

Learning objectives

- 6.1 Point
- 6.3 Surface

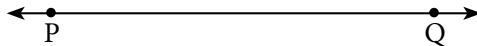
- 6.2 Line
- 6.4 Length of Boundary of Plane figures

6.1 POINT

A point is represented by a dot. It has no size.

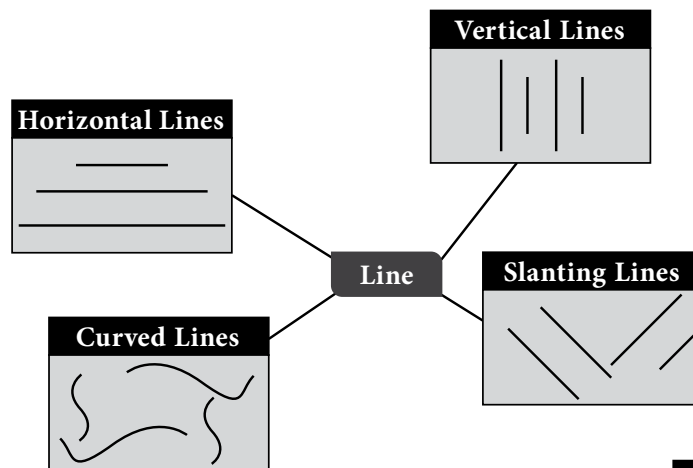
6.2 LINE

If we join two points with a ruler and extend it in both directions, a line is formed.



The above line is represented by \overleftrightarrow{PQ} .

Types of Lines

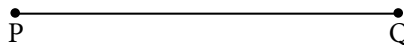


Olympiad Bite

- Horizontal lines are also known as sleeping lines.
- Vertical lines are also known as standing lines.

Line Segment

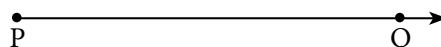
The part of a line is called line segment. It has two fixed points and a definite length.



The above line segment is represented by \overline{PQ} .

Ray

A ray starts from a fixed point and can be extended in the other direction. It has one end point and no definite length.



The above ray is represented by \overrightarrow{PQ} , where P is the initial point.

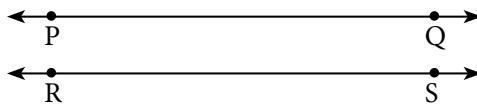


Olympiad Bite

A line segment cannot be extended in any direction.

Parallel lines

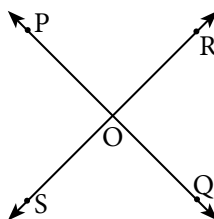
Lines are said to be parallel, if they do not meet.



\overleftrightarrow{PQ} is parallel to \overleftrightarrow{RS} .

Intersecting Lines

If two lines cross each other and meet at a point, then they are called intersecting lines.



\overleftrightarrow{PQ} and \overleftrightarrow{RS} intersect each other at point O. Also, O is called the point of intersection.

SELF TEST - 1

1. How many horizontal lines are there in the given figure?

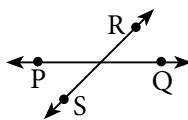
- (A) 5
(C) 8

- (B) 4
(D) 6

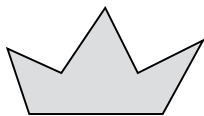


2. In the given figure, \overleftrightarrow{PQ} and \overleftrightarrow{RS} represent _____ lines.

- (A) Parallel
(B) Intersecting
(C) Both (A) and (B)
(D) Can't be determined

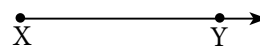


3. How many slanting lines are there in the given figure?



- (A) 5
(C) 4
- (B) 3
(D) 6

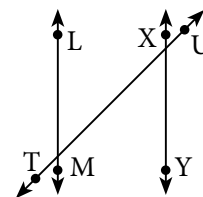
4. The given figure shows a _____.



- (A) Line
(C) Ray
- (B) Line segment
(D) None of these

5. Which of the following line is intersecting \overleftrightarrow{LM} ?

- (A) \overleftrightarrow{XY}
(B) \overleftrightarrow{TU}
(C) Both (A) and (B)
(D) Neither (A) nor (B)

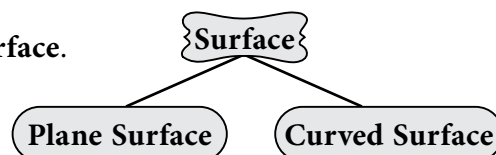
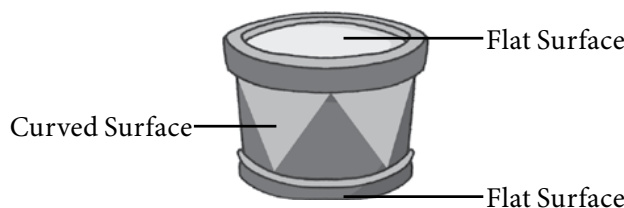


6.3 SURFACE

The part of a solid which we can see and touch is called its **Surface**.

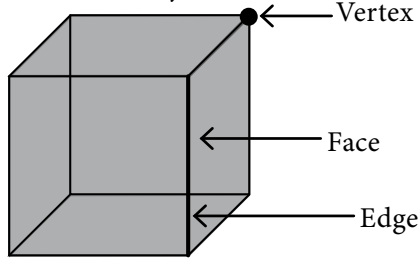
- **Plane Surface** : Surface of a solid which are flat.
- **Curved Surface** : Surface of a solid which are not flat.

For example :



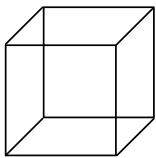

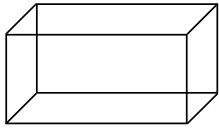
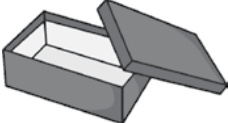
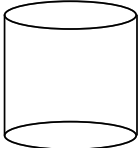

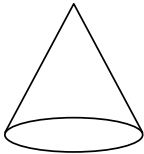

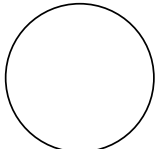
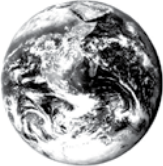
Faces, Edges and Vertices

In a solid object, we have



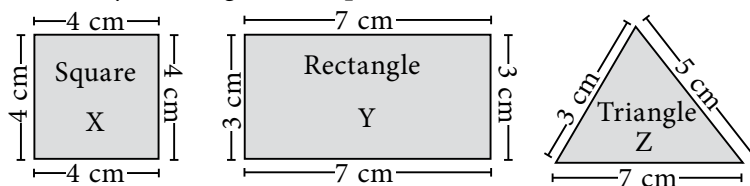
Olympiad Bite

- Only cube and cuboid has all flat faces.
- Edges can be curved or straight.

Solid Shapes	Number of Faces	Number of Edges	Number of Vertices	Example
 Cube	6	12	8	
 Cuboid	6	12	8	
 Cylinder	3	2	0	
 Cone	2	1	1	
 Sphere	1	0	0	

6.4 LENGTH OF BOUNDARY OF PLANE FIGURES

The sum of length of boundary of the given shapes are as follows:



Square X

Sum of all four sides = $4\text{ cm} + 4\text{ cm} + 4\text{ cm} + 4\text{ cm} = 16\text{ cm}$

Rectangle Y

Sum of all four sides = $7\text{ cm} + 3\text{ cm} + 7\text{ cm} + 3\text{ cm} = 20\text{ cm}$

Triangle Z

Sum of all three sides = $3\text{ cm} + 5\text{ cm} + 7\text{ cm} = 15\text{ cm}$



Olympiad Bite

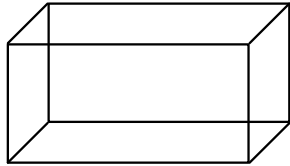
- All four sides of square are of equal length.
- Opposite sides of rectangle are of equal length.

SELF TEST - 2

1. Which of the following is the best example of a sphere?

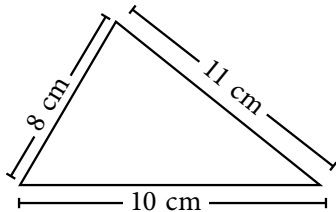
- (A) Gas cylinder (B) Geometry box
(C) Ball (D) Cube

2. The given figure has _____ faces.



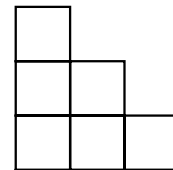
- (A) 6 (B) 5
(C) 4 (D) 3

3. Find the sum of length of boundary of the given figure.



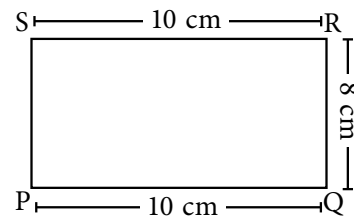
- (A) 27 cm (B) 29 cm
(C) 25 cm (D) 32 cm

4. How many squares are there in the given figure?



- (A) 5 (B) 6
(C) 8 (D) 7

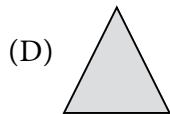
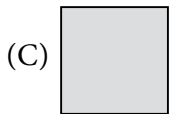
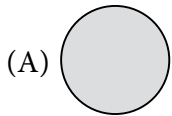
5. If the sum of length of boundary of the given figure is 36 cm, then find the length of PS.



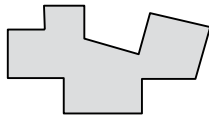
- (A) 5 cm (B) 10 cm
(C) 8 cm (D) 12 cm

EXERCISE

1. Which of the following shapes can be drawn using the given figure?



2. Find the number of sides of the given figure.



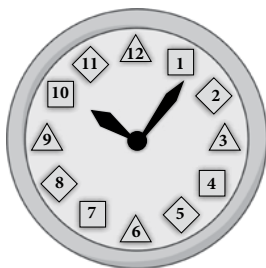
(A) 15

(B) 10

(C) 14

(D) 18

3. Which of the following shapes is missing in the given figure?



(A) Circle

(B) Square

(C) Triangle

(D) Rectangle

4. There are _____ faces and _____ vertices respectively in the given figure.



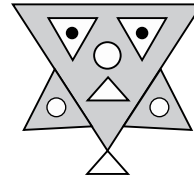
(A) 8, 6

(B) 6, 8

(C) 12, 8

(D) 8, 12

5. There are _____ triangles in the given figure.



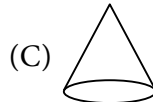
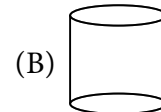
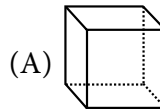
(A) 6

(B) 8

(C) 5

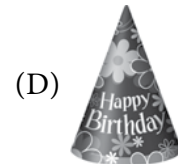
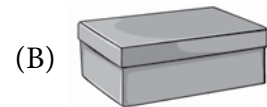
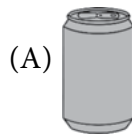
(D) 7

6. Which of the following shapes has exactly 6 faces and 12 edges?

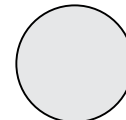


(D) None of these

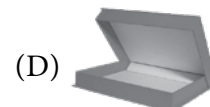
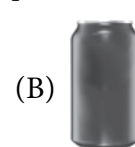
7. Which of the following is the best example of cuboid?



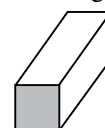
8. Which solid can be used to draw the shape X?



Shape X

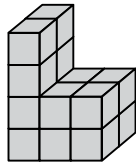


9. The shaded face of the given figure is _____.



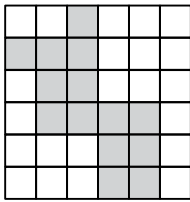
- (A) Rectangle (B) Square
(C) Circle (D) Triangle

10. The given figure is made up of _____ cubes.



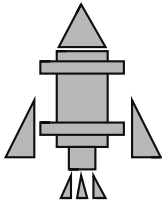
- (A) 18 (B) 14
(C) 16 (D) 20

11. Number of straight lines needed to make the shaded figure is _____.



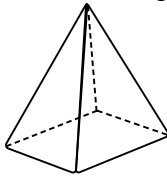
- (A) 15 (B) 12
(C) 18 (D) 20

12. There are _____ slanting lines in the given figure.



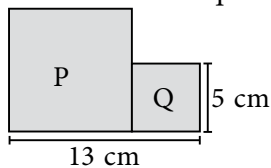
- (A) 6 (B) 10
(C) 8 (D) 12

13. How many faces does the given figure have?



- (A) 4 (B) 5
(C) 9 (D) 6

14. The given figure is made up of 2 squares. Find the length of each side of the square P.



- (A) 10 cm (B) 8 cm
(C) 12 cm (D) 13 cm

15. Sumit wants to draw a square with the help of given objects. Which of the following objects can he use?



P



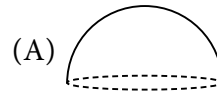
Q



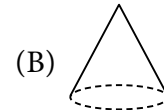
R

- (A) Only P (B) Only Q
(C) Both P and Q (D) Both P and R

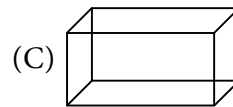
16. Which of the following figures have 6 flat faces?



(A)



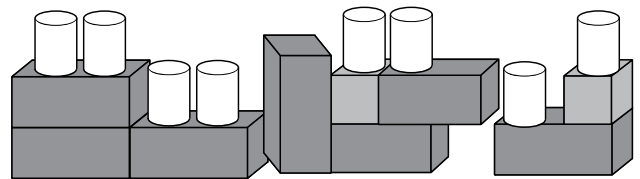
(B)



(C)

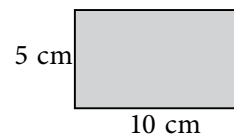
(D) None of these

17. There are _____ cylinders in the given figure.



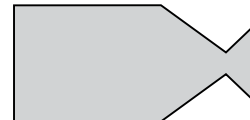
- (A) 9 (B) 8
(C) 6 (D) 7

18. Find the total length of boundary of the given rectangle.



- (A) 25 cm (B) 30 cm
(C) 20 cm (D) 40 cm

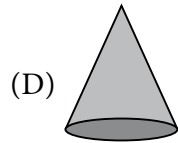
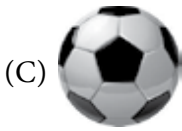
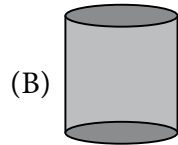
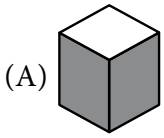
19. How many pairs of parallel lines are there in the given figure?



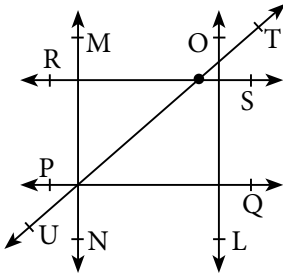
- (A) 3 (B) 2
(C) 0 (D) 1

20. Identify me.

- I have 2 flat faces.
- I have 1 curved face.
- I don't have any vertices.
- I have 2 curved edges.

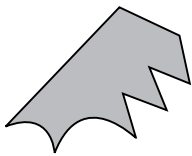


21. Which of the following lines is parallel to line PQ?



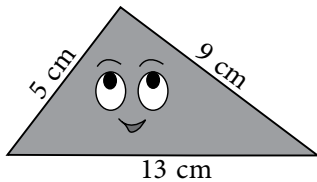
- (A) Line RS (B) Line MN
(C) Line TU (D) Line OL

22. How many curved lines are there in the given figure?



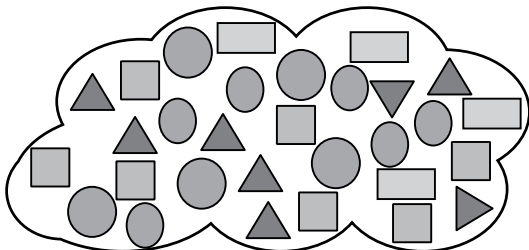
- (A) 1 (B) 2
(C) 5 (D) 4

23. A mouse has walked around the given triangle completely. Find the distance covered by the mouse.



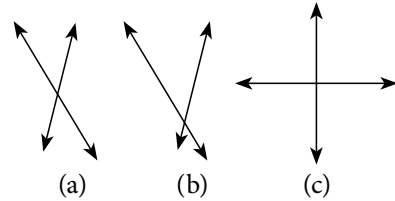
- (A) 18 cm (B) 25 cm
(C) 27 cm (D) 22 cm

24. How many triangles are there in the given cloud?



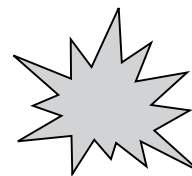
- (A) 6 (B) 7
(C) 12 (D) 8

25. How many pairs of intersecting lines are shown in the given figure?



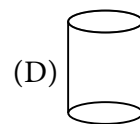
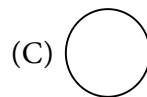
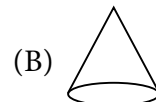
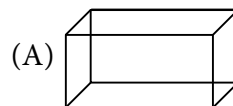
- (A) 2 (B) 1
(C) 3 (D) 4

26. The number of vertices in the given figure is _____.



- (A) 12 (B) 24
(C) 18 (D) 22

27. Which of the following figures have 3 faces and 2 edges?

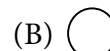
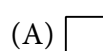


28. Sneha made the following sign board on topic 'NO PARKING'. Find the sum of length of boundary of the board.



- (A) 54 cm (B) 44 cm
(C) 34 cm (D) 38 cm

29. What could be one of the faces of a cone?



- (C) Both (A) and (B) (D) Neither (A) nor (B)

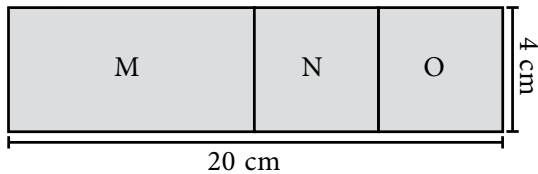
30. Find the number of line segments in the given figure.



- (A) 12 (B) 18
(C) 15 (D) 20

Achievers Section (HOTS)

31. Consider the figure made up of rectangle M and identical squares N and O. Now answer the following questions.



- (a) Find the length of longer side of rectangle M.
(b) Find the difference between the length of boundary of rectangle M and square N.

- | | |
|-----------|-----------|
| (a) | (b) |
| (A) 18 cm | (A) 28 cm |
| (B) 12 cm | (B) 16 cm |
| (C) 12 cm | (C) 25 cm |
| (D) 10 cm | (D) 28 cm |

32. Match the shapes given in Column-P with their properties given in Column-Q.

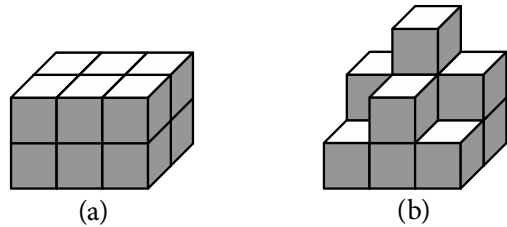
Column-P

Column-Q

- | | | |
|----|--|------------------------------------|
| 1. | | (a) All sides are equal. |
| 2. | | (b) 3 sides and 3 corners. |
| 3. | | (c) No side and no corner. |
| 4. | | (d) Only opposite sides are equal. |

- (A) 1-(b), 2-(a), 3-(c), 4-(d)
(B) 1-(a), 2-(b), 3-(d), 4-(c)
(C) 1-(b), 2-(a), 3-(d), 4-(c)
(D) 1-(b), 2-(c), 3-(a), 4-(d)

33. Consider the following solids (made up of cubes) and select the correct option.



- (A) Number of cubes in fig. (a) is 10.
(B) Number of cubes in fig. (b) is 12.
(C) Total number of cubes in both figures is 23.
(D) None of these

34. Fill in the blanks and select the correct option.

- P. There are _____ faces in a cube.
Q. Number of vertex in a sphere is _____.
R. In a solid object, two surfaces meet to make an _____.

- | | | |
|----------|----------|------------|
| P | Q | R |
| (A) 6 | (A) 0 | (A) Edge |
| (B) 8 | (B) 1 | (B) Edge |
| (C) 5 | (C) 0 | (C) Vertex |
| (D) 6 | (D) 1 | (D) Edge |

35. Study the signs of traffic rules used in India given below.

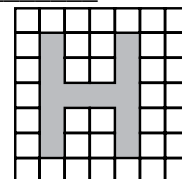


Which of the following statements is CORRECT?

- P. Each sign is made with straight lines only.
Q. There are 3 signs which are made with straight lines only and one sign which is made with curved line.
- (A) Only P (B) Only Q
(C) Both P and Q (D) Neither P nor Q

SOF IMO 2019 QUESTIONS

1. Number of straight lines needed to make the shaded figure is _____.



- (A) 11 (B) 12
 (C) 14 (D) 10 (Level-1)

2. Suman wants to draw a circle with the help of the given objects.



P



Q



R

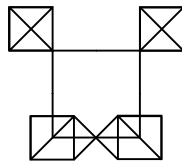
Which of the following objects can she use?

- (A) Only P (B) Both P and Q
 (C) Both P and R (D) Both Q and R

(Level-1)

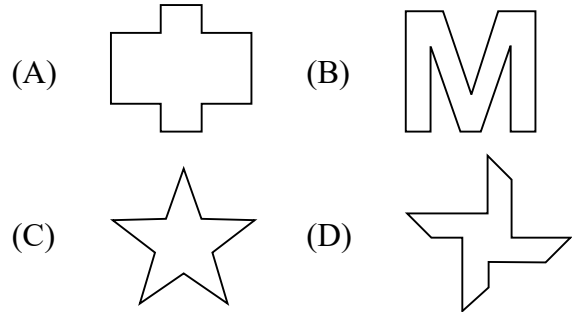
3. How many minimum straight lines are required to draw the given figure?

- (A) 26
 (B) 20
 (C) 24
 (D) 32



(Level-1)

4. Which of the following figures has maximum number of sides?



(Level-2)

5. A field is in the shape of a square. The sum of all the sides of the field is 48 m. Find the length of each side of the field.

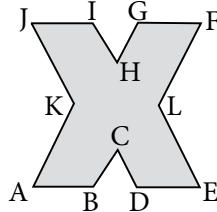
- (A) 10 m
 (B) 14 m
 (C) 8 m
 (D) 12 m

(Level-2)

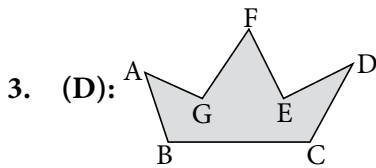
HINTS & EXPLANATIONS

SELF TEST - 1

1. (B): Horizontal lines are JI, GF, AB and DE
So, number of horizontal lines = 4



2. (B)



Slanting lines are AB, AG, GF, FE, DE and CD *i.e.*, 6 in number.

4. (C)

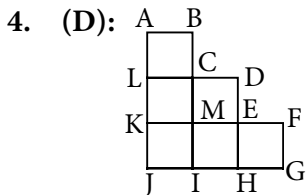
5. (B): \overleftrightarrow{TU} is intersecting \overleftrightarrow{LM} .

SELF TEST - 2

1. (C)

2. (A): A cuboid has 6 faces.

3. (B): Sum of all sides = $8 \text{ cm} + 10 \text{ cm} + 11 \text{ cm}$
 $= 29 \text{ cm}$



Squares formed are : ABCL, LCMK, KMIJ, CDEM, MEHI, EFGH and LDHJ.

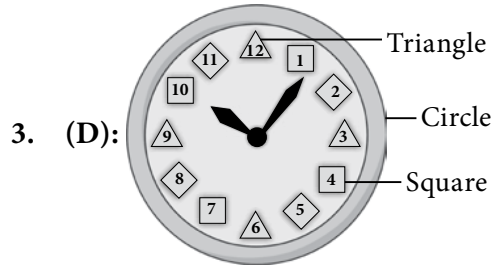
So, number of squares formed = 7

5. (C): Sum of all sides = $PQ + QR + RS + SP$
 $\Rightarrow 36 \text{ cm} = 10 \text{ cm} + 8 \text{ cm} + 10 \text{ cm} + SP$
 $\Rightarrow 36 \text{ cm} = 28 \text{ cm} + SP$
 $\Rightarrow SP = 36 \text{ cm} - 28 \text{ cm} = 8 \text{ cm}$

EXERCISE

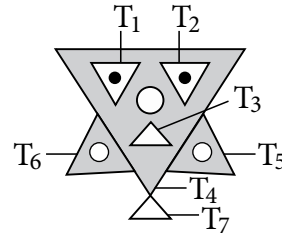
1. (B)

2. (C): Number of sides of the given figure = 14



4. (B): There are 6 faces and 8 vertices in the given figure.

5. (D): Triangles formed are $T_1, T_2, T_3, T_4, T_5, T_6$ and T_7 *i.e.*, 7 in number.



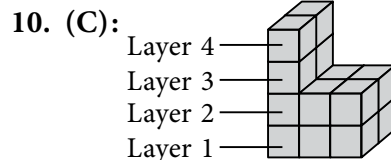
6. (A): (A) It has 6 faces and 12 edges.

(B) It has 3 faces and 2 edges.

(C) It has 2 faces and 1 edge.

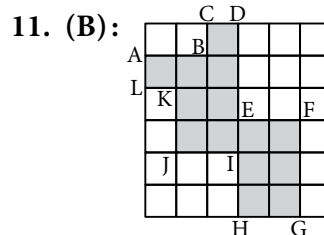
7. (B) 8. (B)

9. (B): The shaded face of the given figure is square.



Number of cubes in the given figure

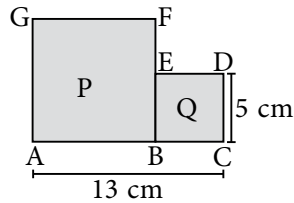
$$= 6 + 6 + 2 + 2 = 16$$



Straight lines needed to make the shaded figure are AB, BC, CD, DE, EF, FG, GH, HI, IJ, JK, KL and AL. So, 12 straight lines are needed to make the shaded figure.

12. (C) 13. (B)

14. (B): As, Q is a square, so each side of square Q is 5 cm long.



Also, $AC = AB + BC$

$$\Rightarrow 13 = AB + 5$$

$$\Rightarrow AB = 8 \text{ cm}$$

So, each side of square P is 8 cm long.

15. (A)

16. (C): It has 1 flat face.

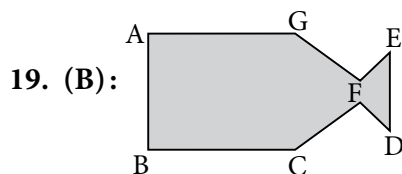
(B) It has 1 flat face.

(C) It has 6 flat faces.

17. (B)

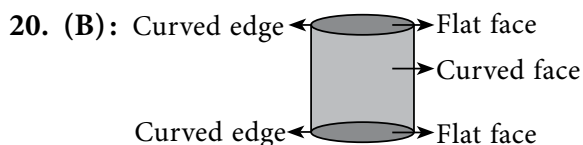
18. (B): A rectangle has opposite sides of equal length.

Length of boundary of the given figure
 $= 5 \text{ cm} + 10 \text{ cm} + 5 \text{ cm} + 10 \text{ cm} = 30 \text{ cm}$



19. (B):

Pair of parallel lines are (AB, ED) and (AG, BC)



21. (A): Line RS is parallel to line PQ.

22. (B)

23. (C): Distance covered by mouse
 $= (5 + 9 + 13) \text{ cm} = 27 \text{ cm}$

24. (D): There are 8 triangles in the given cloud.

25. (C) 26. (B)

27. (D): (A) It has 6 faces and 12 edges.

(B) It has 2 faces and 1 edge.

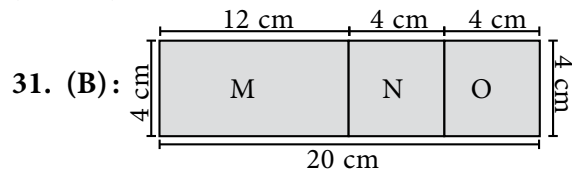
(C) It has 1 face and 0 edge.

(D) It has 3 faces and 2 edges.

28. (B): Sum of length of all sides of board = 7 cm
 $+ 15 \text{ cm} + 7 \text{ cm} + 15 \text{ cm} = 44 \text{ cm}$

29. (B)

30. (B): Number of line segments formed in the given figure = 18



31. (B):

(a) Length of longer side of M + side of N + side of O
 $= 20 \text{ cm}$

Length of longer side of M + 4 + 4 = 20

\therefore Length of longer side of M = 20 - 8 = 12 cm

(b) Length of boundary of rectangle M = 12 + 12 + 4 + 4
 $= 32 \text{ cm}$

Length of boundary of square N = 4 + 4 + 4 + 4
 $= 16 \text{ cm}$

\therefore Required difference = 32 - 16 = 16 cm

32. (C):

1. Triangle : It has 3 sides and 3 corners.

2. Square : Its all sides are equal.

3. Rectangle : Its opposite sides are equal.

4. Circle : It has no side and no corner.

33. (C): Number of cubes in fig.(a) = 6 + 6 = 12

Number of cubes in fig.(b) = 6 + 4 + 1 = 11

\therefore Total number of cubes in both figures
 $= 12 + 11 = 23$

34. (A) 35. (B)

SOF IMO 2019 QUESTIONS

1. (B): Number of straight lines required to make the shaded figure = 12

2. (D)

3. (C): There are 8 horizontal, 8 vertical and 8 slanting lines in the given figure.

4. (B):

(A) Total number of sides = 12

(B) Total number of sides = 13

(C) Total number of sides = 10

(D) Total number of sides = 12

So, figure in option (B) has maximum number of sides.

5. (D): A square has all four sides of equal length.

Sum of all four sides of square = 48 m

\therefore Each side of square = $48 \div 4$
 $= 12 \text{ m}$