through patterns and through appropriate word problems and generalizations (example $5 \times 1 = 5$ etc.). • Generate such patterns with more examples. • Introduction to unknowns through examples with simple contexts (single operations). • Number forms of even and odd ($2n$, $2n+1$).
<p>Arithmetic (15hrs)</p> <p>11. Ratio and Proportion</p>	<p>Ratio and Proportion :</p> <ul style="list-style-type: none"> • Concept of Ratio • Proportion as equality of two ratios • Unitary method (with only direct variation implied) • Word problems • Understanding ratio and proportion in Arithmetic
<p>Geometry (65 hrs)</p> <p>4. Basic geometrical ideas</p>	<p>Basic geometrical ideas (2-D):</p> <ul style="list-style-type: none"> • Introduction to geometry. Its linkage with and reflection in everyday experience. • Line, line segment, ray. • Open and closed figures. • Interior and exterior of closed figures. • Curvilinear and linear boundaries • Angle — Vertex, arm, interior and exterior, • Triangle — vertices, sides, angles, interior and exterior, altitude and median. • Quadrilateral — Sides, vertices, angles, diagonals, adjacent sides and opposite sides (only convex quadrilateral are to be discussed), interior and exterior of a quadrilateral. • Circle — Centre, radius, diameter, interior and exterior, arc, chord, sector, segment, semicircle, circumference,

5. Measures of Lines and Angles 12. Symmetry 13. Practical Geometry 14. Understanding 3D, 2D Shapes	Measures of Lines and Angles: <ul style="list-style-type: none"> • Measure of Line segment. • Measure of angles. • Types of angles- acute, obtuse, right, straight, reflex, complete and zero angle. • Pair of lines Intersecting and perpendicular lines Parallel lines.
	Symmetry: <ul style="list-style-type: none"> • Observation and identification of 2-D symmetrical objects for reflection symmetry. • Operation of reflection (taking mirror images) of simple 2-D objects. • Recognising reflection symmetry (identifying axes).
	Practical Geometry (Constructions): <ul style="list-style-type: none"> • Drawing of a line segment (using Straight edge Scale, protractor, compasses). • Construction of circle. • Perpendicular bisector. • Construction of angles (using protractor) • Angle 60°, 120° (Using Compasses) • Angle bisector - making angles of 30°, 45°, 90° etc. (using compasses) • Angle equal to a given angle (using compass) • Drawing a line perpendicular to a given line from a point <ol style="list-style-type: none"> a) on the line b) outside the line.
	Understanding 3D, 2D Shapes: <ul style="list-style-type: none"> • Identification of 3-D shapes: Cubes, Cuboids, cylinder, sphere, cone, prism (triangular), pyramid (triangular and square) Identification and locating in the surroundings • Elements of 3-D figures. (Faces, Edges and vertices) • Nets for cube, cuboids, cylinders, cones and tetrahedrons.
Mensuration (15 hrs) 10. Perimeter and Area	Perimeter and Area: <ul style="list-style-type: none"> • Introduction and general understanding of perimeter using many shapes. • Shapes of different kinds with the same perimeter. • Concept of area, Area of a rectangle and a square Counter examples to different misconceptions related to perimeter and area. • Perimeter of a rectangle – and its special case – a square. • Deducing the formula of the perimeter for a rectangle and then a square through pattern and generalisation.
8. Data Handling (10 hrs)	Data Handling: <ul style="list-style-type: none"> • What is data. • Collection and organisation of data - examples of organising it in tally marks and a table. • Pictograph- Need for scaling in pictographs interpretation & construction. • Making bar graphs for given data interpreting bar graphs.

Academic Standards

CONTENT

ACADEMIC STANDARDS

CONTENT	ACADEMIC STANDARDS
Number system 1. Knowing our numbers	Problem Solving <ul style="list-style-type: none"> • Word problems on number operations involving large numbers up to a maximum of 5 digits in the answers. • Conversions of units of length and mass.
	Reasoning, Proof <ul style="list-style-type: none"> • Estimation of outcome of number operations. • Comparison of numbers up to large numbers with concept of place value. • Formation of different numbers by using given numbers and select biggest, smallest among them.
	Communication: <ul style="list-style-type: none"> • Writes any five digit numbers in words and vice versa. • Comparison of five digit numbers using the symbols $<$, $>$, $=$.
	Connections: <ul style="list-style-type: none"> • Understands the Usage of large numbers in daily life (village population, income from land, etc.)
	Representation: <ul style="list-style-type: none"> • Expresses the numbers into expanded and compact form By using unit, ten, hundred, thousand blocks represents numbers through them.
2. Whole numbers	Problem Solving <ul style="list-style-type: none"> • _____
	Reasoning, Proof <ul style="list-style-type: none"> • Verification of properties of whole numbers such as closure, associative, inverse, identity, distributive, commutative (+, -, x)
	Communication: <ul style="list-style-type: none"> • Understands the need of whole number instead of natural numbers.
	Connections: <ul style="list-style-type: none"> • Finds the usage of whole numbers from their daily life. • Understands the relation between N, and W.
	Representation: <ul style="list-style-type: none"> • Represents the whole numbers on the number line.
3. Playing with Numbers	Problem Solving <ul style="list-style-type: none"> • Simplification of numerical statements involving two or more brackets • Tests the divisibility rules • Understands the use of LCM and HCF in different situations and find them in division, prime factorization method.

	Reasoning, Proof	<ul style="list-style-type: none"> • Finds the logic behind the divisibility rules. • Understands the relationship between LCM and HCF of two numbers by verification, why this relation hold only in two numbers, take more than two numbers and see the pattern, conclude
	Communication:	• Uses brackets involving fundamental operations.
	Connections:	<ul style="list-style-type: none"> • Establishes the relation among factors. • Under stands the use of LCM and HCF from their real life situations. • Finds the patterns in division, multiplication tables.
	Representation:	•
6. Integers	Problem Solving	• Solves the problems on addition, subtraction involving integers
	Reasoning, Proof	<ul style="list-style-type: none"> • Compares integers, and ordering of integers. • Difference of +, _ between N, and Z
	Communication:	• Understands the necessity of set of integers.
	Connections:	• Finds the connection among N, W and Z
	Representation:	<ul style="list-style-type: none"> • Represents the integers on the number line. • Shows the addition, subtraction on the number line.
7. Fractions and Decimals	Problem Solving	<ul style="list-style-type: none"> • Adds, subtracts, multiplies like and unlike fractions (avoid complicated, large tasks) • Inter conversion of fractions and decimal fractions. • Word problems involving +, - of decimals (two operations together on money, mass, length, temperature)
	Reasoning, Proof	• _____
	Communication:	• _____

	Connections: <ul style="list-style-type: none"> • Connections between fraction, decimal fractions, decimal numbers
	Representation: • _____
Algebra 9. Introduction Algebra	Problem Solving <ul style="list-style-type: none"> • Finds the value of the expression when substituting a value in place of variable (Simple expressions can be taken and single operation)
	Reasoning, Proof <ul style="list-style-type: none"> • Generalizes the given patterns and express as algebra expression.
	Communication: • Converts the real life simple contexts into Algebraic expression (vice versa)
	Connections: <ul style="list-style-type: none"> • Finds the usage of algebraic expression when occurring the unknown values. • Inter links the number system with algebraic system by usage of simple contexts.
	Representation: • Represents the even, odd number in general form as $2n, 2n+1$.
Arithmetic 11. Ratio and Proportion	Problem Solving <ul style="list-style-type: none"> • Calculates compound, inverse ratio of two ratios. • Solves word problem involving unitary method
	Reasoning, Proof <ul style="list-style-type: none"> • Compares the given ratios. • Verifies the rule of proportion involving the ratios. • Gives the reasons why the same units can be taken in expressing of ratios.
	Communication: • Write ratios in symbiotic and equivalent fractional form.
	Connections: <ul style="list-style-type: none"> • Observes the relation between line and work, time and distance writing reading to proportions. • Understands the usage of ratios and proportion in daily life problems.
	Representation: • _____

Geometry 4. Basic Geometrical Ideas	Problem Solving	<ul style="list-style-type: none"> • _____
	Reasoning, Proof	<ul style="list-style-type: none"> • Differentiates the basic geometric shapes (triangle, circle, Quadrilaterals) • Differentiates and compares the Quadrilaterals and triangle.
	Communication:	• Gives the example of basic geometry shapes (from surface of the surrounding objects).
	Connections:	<ul style="list-style-type: none"> • Visualizes the basic geometric shapes from surroundings. • Understands the inter relation between various components of a circle (Circle, Semi Circle, Sector, Diameter, Radius, chord etc).
	Representation:	• Gives pictorial representation of basic geometric shapes.
5. Measures of Lines and Angles	Problem Solving	<ul style="list-style-type: none"> • Measures the given line segment
	Reasoning, Proof	<ul style="list-style-type: none"> • Compares the lengths of line segments by estimation and verification. • Classifies the given angles. • Differentiates the pair of lines as intersecting, perpendicular lines. • Estimates the type of given angle. • Compares the given angle. • Rounds off an angle to nearest measure by estimation.
	Communication:	• _____
	Connections:	• Finds the usage of elementary shapes and their measurements in surroundings.
	Representation:	<ul style="list-style-type: none"> • Draws a line segment with given measurement. • Draws the given angle using apparatus.

12. Symmetry	Problem Solving	<ul style="list-style-type: none"> • Finds the symmetric axis of given 2D shapes.
	Reasoning, Proof	<ul style="list-style-type: none"> • Distinguishes symmetrical and non symmetrical shapes. • Explains the reflection symmetry in the given 2D figure
	Communication:	• Explains reflection symmetry with its axis in 2D objects
	Connections:	<ul style="list-style-type: none"> • Observes and identify the reflective symmetry from surroundings. • Appreciates the reflection symmetric nature in surroundings.
	Representation:	• Draws the symmetric axis in the given 2D figures
13. Practical Geometry	Problem Solving	• _____
	Reasoning, Proof	<ul style="list-style-type: none"> • Estimates the given pair of lines whether they are perpendicular or not. • Estimates the given line whether it is angle bisector or not
	Communication:	• Communicate how constructions made in line segment, Circle, Perpendicular bisector, angle, angle bisector.
	Connections:	• _____
	Representation:	• Draws the line segment, circle, perpendicular bisector, angle, angle bisector.
14. Understanding 3D, 2D Shapes	Problem Solving	• _____
	Reasoning, Proof	<ul style="list-style-type: none"> • Differentiates the 3D shapes as per faces edges, vertices (Cube, Cuboids, Cylinder, Sphere, Cone, Prism, Pyramid)
	Communication:	• _____

	Connections: <ul style="list-style-type: none"> • Identifies the 3D shape by their names from surroundings. • Understands the relation between cube, cuboid, cylinder and their nets.
	Representation: • Represents 3D shape as 2D on paper.
Mensuration 10. Perimeter and Area	Problem Solving <ul style="list-style-type: none"> • Solves the problems involving perimeter and area of rectangle and square. • Solves word problems
	Reasoning, Proof <ul style="list-style-type: none"> • Differentiates perimeter and area of a figure. • Finds the perimeter of a given figure, involving more than 2 shapes. • Gives the measurements of rectangle/ square which have same area but different perimeters. • Identifies the same perimeter different shapes from given shapes. • Finds errors in solving of perimeter, area and rectifying them.
	Communication: • Perimeter / area of rectangle / square is expressed in formulae and in words also
	Connections: <ul style="list-style-type: none"> • Establishes relation between units to area and perimeter.
	Representation: • Shows the area of the polygon by shading the region.
8. Data Handling	Problem Solving <ul style="list-style-type: none"> • Organization of raw data into classified data.
	Reasoning, Proof <ul style="list-style-type: none"> • Interpretation of tabular data into verbal form.
	Communication: • Merits, demerits of bar graphs and pictographs, comparing with raw data.
	Connections: <ul style="list-style-type: none"> • Understands the usage of bar graphs, pictographs in daily life situations (Year wise population, Annual Budget, Production of crops etc).
	Representation: • Represents data in tally marks. <ul style="list-style-type: none"> • Represents data in tabular forms. • Represents data into bar graphs and pictographs.

Distribution of Population and Sex Ratio: Census 2011

State / UT Code	India / State / Union Territory	Total Population			Sex ratio (females per 1000 males)
		Persons	Males	Female	
1	2	3	4	5	6
	INDIA	1,210,193,422	623,724,248	586,469,174	940
1	Jammu & Kashmir	12,548,926	6,665,561	5,883,365	883
2	Himachal Pradesh	6,856,509	3,473,892	3,382,617	974
3	Punjab	27,704,236	14,634,819	13,069,417	893
4	Chandigarh	1,054,686	580,282	474,404	818
5	Uttarakhand	10,116,752	5,154,178	4,962,574	963
6	Haryana	25,353,081	13,505,130	11,847,951	877
7	NCT of Delhi	16,753,235	8,976,410	7,776,825	866
8	Rajasthan	68,621,012	35,620,086	33,000,926	926
9	Uttar Pradesh	199,581,477	104,596,415	94,985,062	908
10	Bihar	103,804,637	54,185,347	49,619,290	916
11	Sikkim	607,688	321,661	286,027	889
12	Arunachal Pradesh	1,382,611	720,232	662,379	920
13	Nagaland	1,980,602	1,025,707	954,895	931
14	Manipur	2,721,756	1,369,764	1,351,992	987
15	Mizoram	1,091,014	552,339	538,675	975
16	Tripura	3,671,032	1,871,867	1,799,165	961
17	Meghalaya	2,964,007	1,492,668	1,471,339	986
18	Assam	31,169,272	15,954,927	15,214,345	954
19	West Bengal	91,347,736	46,927,389	44,420,347	947
20	Jharkhand	32,966,238	16,931,688	16,034,550	947
21	Orissa	41,947,358	21,201,678	20,745,680	978
22	Chhattisgarh	25,540,196	12,827,915	12,712,281	991
23	Madhya Pradesh	72,597,565	37,612,920	34,984,645	930
24	Gujarat	60,383,628	31,482,282	28,901,346	918
25	Daman & Diu	242,911	150,100	92,811	618
26	Dadra & Nagar Haveli	342,853	193,178	149,675	775
27	Maharashtra	112,372,972	58,361,397	54,011,575	925
28	Andhra Pradesh	84,665,533	42,509,881	42,155,652	992
29	Karnataka	61,130,704	31,057,742	30,072,962	968
30	Goa	1,457,723	740,711	717,012	968
31	Lakshadweep	64,429	33,106	31,323	946
32	Kerala	33,387,677	16,021,290	17,366,387	1,084
33	Tamil Nadu	72,138,958	36,158,871	35,980,087	995
34	Puducherry	1,244,464	610,485	633,979	1,038
35	Andaman & Nicobar Islands	3,79,944	202,330	177,614	878