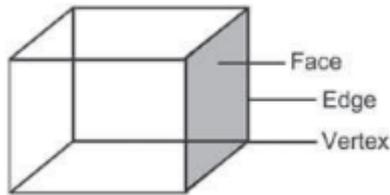# Mensuration

SOLIDS

A solid has three dimensions, namely length, breadth or width, and height or thickness. The plane surfaces that bind it are called its faces and the solid so generated is known as polyhedron.

The volume of any solid figure is the amount of space enclosed within its bounding faces. A solid has edges, vertices, and faces, which are shown in the figure.

A solid has the following two types of surface areas:

Lateral Surface Area   Lateral surface area (LSA) of a solid is the sum of the areas of all the surfaces it has except the top and the base.

Total Surface Area   Total surface area (TSA) of a solid is the sum of the LSA and the areas of the base and the top.

Note: In case of solids, like the cube and cuboid, the LSA consists of plane surface areas (i.e., area of all surfaces except the top and base), whereas in case of solids, like cone and cylinder, it consists of curved surface areas (CSA). Therefore, for such solids, the LSA is also called CSA.

Euler's Rule

Euler's rule states that for any regular solid:
Number of faces (F) + Number of vertices (V) = Number of edges (E) + 2

CUBOID

A cuboid is a rectangular solid having six rectangular faces. The opposite faces of a cuboid are equal rectangles. A cuboid has a length (l), breadth (b), and height (h).
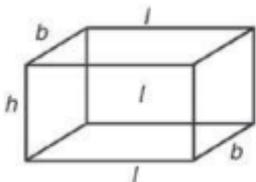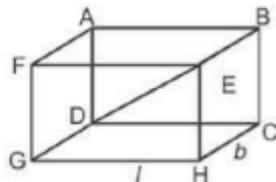

| **Figure 1** | **Figure 2** |

In Figure 2, ED is the diagonal of the cuboid. Moreover, the area of the surface GDCH is x, the area of the surface HEBC is y, and the area of the surface GFEH is z.

(i) Volume = Area of base × height = lbh
(ii) Volume = $\sqrt{xyz}$
(iii) Volume = xh = yl = zb
(iv) Lateral surface area (LSA) or area of the four walls
        = 2 (l + b) h
(v) Total surface area (TSA) = 2(x + y + z) = 2 (lb + bh + lh)
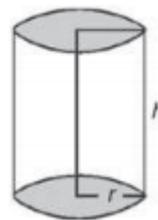
(vi) Diagonal = $\sqrt{l^2 + b^2 + h^2}$

CUBE

A cube is a solid figure having six faces. All the faces of a cube are equal squares (let us say of the side 'a'). Therefore, the length, breadth, and height of a cube are equal.
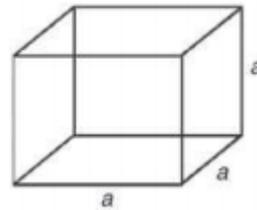
(i) Volume = a^3
(ii) Lateral surface area (LSA) or area of the four walls = $4a^2$
(iii) Total surface area (TSA) = $6a^2$
(iv) Diagonal = $a\sqrt{3}$

RIGHT CIRCULAR CYLINDER

In the above figure, r is the radius of the base and h is the height of a right circular cylinder. A cylinder is generated by rotating a rectangle or a square by fixing one of its sides.

(i) Volume = area of base × height
(ii) Volume = $\pi r^2 h$
(iii) Curved surface area (CSA) = Perimeter of base × height
(iv) LSA = $2\pi rh$
(v) Total surface area (TSA) = LSA + area of the top + area of the base
(vi) TSA = $2\pi rh + \pi r^2 + \pi r^2$
(vii) TSA = $2\pi r(r + h)$

Some Important Deductions
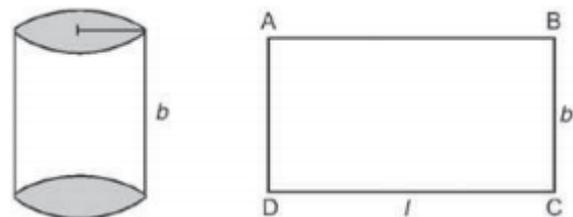
If the above rectangular sheet of paper (ABCD) is rolled along its length to form a cylinder, then the radius (r) of the cylinder will be (L/2n) and its height will be b and volume of this cylinder = $\frac{l^2 b}{4\pi}$, where l is the length of the rectangle.
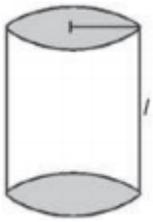
If the above rectangular sheet of paper (ABCD) is rolled along its breadth to form a cylinder, then the radius (r) of the cylinder will be $\frac{b}{2\pi}$ and its height will be L. Volume of this cylinder = $\frac{b^2 L}{4\pi}$.

PRISM

A prism is a solid having identical and parallel top and bottom faces, that is, they will be identical polygons of any number of sides. The side faces of a prism are rectangular and are known as lateral faces. The distance between two bases is known as the height or the length of the prism.
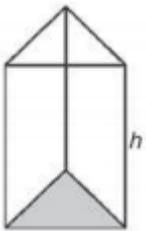
(i) Volume = Area of base × Height
(ii) Lateral surface area (LSA) = Perimeter of the base × Height
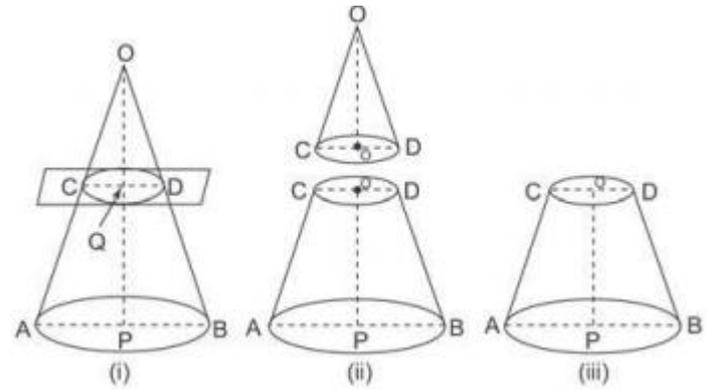(iii)   Total surface area (TSA) = LSA + (2 × Area of the base)

RIGHT CIRCULAR CONE
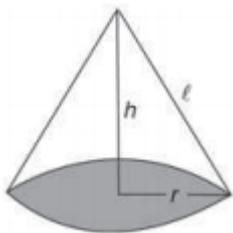
In the above figure, 'r' is the radius of the base, h is the height, and l is the slant height of the right circular cone.
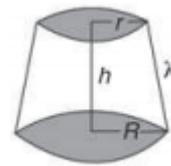(i) Volume = $\frac{1}{3}$ × Area of the base height × height

Volume = $\frac{1}{3}\pi r^2 h$

(ii) Slant height = l = $\sqrt{r^2 + h^2}$
(iii) Curved surface area (CSA) = $\pi r l$
(iv) Total surface area (TSA) = (CSA + Area of the base)
TSA = $\pi r l + \pi r^2$

Frustum of Cone

A cone whose top portion is sliced o by a plane which is parallel to the base is called frustum of cone.
Formation of frustum:

However, for the sake of representing the formula, we will use another form of frustum right now as given below:

In the above figure, r is the radius of the base, h is the vertical height of the frustum, and l is the slant height of the frustum.
(i) Volume = $\frac{\pi h}{3}(R^2 + r^2 + Rr)$
(ii) Slant height = $\lambda = \sqrt{(R-r)^2 + h^2}$
(iii) Curved surface area (CSA) = $\pi (R + r) \lambda$
(iv) Total surface area (TSA) = CSA + Area of the top + area of the base
TSA = $\pi (R + r) \lambda + \pi r^2 + \pi R2$
TSA = $\pi (R \lambda + r \lambda + r^2 + R^2)$
(v) To find the height (H) of original cone.
H = $\frac{Rh}{R-r}$

PYRAMID
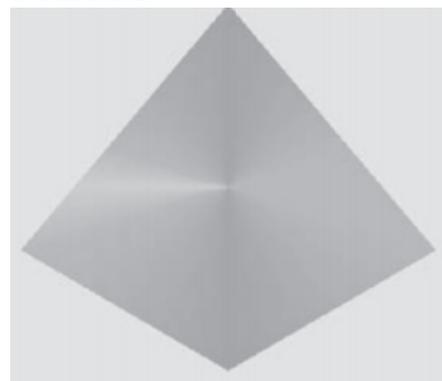
A pyramid is a solid having an n-sided polygon at its base. The side faces of a pyramid are triangular with the top as a point.
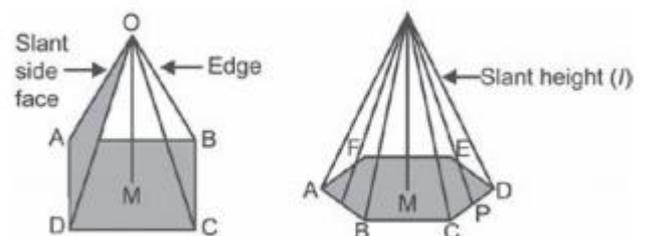
In the above figures, OM is the height of the pyramid.
(i) Volume = $\frac{1}{3}$ × Area of the base × Height

(ii)   Lateral surface area (LSA) = $\frac{1}{2}$ × (Perimeter of the base)   × Slant Height
(iii)   Total surface area (TSA) = LSA + Area of the base

Frustum of Pyramid

A pyramid whose top portion is sliced o by a plane that is parallel to the base is called the frustum of a pyramid.

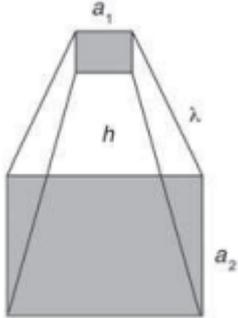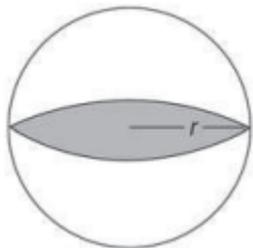In the above figure, a_1 is the area of the top face of the frustum, a_2 is the area of the bottom face of the frustum, h is the height of the frustum, and l is the slant height of the frustum.

(i) Volume = $\frac{1}{3}$ h $\left(a_1 + a_2 + \sqrt{a_1 a_2}\right)$

(ii) Lateral surface area (LSA) = $\frac{1}{2}$ $(p_1 + p_1)$l

where P_1 and P_2 are perimeters of the top and the   bottom faces.

(iii)   Total surface area (TSA) = LSA + a_1 + a_2

SPHERE

In the above figure, r is the radius of the sphere.

(i) Volume = $\frac{4}{3}$ πr^3

(ii) Surface area = $4\pi r^2$

HEMISPHERE
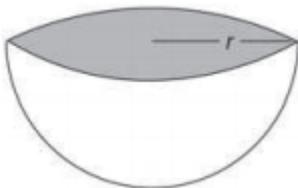
(i) Volume = $\frac{2}{3}\pi r^2$

(ii) Curved surface area (CSA) = $2\pi r^2$

(iii) Total surface area (TSA) = LSA + Area of the top face (read circle)

TSA = $2\pi r^2$ + πr^2

TSA = $3\pi r^2$

SOME MORE SOLIDS

Tetrahedron

A tetrahedron is a solid with four faces. All the faces of a tetrahedron are equilateral triangles. A tetrahedron has four vertices and six edges.
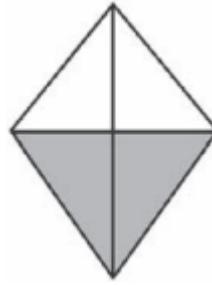
Octahedron

An octahedron is a solid that has eight faces. All the faces of an octahedron are equilateral triangles. An octahedron has six vertices and 12 edges.
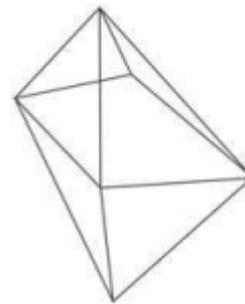
Inscribed and Circumscribed Solids

If a sphere of the maximum volume is inscribed in a cube of edge 'a', then the radius of the sphere = $\frac{a}{2}$.

If a cube of the maximum volume is inscribed in a sphere of radius 'r', then the edge of the cube = $\frac{2r}{\sqrt{3}}$ × r .

If a cube of the maximum volume is inscribed in a hemisphere of radius 'r', then the edge of the cube = $\sqrt{\frac{2}{3}} \times r$.

Some Important Deductions
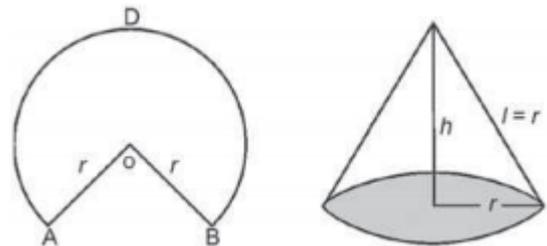
If a cone is made by a sector of a circle (AOBD), then the following two things must be remembered:

The area of the sector of a circle (AOBD) = The CSA of the cone

Radius of the circle (r) = Slant height (l) of the cone

FORMULAE
1. Cuboid
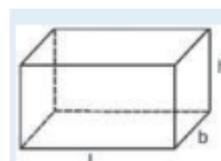
Figure

Nomenclature $\Rightarrow$ l = length, b = breadth, h = height

Volume $\Rightarrow$ lbh

Curved/Lateral surface area $\Rightarrow$ 2(l + b) h

Total Surface area $\Rightarrow$ 2 (lb + bh + hl)

3.Cube
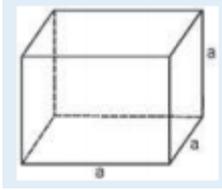
Figure

Nomenclature $\Rightarrow$ a = edge/side

Volume $\Rightarrow a^3$

Curved/Lateral surface area $\Rightarrow 4a^2$

Total Surface area $\Rightarrow 6a^2$

3. Right circular cylinder
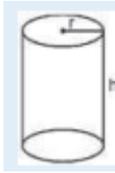
Figure

Nomenclature $\Rightarrow$ R = radius of base, h = height of the cylinder

Volume $\Rightarrow \pi r^2$h

Curved/Lateral surface area $\Rightarrow 2\pi rh$

Total Surface area $\Rightarrow 2\pi r(r + h)$

4. Right circular cone

Figure

Nomenclature $\Rightarrow$ r = radius, h = height, l = slant height,

l = $\sqrt{r^2 + h^2}$

Volume $\Rightarrow \frac{\pi r^2 h}{3}$

Curved/Lateral surface area $\Rightarrow \pi rl$

Total Surface area $\Rightarrow \pi r(l + r)$

5. Right triangular prism
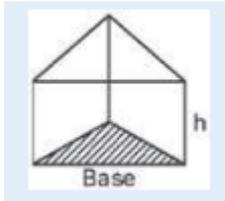
Figure

Volume $\Rightarrow$ Area of the base × Height

Curved/Lateral surface area $\Rightarrow$ Perimeter of the base × Height

Total Surface area $\Rightarrow$ Lateral surface area + 2(Area of base)

6. Right pyramid

Figure

Nomenclature $\Rightarrow$ height

Volume $\Rightarrow$ 1/3 area of the base × Height

**Curved/Lateral surface area** $\Rightarrow$ 1/2 ×Perimeter of the base × Slant height

Total Surface area $\Rightarrow$ Lateral surface area + Area of base

7.Sphere
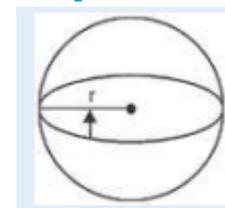
Figure

Nomenclature $\Rightarrow$ r = radius

Volume $\Rightarrow \frac{4}{3}\pi r^3$

Total Surface area $\Rightarrow 4\pi r^2$

8.Hemisphere
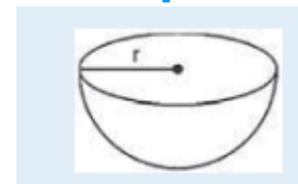
Figure

Nomenclature $\Rightarrow$ r = radius

Volume $\Rightarrow \frac{4}{3}\pi r^3$

Curved/Lateral surface area $\Rightarrow 2\pi r^2$

Total Surface area $\Rightarrow 3\pi r^2$

9. Spherical Shell
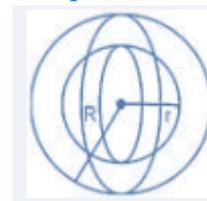
Figure

Nomenclature $\Rightarrow$ r = inner radius, R = outer radius

Volume $\Rightarrow \frac{4}{3}\pi(R^3 - r^3)$

Total Surface area $\Rightarrow 4\pi(R^2 + r^2)$

10. Frustum of a Cone
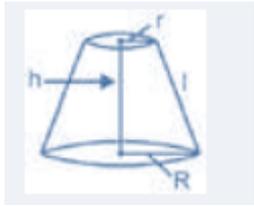
Figure

Total Surface area $\Rightarrow$ Lateral surface area + Area of top + Area of base

Q1.
The area of a rectangular park is 1050 sq.m, and its perimeter is 130 metre. There is a 2.5 m wide path inside the park all around. The cost of construction of path is Rs. 40 per sq. metre. Find the total cost of construction of whole path.
(a) Rs. 10000
(b) Rs. 12000
(c) Rs. 12500
(d) Rs. 8500
(e) None of these

Q2.
Length of the floor of a rectangular auditorium is 6 metre more than the radius of a circle with a circumference of 572 m. The perimeter of the floor of the rectangular auditorium is 356 m. What will be cost of flooring the auditorium (only the floor of the auditorium), if the cost of flooring is Rs. 12/ square meter ?
(a) Rs. 87,954
(b) Rs. 91.236
(c) Rs. 94,284
(d) Rs. 75,490
(e) None of these

Q3.
The area of a right angled triangle is 80 sq. cm. The ratio of the base and the height of the triangle is 4 : 5. Find the length of hypotenuse.
(a) $\sqrt{82}$ cm
(b) $2\sqrt{82}$ cm
(c) $2\sqrt{41}$ cm
(d) $3\sqrt{82}$ cm
(e) None of these

Q4.
A well with 14m inside diameter is dug 10m deep. Earth taken out of it, has been evenly spread all around it to a width of 21m to form an embankment. The height (in metres) of the embankment is
(a) 0.5
(b) 0.67
(c) 0.75
(d) 0.6
(e) None of these

Q5.
There are two circles of different radii. The area of a square is 196 sq.cm, whose side is half the radius of the larger circle. The radius of the smaller circle is three-seventh that of the larger circle. What is the circumference of the smaller circle ?
(a) 12 pie cm
(b) 16 pie cm
(c) 247 pie cm
(d) 327 pie cm
**(e)** None of these

Q6.
A horse is tethered to a peg with a 14 metre long rope at the corner of a 40 metre long and 24 metre wide rectangular grass-field. What area of the field will the horse graze ?
(a) 154 m square
(b) 308 m square
(c) 240 m square
(d) 480 m square
(e) None of these

Q7.
The length of a rectangular floor is twice its breadth. If Rs. 256 is required to paint the floor at the rate of Rs. 2 per square metre, then what would be the length of floor ?
(a) 16 metres
(b) 8 metres
(c) 12 metres
(d) 32 metres
(e) None of these

Q8.
The area of a rectangle is equal to the area of a square whose diagonal is $12\sqrt{6}$ metre. The difference between the length and the breadth of the rectangle is 6 metre. What is the perimeter of rectangle ? (inmetre).
(a) 160 metre
(b) 80 metre
(c) 82 metre
(d) 84 metre
(e) None of these

Q9.
What is the area of a circle whose radius is equal to the side of a square whose perimeter is 112 metres?
(a) 176 sq. m.
(b) 2504 sq. m.
(c) 284 sq. m.
(d) 1956 sq. m.
(e) None of these

Q10.
If the length of a rectangular field Is increased by 20% and the breadth is reduced by 20%, the area of the

rectangle will be 192 m square. What is the area of the original rectangle ?

(a) 184 m square

(b) 196 m square

(c) 204 m square

(d) 225 m square

(e) None of these

Q11.

The total area of a circle and a rectangle is equal to 1166 sq.cm. The diameter of the circle is 28 cm. What is the sum of the circumference of the circle and the perimeter of the rectangle if the length of the rectangle is 25 cm?

(a) 186 cm

(b) 182 cm

(c) 184 cm

(d) Cannot be determined

(e) None of these

Q12.

The area of a square is 196 sq. cm. whose side is half the radius of a circle. The circumference of the circle is equal to breadth of a rectangle. If perimeter of the rectangle is Rs. 12 cm, what is the length of the rectangle?

(a) 196 cm

(b) 186 cm

(c) 180 cm

(d) 190 cm

(e) None of these

Q13.

An equilateral triangle and a regular hexagon have equal perimeters. If the area of the triangle is 2 cm square, then the area of the hexagon is

(a) 2 cm square

(b) 3 cm square

(c) 4 cm square

(d) 6 cm square

(e) None of these

Q14.

Smallest side of a right angled triangle is 8 cm less than the side of a square of perimeter 56 cm. Second largest side of the right angled triangle is 4 cm less than the length of rectangle of area 96 sq. cm. and breadth 8 cm. What is the largest side of the right angled triangle?

(a) 20 cm

(b) 12cm

(c) 10cm

(d) 15cm

(e) None of these

Q15.

The circumference of a circular playground is 308 metre. There is 7 metre wide path around the ground. The area of the path is

(a) 2130 sq. metre

(b) 2410 sq. metre

(c) 2510 sq. metre

(d) 2310 sq. metre

(e) None of these

Q16.

The length of a rectangle is twice the diameter of a circle. The circumference of the circle is equal to the area of a square of side 22 cm. What is the breadth of the rectangle if its perimeter is 668 cm ?

(a) 24 cm

(b) 26 cm

(c) 52 cm

(d) Cannot be determined

(e) None of these

Q17.

The area of circle is nine times the numerical value of its circumference. What is the circumference of the circle ?

(a) 24 pie units

(b) 36 pie units

(c) 28 pie units

(d) 32 pie units

(e) None of these

Q18.

A and B travel around a circular path at uniform speed in opposite directions, starting from diametrically opposite points, at the same time. They meet each other first after B has travelled 100 metres and meet again 60 metres before A completed one round. The circumference of the park is

(a) 240 m

(b) 300 m

(c) 320 m

(d) 480 m

(e) None of these

Q19.

The circumference of a park is 750m. A and B start walking from the same point in the same direction at 6.75 kmph and 4.75 kmph. In what time will they meet each other again?

(a) 3 hours

(b) 2.5 hours

(c) 3.5 hours

(d) 4 hours

(e) None of these

Q20.

The smallest side of a right angled triangle is 6 cm. and second largest side is 8 cm. Side of a square is

thrice the largest side of the triangle. What is the diagonal of the square ?

(a) 30 72 cm
(b) 60 72 cm
(c) 30 cm.
(d) Cannot be determined
(e) None of these

Q21.
The ratio of the length and- the breadth of a rectangular plot is 6:5 respectively. If the breadth of the plot is 34 metres less than the length, what is the perimeter of the rectangular plot?'

(a) 374 metres
(b) 408 metres
(c) 814 metres
(d) 748 metres
(e) None of these

Q22.
The perimeter of a square is equal to twice the perimeter of a rectangle of length 8 cms. and breadth 7 cms. What is the circumference of a semicircle whose diameter is equal to the side of the square ? (Rounded off to the two decimal places)

(a) 38.57 cms.
(b) 23.57 cms.
(c) 42.46 cms.
(d) 47.47 cms.
(e) None of these

Q23.
The perimeter of a rectangular , field is 240 metre. The ratio between the length and breadth of the field is 8 : 7. Find the area of the field.

(a) 3854 sq. m.
(b) 3584 sq. m.
(c) 3684 sq. m.
(d) 3666 sq. m.
(e) None of these

Q24.
The area of a square is equal to that of a rectangle. The length of, rectangle is 4 cm more than the side of square and the breadth is 3 cm less than that of the square. What is the perimeter of the rectangle ?

(a) 40 cm
(b) 60 cm
(c) 75 cm
(d) 50 cm
(e) None of these

Q25.
A solid is in the form of a right circular cylinder with hemispherical ends. The total length of the solid is 35 cm. The diameter of the cylinder is 1/4 of its height. The surface area of the solid is (take pie = 22/7)

(a) 462 cm square

(b) 693 cm square
(c) 750 cm square
(d) 770 cm square
(e) None of these

Q26.
Area of a rectangle is 96 square metre. When the length of the same rectangle is increased by 6 metres and the breadth is decreased by 3 metres, then the area of the rectangle decreases by 30 square metres. What is the perimeter of a square whose sides are equal to the length of rectangle?

(a) 48 m
(b) 60 m
(c) 80 m
(d) 64 m
(e) 52 m

Q27.
The area of a square is 1024 sq. cm. What is the respective ratio between the length and the breadth of a rectangle whose length is twice the side of the square and breadth is 12 cm. less than the side of the square ?

(a) 5 : 18
(b) 16 : 7
(c) 14 : 5
(d) 32 : 5
(e) None of these

Q28.
The length of a rectangle is 20% more than its breadth. What will be the ratio of the area of this rectangle to the area of a square whose side is equal to the breadth of the rectangle?

(a) 5 : 6
(b) 6 : 5
(c) 2 : 1
(d) Data inadequate
(e) None of these

Q29.
The cost of tiling the floor of a rectangular room at the rate of Rs. 85 per square foot is Rs. Rs.480. The length of rectangular room is equal to the length of a square room whose area is 256 square foot. What is the breadth of the rectangular room ?

(a) 5.2 feet
(b) 5.5 feet
(c) 4.5 feet
(d) 4.8 feet
(e) None of these

Q30.
 The length of a rectangular plot is thrice its breadth. If the area of the rectangular plot is 7803 sq. metre, what Is the breadth of the rectangular plot ?

(a) 51 metres

(b) 153 metres

(c) 104 metres

(d) 88 metres

(e) None of these

Q31.

The area of circle is seven times the numerical value of its circumference. What is the circumference of the circle ?

(a) 616 units

(b) 132 units

(c) 88 units

(d) Cannot be determined

(e) None of these

Q32.

The circumference of a semicircle of area 1925 sq. cm is equal to the breadth of a rectangle, If the length of the rectangle is equal to the perimeter of a, square of side 48 cm. What is the perimeter of the rectangle?

(a) 734 cm

(b) 754 cm

(c) 745 cm

(d) Cannot be determined

(e) None of these

Q33.

If the area of a circle is 616 cm square, what is its circumference?

(a) 76 cm.

(b) 84 cm.

(c) 96 cm.

(d) 80 cm.

(e) None of these

Q34.

A circle and a rectangle have the same perimeter. The sides of the rectangle are 18 cm and 26 cm. What Is the area of the circle?

(a) 88 cm square

(b) 154 cm square

(c) 616 cm square

(d) 1250cm square

(e) None of these

Q35.

The area of a square is 2.25 cm square. What is its perimeter?

(a) 9.0 cms

(b) 6.0cms.

(c) 1.5 cms

(d) 4.5 cms.

(e) None of these

Q36.

Inside a square plot, a circular garden is developed which exactly fits in the square plot and the diameter of the garden is equal to the side of the square plot

which is 28 metres. What is the area of the space left out in the square plot after developing the garden ?

(a) 98 m square

(b) 146 m square

(c) 84 m square

(d) 168 m square

(e) None of these

Q37.

The area of a rectangle gets reduced by 9 sq. metre if its length is reduced by 5m and breadth is increased by 3m. If we increase the length by 2m and breadth by 3m, the area is increased by 67sq. metre. The length of the rectangle is:

(a) 9m

(b) 15.6m

(c) 17m

(d) 18.5m

(e) None of these

Q38.

A solid metallic sphere of radius r is converted into a solid right circular cylinder of radius R. If the height of the cylinder is twice the radius of the sphere, then

(a) R = r

(b) R = r 2/3

(c) R=2r/3

(d) R = 2r/3

(e) None of these

Q39.

2 metres broad pathway is to be constructed around a rectangular plot. The area of the plot is 96 sq.m. The cost of construction is 50 per sq. metre. Then find the total cost of production.

(a) Rs 4,800

(b) Rs 4,000

(c) Rs. 2400

(d) Data inadequate

(e) None of these

Q40.

An order was placed for supply of carpet of breadth 3 metres. The length of carpet was 1.44 times of breadth. Subsequently, the breadth and length were increased by 25 and 40 per cent respectively. At the rate of Rs. 45 per square metre, what would be the increase in the cost of the carpet?

(a) Rs. 1020.6

(b) Rs. 398.8

(c) Rs. 437.4

(d) Rs. 583.2

(e) None of these

Q41.

What would be the cost of building a fence around a square plot with area 462.25 sq. ft. at the rate of Rs. 34 per foot ?

(a)Rs. 2,924
(b)Rs. 2,682
(c)Rs. 2,846
(d)Cannot be determined
(e)None of these

Q42.
What would be the cost of building a fence around a circular field with area equal to 32378.5 sq. metres, if the price per metre for building the fence was Rs. 154 ?
(a)Rs. 84,683
(b)Rs. 86,495
(c)Rs. 79,326
(d)Rs. 98,252
(e) None of these

Q43.
The area of a square of side 8 cm is equal to a rectangle. Which of the following statement/s is/ are definitely true about the rectangle ?
(a)(1)The length of rectangle is 16 times its breadth
(b)(2)The length of rectangle is 32 times its breadth
(c)(3)The breadth of rectangle is 1/6 of its length
(d)(4)The breadth of rectangle Is 1/9 of its length
(e)(5)None of these

Q44.
Suface area of a cuboid is 22 cm square and the sum of the length of all its edges is 24 cm. Length of each diagonal of the cuboid (in cm) is
(a)$\sqrt{11}$
(b)$\sqrt{13}$
(c)$\sqrt{14}$
(d)$\sqrt{15}$
(e)None of these

Q45.
The wheel of a motor car makes 1000 revolutions in moving 440 m. The diameter (in meter) of the wheel is
(a)0.44
(b)0.14
(c)0.24
(d)0,34
(e)None of these

Q46.
The radius of the cylinder is half of its height and area of the inner part is 616sq. metres. Approximately how many liters of milk can it contains ?
(a)1.4
(b)1.5
(c)1.9
(d)1.7
(e)2.2

Q47.
A triangle has two of its angles in the ratio of 1 : 2. If the measure of one of its angles is 30 degrees, what is the measure of the largest angle of the triangle in degrees ?
(a)100
(b)90
(c)135
(d)Cannot be determined
(e)None of these

Q48.
The perimeter of a square is double the perimeter of a rectangle. The area of the rectangle is 240 sq. cm. What is the area of the square?
(a)100 sq. cm.
(b)36 sq. cm.
(c)81 sq. cm.
(d)Cannot be determined
(e)None of these

Q49.
The circumference of two circles is 132 metres and 176 metres respectively. What is the difference between the area of the larger circle and the smaller circle ?
(a)1048 sq. metres
(b)1076 sq. metres
(c)1078 sq. metres
(d)1090 sq. metres
(e)None of these

Q50.
A rectangular carpet has an area of 120sq. metres and a perimeter of 46 metres. The length of its diagonal (in metres) is :
(a)11
(b)13
(c)15
(d)17
(e)None of these

Q51.
The length of a rectangle is three-fifth of the side of a square. The radius of a circle is equal to side of the square. The circumference of the circle is 132 cm. What is the area of the rectangle if the breadth of the rectangle is 8 cm ?
(a)112.4 sq. cm.
(b)104.2 sq. cm.
(c)100.8 sq. cm.
(d)Cannot be determined
(e)None of these

Q52.
The area of a square is 1444 square metre. The breadth of a rectangle is 1/4th of the side of the square and the length of the rectangle is thrice the

breadth. What is the difference between the area of the square and the area of the rectangle?
(a)1152.38 sq.m.
(b)1169.33sq.m.
(c)1181.21sq.m.
(d)1173.25sq.m.
(e)None of these

Q53.
The radius of the circular field is equal to the side of a square field. If the difference between the area of the circular field and area of the square field is 105 sq.m.what is the perimeter of the circular field? (in metres)
(a)132
(b)80
(c)44
(d)176
(e)112

Q54.
Four circles having equal radii are drawn with centers at the four corners of a square. Each circle touches the other two adjacent circle. If remaining area of the square is 68 cm square, what is the size of the radius of the radius of the circle ? (in centimetres)
(a)14
(b)1.4
(c)35
(d)21
(e)3.51

Q55.
The perimeter of a circular and a square field are equal- What is. the diameter of the circular field,, if the area of the square field is 484 metre2?
(a)14 meter
(b) 21 metre
(c) 28 metre
(d) None of these
(e)Can't be determined

Q56.
The length of rectangular plot is thrice its breadth. If the area of the rectangular plot is 6075 sq. metres, what is its length ?
(a)145 metres
(b)130 metres
(c)75 metres
(d)45 metres
(e)None of these

Q57.
The area of a rectangular field is 460 square metres. If the length is 15 percent more than the breadth, what Is breadth of the rectangular field ?
(a)15 metres
(b)26 metres

(c)34.5 metres
(d)Cannot be determined
(e)None of these

Q58.
 The area of a rectangular field Is 460 square metres. If the length is 15 per cent more than the breadth, what is breadth of the rectangular field ?
(a)15 metres
(b)26 metres
(c)34.5 metres
(d)Cannot be determined
(e)None of these

Q59.
The length and breadth of the floor of a room are 20 feet and 10 feet respectively. Square tiles of 2 feet length of three different colours are to be laid on the floor. Black tiles are laid in the first row on all sides. If white titles are laid in the one-third of the remaining and blue tiles in the rest, how many blue tiles will be there?
(a)16
(b)32
(c)48
(d)24
(e) None of these

Q60.
A circular ground whose diameter is 35 metres, has a 1.4 metre broad garden around it. What is the area of the garden in square metres?
(a)160.16
(b)6.16
(c)1122.66
(d)Data inadequate
(e)None of these

Q61.
The sum of the radius and height of a cylinder is 42 cm.. Its total surface area is 3696 cm square. What is the volume of cylinder ?
(a)17428 cubic cm
(b)17248 cubic cm
(c)17244 cubic cm
(d)17444 cubic cm
(e)None of these

Q62.
Diameter of a cylindrical jar is increased by 25%. By what percent must the height be decreased so that there is no change in its volume ?
(a)18%
(b)25%
(c)32%
(d)36%
(e)None of these

Q63.

The sum of the radius and height of a cylinder is 18 metre. The total surface area of the cylinder is 792 sq. metre, what is the volume of the cylinder ? (in cubic metre)
(a)1848
(b)1440
(c)1716
(d)1724
(e)1694

Q64.
The perimeters of a square and a regular hexagon are equal. The ratio of the area of the hexagon to the area of the square is
(a)2 √3:3
(b) √3:1
(c)3 √3:2
(d)√2 : 4
(e)None of these

Q65.
The edge of an ice cube is 14 cm. The volume of the largest cylindrical ice cube that can be formed out of it is
(a)2200 cu.cm
(b)2000 cu.cm
(c)2156 cu.cm
(d)2400 cu.cm
(e)None of these

Q66.
The circumference of a circle is equal to the side of a square whose area measures 407044 sq. cm. What is the area of the circle?
(a)22583.2 sq. cms.
(b)32378.5 sq. cms.
(c)41263.5 sq. cms.
(d)39483.4 sq. cms.
(e)None of these

Q67.
For a sphere of radius 10 cm, the numerical value of the surface area is how many per cent of the numerical value of its volume?
(a)24%
(b)26.50%
(c)30%
(d)45%
(e)None of these

Q68.
The cost of building a fence around a circular field is Rs. 7, 700 at the rate of Rs. 14 per foot. What is the area of the circular field ?
(a)24062.5 sq.ft.
(b)23864.4sq.ft.
(c)24644.5sq.ft.
(d)Cannot be determined

(e)None of these

Q69.
The radius of a circle is twice the side of a square of area 196 sq.cm. Length of a rectangle is twice the diameter of the circle. What is the perimeter of the rectangle if its breadth is half the length of the rectangle ?
(a)244 cm
(b)168 cm
(c)336 cm
(d)Cannot be determined
(e)None of these

Q70.
The sum of the circumference of a circle and the perimeter of a square is equal to 272 cm. The diameter of the circle is 56 cm. What is the sum of area of the circle and the area of square ?
(a)2464 sq. cm.
(b)2644 sq. cm.
(c)3040 sq. cm.
(d)Cannot be determined
(e)None of these

Q71.
Height of a cylindrical jar is decreased by 36%. By what percent must the radius be increased so that there is no change in its volume?
(a)25%
(b)35%
(c)36%
(d) 40%1
(e)None of these

Q72.
A rectangular plot has a concrete path running in the middle of the plot parallel to the breadth of the plot. The rest of the plot is used as a lawn, which has an area of 240 sq. m. If the width of the path is 3m and the length of the plot is greater than its breadth by 2m, what is the area of the rectangular plot? (in sq. m.)
(a)255
(b)168
(c)288
(d)360
(e)224

Q73.
The ratio of length and breadth of a rectangular plot is 8 : 5 respectively. If the breadth is 60 metre less than the length, what is the perimeter of the rectangular plot ?
(a)260 metres
(b)1600 metres
(c)500 metres
(d)Cannot be determined

(e)None of these

Q74.

The total area of a circle and a square is equal to 2611 sq.cm. The diameter of the circle is 42 cms. What is the sum of the circumference of the circle and the perimeter of the square ?

(a)272 cms.

(b)380cms.

(c)280cms.

(d)Cannot be determined

(e)None of these

Q75.

The respective ratio of curved surface area and total surface area of a cylinder is 4 : 5. If the curved surface area of the cylinder is 1232 square cm, what is the height ? (in cm)

(a)28 cm

(b)24 cm

(c)26 cm

(d)30 cm

(e) None of these

Q76.

A hollow spherical silver ball has an external diameter 4 cm and internal diameter 2 cm thick. Then the volume of the silver used in the ball is?

(a)28/3 pie cubic cm

(b) 1 cubic cm

(c)4/3 pie cubic cm

(d) 7 cubic cm

(e)None of these

Q77.

Two equal circles are drawn in square in such a way that a side of the square forms diameter of each circle. If the remaining area of the square is 42 cm square, how much will the diameter of the circle measure ? (in centimetre)

(a)3.5

(b)4

(c)14

(d)7.5

(e)21

Q78.

The volume and curved surface area of a right circular cylinder are 462 cu. metre and 264 sq. metre respectively. What is the total surface area of the cylinder? (In sq. metre)

(a)332

(b)341

(c)336

(d)431

(e) None of these

Q79.

The circumference of two circles is 88 metres and 220 metres respectively. What is the difference between the area of the larger circle and the smaller circle ?

(a)3422 sq. metre

(b)3242 sq. metre

(c)3244 sq. metre

(d)3424 sq. metre

(e)None of these

Q80.

The diameter of a circle is equal to the perimeter of a square whose area is 3136 sq. cm. What is the circumference of the circle ?

(a)352 cm.

(b)704 cm.

(c)39424 cm.

(d)Cannot be determined

(e)None of these

Q81.

The total area of a circle and a square is equal to 5450 sq.cm. The diameter of the circle is 70 cm. What is the sum of the circumference of the circle and the perimeter of the square ?

(a)360 cm

(b)380 cm

(c)270 cm

(d)Cannot be determined

(e)None of these

Q82.

The area of three consecutive faces of a cuboid are 12cm square, 20cm square and 15 cm square , then the volume (In cm cube) of the cuboid is

(a)3600

(b)100

(c)80

(d)60

(e)None of these

Q83.

Circumference of a circle-A is 11/7 times perimeter of a square. Area of the square is 784 sq cm. What is the area of another circle-B whose diameter is half the radius of the circle-A ?

(a)38.5 sq.cm

(b)156 sq.cm

(c)35.8 sq.cm

(d)616 sq.cm

(e)None of these

Q84.

A playground is built on of the area of a rectangular plot. The area of the playground is 1260 square metre and the length of the plot is seven times the breadth of the plot. What is the perimeter of the plot ?

(a)400 metre

(b)380 metre

(c)480 metre
(d)440 metre
(e)420 metre

Q85.
The length of a rectangular park is 11 metre more than its breadth. The area of park is 242 square metre. There is a 5 metre wide path around the park. Find the area of the path.
(a)405 square metre
(b)430 square metre
(c)425 square metre
(d)435 square metre
(e)None of these

Q86.
If the volume and curved surface area of a cylinder are 616 cubic meter and 352 square meter respectively, what is the total surface area of the cylinder (in square meter)
(a)429
(b)419
(c)435
(d)421
(e)417

Q87.
A rectangular courtyard 3.78 m long and 5.25 m broad is to be paved exactly with square tiles, all of the same size. The minimum number of such tiles is:
(a)430
(b)440
(c)450
(d)460
(e)None of these

Q88.
Each dimension in metres of a rectangular solid is an integer less than 17, the volume of the solid is 176 cubic metre, if the height of the solid is 16m, what is the surface area (in sq. metre) of the solid?
(a)448
(b)384
(c)395
(d)424
(e)406

Q89.
A rectangular plot 55 m long and 45 m broad, has two concrete crossroads (of equal width) running in the middle of it one parallel to the length and the other parallel to the breadth. The rest of the plot is used as a lawn. If the area of the lawn is 1911 m square, what is the width of each of the crossroads ? (in m)
(a)5
(b)5.5
(c)6
(d)4

(e)4.5

Q90.
If the area of a square inscribed in a circle is 15'cm square, then the area of the square inscribed in a semicircle of the same circle, in cm square, Is
(a)5
(b)6
(c)7.5
(d)750
(e)None of these

Q91.
The surface of water in a swimming pool forms a rectangle with length 40 m and breadth 15 m. The depth of water increases uniformly from 1.2 m to 2.4 m at the other end. The volume (in m cube) of water in the pool is
(a)500
(b)540
(c)720
(d)1080
(e)None of these

Q92.
A wall 3m x 2.7m x 0.2m of concrete weight 320 kg per cubic metre. What will be the total weight of the wall in kg.?
(a)5184
(b)51.84
(c)518.4
(d)51840
(e)None of these

Q93.
The length of a rectangle is 4m more than the side of a square and the breadth of the rectangle is 4m less than side of the same square. The area of the square is 567 square metre, what is the area of the rectangle ? (in square metre)
(a)549
(b)545
(c)557
(d)559
(e)551

Q94.
The area of a rectangle is 150 sq. metre. On increasing its breadth by 2 metre and decreasing its length by 5 metre, the area is decreased by 30 sq. metre. What will be the perimeter of a square whose side is equal to the length of the rectangle? (inmetre).
(a)60
(b)55
(c)45
(d)55
(e)52

Q95.

The radius of a circular field is equal to the side of a square field. If the difference between the perimeter of the circular field and that of the square field is 32m, what is the perimeter of the square field ? (in metre)

(a)84
(b)95
(c)56
(d)28
(e)112

Q96.

What is the area of a circle whose circumference is 1047.2 metres ?

(a)87231.76 sq.metres
(b)85142.28 sq.metres
(c)79943.82 sq.metres
(d)78621.47 sq.metres
(e)69843.23 sq.metres

Q97.

A rectangular plot has a concrete path running in the middle of the plot parallel to the length of the plot. The rest of the plot is used as a lawn, which has an area of 2013 sq. m. If the width of the path is 4 m and the length of the plot is greater than its breadth by 8 m, what is the area of the plot? (in sq. metre)

(a)896
(b)345
(c)432
(d)354
(e)682

Q98.

There are two garbage disposal rectangular tanks, A and B with lengths 12m mid 15m respectively in a square field. If the total area of the square field excluding the rectangular tanks is 360 sq. m. and the breadth of both1the rectangular tanks is of the side of the square field, what is the perimeter of the square field ? (in metre)

(a)92
(b)84
(c)96
(d)78
(e)72

Q99.

If Length of the rectangle is increased by 50% and breadth is decreased by 20%. Then what is the percentage change in the area?

(a)decrease 20%
(b)20% increase
(c)80% increase
(d)30% decrease
(e)None of these

Q100.

If the height of a triangle is decreased 20% and its base is increased by 20% what will be the effect on its area?

(a)No change
(b)8% increase
(c)12% decrease
(d)16% increase
(e)None of these

ANSWERS :

1 b	**2** c	**3** b	**4** b	**5** c	**6** a
7 a	**8** b	**9** e	**10** e	**11** b	**12** c
13 b	**14** c	**15** d	**16** b	**17** b	**18** d
19 a	**20** a	**21** d	**22** a	**23** b	**24** d
25 d	**26** d	**27** e	**28** b	**29** b	**30** a
31 c	**32** e	**33** e	**34** c	**35** b	**36** d
37 c	**38** b	**39** d	**40** c	**41** a	**42** d
43 a	**44** c	**45** b	**46** e	**47** d	**48** d
49 c	**50** d	**51** c	**52** d	**53** c	**54** a
55 c	**56** e	**57** e	**58** e	**59** a	**60** a
61 b	**62** d	**63** e	**64** a	**65** c	**66** b
67 c	**68** a	**69** c	**70** c	**71** a	**72** c
73 e	**74** a	**75** a	**76** a	**77** c	**78** b
79 e	**80** b	**81** b	**82** d	**83** e	**84** c
85 b	**86** a	**87** c	**88** e	**89** c	**90** b
91 d	**92** c	**93** d	**94** a	**95** c	**96** a
97 b	**98** c	**99** b	**100** e		

1.(5) There are 8 letters in the word 'SOFTWARE' including 3 vowels (O,A,E) and 5 Consonants (S,F,T,W,R). Considering three vowels as one letter, we have six letters which can be arranged in $^6P_6$ = 6| ways, But corresponding to each way of these arrangements, the vowels can be put together in 3| ways.
∴ Required number of words.
= 6 | × 3| = 4320

2.(1) 4 men out of 7 men and 4 women out of 8 women can be chosen in $^7C_4 \times ^8C_4$ ways
 = (7 × 6 × 5 × 4)/(1 × 2 × 3 × 4) × (8 × 7 × 6 × 5)/(1 × 2 × 3 × 4)
 = 35 × 70 = 2450

3.(1) A team of 5 children consisting of at least two girls can be formed in following ways:
I. Selecting 2 girls out of 4 and 3 boys out of 5. This can be done in $^4C_3 \times ^5C_3$ ways.
II. Selecting 3 girls out of 4 and 2 boys out 5. This can be done in $^4C_3 \times ^5C_2$ ways.
 Selecting 4 girls out of 4 and 1 boy out of 5. This can be done in $^4C_4 \times ^5C_1$
Since the team is formed in each case, therefore, by the fundamental principal of addition, the total number of ways forming the team.
= $^4C_2 \times ^5C_3 + ^4C_3 \times ^5C_2 + ^4C_4 \times ^5C_1$
 =[4 × 3/ 1× 2] × [5 ×4 × 3/1 × 2 × 3] + [4 × 3 × 2/ 1 × 2 ×3]× [5 × 4/1 × 2] + 1× 5
 = 60 + 40 + 5 = 105

4.(4) The work PADDLED consists of seven letters out of which the letter D is repeated thrice.

∴ Required number of arrangements

$= 7!/3! = 7 \times 6 \times 5 \times 4 = 840$

5.(1) The work BLOATING has eight distinct letters.

∴ Number of arrangements = $8!$

$= 8 \times 7 \times 6 \times 5 \times 3 \times 2 \times 1 = 40320$

6.(4) The word CREATE consists of 6 letters in which E comes twice.

∴ Number of arrangements = $6!/2!$

$= (6 \times 5 \times 4 \times 3 \times 2 \times 1)/(2 \times 1) = 360$

7.(5) The word SMART has 5 distinct letters.

∴ Number of arrangements

$= 5 \times 4 \times 3 \times 2 \times 1 = 120$

8.(4) Number of selections = Number of ways of selecting 2 men out of 5 men x number of ways of selecting 1 woman out of 3 women.

$= {}^5C_2 \times {}^3C_1 = (5 \times 4)/(1 \times 2) \times 3 = 30$

9.(1) The word DESIGN consists of 2 vowel & 4 consonants.

V C C C C V

Four consonants can be arranged in $4!$ ways two vowels can be arranged in $2!$ ways

Required number of arrangements $= 4! \times 2! = 48$

10.(1) The committee will be formed as follows:

(i) 1 woman and 2 men

(ii) 2 women and 1 man

(iii) women

∴ Required number of committees

$= {}^5C_1 \times {}^4C_2 + {}^5C_2 \times {}^4C_1 + {}^5C_3$

$= 5 \times (4 \times 3)/(1 \times 2) + (5 \times 4)/(1 \times 2) \times 4 + (5 \times 4 \times 3)/(1 \times 2 \times 3)$

$= 30 + 40 + 10 = 180$

11.(2) The word TOTAL has 5 letters in which T comes twice.

∴ Total number of arrangements

$= 5!/2! = (5 \times 4 \times 3 \times 2 \times 1)/(2 \times 1) = 60$

12.(3) Number of selections

$= {}^8C_5 = {}^8C_3$

$[{}^nC_r = {}^nC_{n-r}] = (8 \times 7 \times 6)/(1 \times 2 \times 3) = 56$

13.(4) The word AWARE consists of 5 letters in which letter 'A' comes twice.

∴ Number of arrangements = $5!/2!$

$= (5 \times 4 \times 3 \times 2 \times 1)/(2 \times 1) = 60$

14.(1) The word 'OFFICES' consists of 7 letters out of which letter 'F' cornes twice.

∴ Total number of arrangements

$= 7!/2!$

$= (7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1)/(2 \times 1) = 2520$

15.(1) The word TRUST consists of five letters in which T comes twice.

∴ Number of arrangements = $5!/2!$

$= (5 \times 4 \times 3 \times 2 \times 1)/(2 \times 1) = 60$

16.(5) The word ATTEND consists of 6 letters in which letter T comes twice.

∴ Number of arrangements = $6!/2!$

$= (6 \times 5 \times 4 \times 3 \times 2 \times 1)/(2 \times 1)$

$= 360$

17.(4) The word BANKING consists of 7 letters in which 'N' comes twice

∴ Number of arrangements = $7!/2!$

$= (7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1)/(2 \times 1)$

$= 2520$

18.(1) The word PEANUT consists of 6 distinct letters.

∴ Number of arrangements = $6!$

$= 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$

19.(4) Required number of combinations

$= {}^4C_2 \times {}^3C_2 \times {}^2C_1$

$= (4 \times 3)/(1 \times 2) \times (3 \times 2)/(1 \times 2) \times 2 = 36$

20.(1) Required number of combinations

$= {}^9C_2 = (9 \times 8 \times 7 \times 6 \times 5)/(1 \times 2 \times 3 \times 4 \times 5) = 126$

21.(4) The word LEASE consists of 5 letters in which E comes twice.

∴ Number of arrangements = $5!/2!$

$= (5 \times 4 \times 3 \times 2 \times 1)/(2 \times 1) = 60$

22.(5) The word CYCLE has 5 letters in which letters comes twice.

∴ Number of arrangements = $5!/2!$

$= (5 \times 4 \times 3 \times 2 \times 1)/(2 \times 1) = 60$

23.(2) Required number of committees

$= ({}^4c \times {}^5c_2 \times {}^3c_2)$

$= (4 \times 3)/(1 \times 2) \times (5 \times 4)/(1 \times 2) \times (3 \times 2)/(1 \times 2)$

$= 6 \times 10 \times 3 = 180$

24.(4) Required number of committees

= Selection of 6 teachers from science and arts teachers

$= {}^9c_6 = {}^9c_3$

$[\because {}^nc_r = {}^nc_{n-r}]$

$= (9 \times 8 \times 7)/(1 \times 2 \times 3) = 84$

25.(3) Required number of committees = Selection out of all the teachers

$= {}^{12}C_6$

$= (12 \times 11 \times 10 \times 9 \times 8 \times 7)/(1 \times 2 \times 3 \times 4 \times 5 \times 6) = 924$

26.(1) The word PRAISE consists of 6 distinct letters.

∴ Number of arrangements = $6!$

$= 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$

27.(4) The word THERAPY consists of 7 distinct letters in which E,A are two vowels.

We get THRPY (EA) keeping EA together as single entity.

Number of permutations when vowels are together

$= 6! \times 2!$

∴ Required number of arrangements $= 7! - 1440$

$= 5040 - 1440 = 3600$

28.(1) The word VISITING has 8 letters in which I comes thrice.

∴ Number of arrangements = $8!/3!$

$= 8 \times 7 \times 6 \times 5 \times 4 = 6720$

29.(5) The word REPLACE consists of 7 letters in which 'E' comes twice.

∴ Number of arrangements = $7!/2!$

$= 7 \times 6 \times 5 \times 4 \times 3 = 2520$

30. The Word SACRED consists of 4 consonants (SCRD) and two vowels (AE). On keeping vowels together we get SCRD (AE).

∴ Number of arrangements

$= 5! \times 2!$

$= 5 \times 4 \times 3 \times 2 \times 1 \times 1 \times 2$

$= 240$

31.(1) The word RUMOUR consists of 6 letters in which each of R and U comes twice.

∴ Number of arrangements

$= 6!/2!2! = (6 \times 5 \times 4 \times 3 \times 2 \times 1)/(2 \times 2)$

$= 180$

32.(1) In the word CANDIDATE, letters C,N,D,D,T are consonants and A,I,A,E are vowels.

We have to arrange C,N,D,D,T (A, I, A, E) in which 'D' comes twice and A comes twice.

∴ Number of arrangements

$= (6! \times 4!)/2!2!$

= (6 × 5 × 4 × 3× 2 × 4 ×3× 2)/ (2 × 2)
= 4320

33.(4) Number of committees.
= $^4C_4 × {}^6C_1 + {}^3C_3 × {}^4C_2$
= 1 × 6 + 1 × (4 × 3)/(1 × 2)
= 6 + 6 = 12

34.(1) No. of ways = 4| × 4|
= 24 × 24 = 576 ways

35.(4) No. of ways
= $^6c_4 + ({}^6c_3 × {}^4c_1) + ({}^6c_2 × {}^4c_2) + ({}^6c_1 × {}^4c_3)$
= 15 + (30 × 5) + (15 × 6) + (6 × 4)
= 15 + 80 + 90 + 24 = 209

36.(1) Total members in the family = 11
No. of males = 4
No. of females = 7
No. of cars hired = 3
No. car can have more than 4 members. So the possible combinations can be such that one car has 3 members and the other two cars 4 each.
Further, each car must have at least one male. The total no. of males is 4. So, only one car will have 2 males and the rest one each.

Option :	I	II	III
Total members	3	4	4
Possible combination:	1m and 2f or (2m and 1f	1m and 3f or 2m and 2f	1m and 2f or 1m and 3f)
			×2

No. of ways : [$^4c_1 × {}^7c_2 + {}^4c_1 × {}^7c_3 + {}^4c_2 × {}^7c_2 + {}^4c_2 × {}^7c_1 + {}^4c_2 × {}^7c_2 + {}^4c_1 × {}^7c_3$] × 2
=(4 × 21 + 4 × 4 × 35 + 6 × 21 + 6 × 7 + 6 × 21 + 4 × 35) × 2
= 126 + 266 + 266
= Total no. ways
= 126 + 266 + 266 = 658

37.(2) 4 boys can be seated in a row in $^4P_4 = 4|$ ways
Now in the 5 gaps 2 girls can be arranged in $^5P_2$ ways
Hence, the number of ways in which no two girls sit together
= 4| × $^5P_2$ = 4 × 3 × 2 × 5 × 4
= 480

38.(1) There are 7men and 3 women. We have to select 5 men out of 7 and 2 women out of 3. This can be done in $^7C_5 × {}^3C_2$ way
∴ The number of ways of making the selection
= $^7C_5 × {}^3C_2$
= $^7C_2 × {}^3C_2$
[∵ $^nC_r = {}^nC_{n-r}$]
= (7 × 6)/(1 ×2) × (3 × 2)/(1×2) = 63

39.(5) There are 11 letters in the word 'CORPORATION' of which three are O's, two are R's and all others are distinct. There are 5 vowels viz. O,O,O,I,A.
Considering these 5 vowels as the one letter we have 7 letters (C,R,R,N,T,P and letter obtained by combining all vowels), out of which R occurs twice.
These 7 letters can be arranged in 7| / 2| ways.
But the 5 vowels (O,O,O, I, A)
can be put together in 5| / 3| way
Hence, the number of arrangements in which vowels are always together 7|/2| / 5|/3|
= (7 × 6 × 5 × 4× 3 × 2 × 5× 4× 3 × 3×2)/(2 × 3 × 2)

= 50400

40.(1) The committee can be formed in the following ways;
(i) By selecting 2 men and 1 women
(ii) By selecting 1 man and 2 women
(iii) By selecting 3 women
∴ Total number of ways of forming the committee
= $3c_2 × 4c_1 + 3c_1 + 4c_2 + 4c_3$
= 3 × 4 + 3 × 6 + 4
= 12 + 18 + 4 = 34

41.(3) 3 Girls can be seated in a row in 3| ways. Now, in the 4 gaps 4 BGBGBGB boys can be seated in 4| ways
Hence, the number of ways in which no two boys sit adjacent to each other
= 3| × 4| = 6 × 24 = 144

42.(2) There are 9 letters in the word ALLAHABAD out of which 4 are A's 2 are L's and the rest are all distinct.
So, the requisite number of words
= 9|\ 412| = 7560

43.(2) The word MIRACLE has 7 distinct letters.
∴ Number of arrangements = 7|
= 7 × 6 × 5 × 4 × 3 × 2 × 1 = 5040

44.(4) The word PUNCTUAL consists of 8 letters in which the letter 'U' comes twice.
∴ Number of arrangements = 8| / 2|
= (8 × 7 × 5 × 4 × 3 × 2 × 1)/(1 × 2)
= 20160

(15-16): There are 6 men and 4 women. A committee of 4 persons is to be formed amongst these 6 m and 4w.

45.(4) The committee of 4 persons is to be so formed that it has at least 2 men. The different ways that we can choose to form such a committee:
(1) 2m. 2w in $^6C_2 × {}^4C_2$
= (6 × 5)(2 × 1) × (3 × 3)/(2 × 1) = 90
(ii) 3m. 1w in $^6C_3 × {}^4C_1$
= (6 × 5 × 4)/(3 × 2 × 1) × 4 = 15
∴ Total no. of different ways in which a committee of 4 persons can be formed so that it has at least 2 men
= 90 + 80 + 15 = 185

46.(3) There are 9 women and 8 men. A committee of 12, consisting of at least 5 women, can formed by choosing:
(i) women and 7 men
(ii) 6 women and 6 men
(iii) 7 women and 5 men
(iv) 8 women and 4 men
∴ Total number of ways of forming the committee
= $^9C_5 × {}^8C_7 + {}^9C_6 × {}^8C_6 + {}^9C_7 × {}^8C_5 + {}^9C_8 × {}^8C_4 + {}^9C_9 × {}^8C_3$
= 126 × 8 + 84 × 28 + 36 × 56 + 9 × 70 + 1 × 56 = 6062

47.(1) Men are in majority in only
(i) case as discussed in question 17.
∴ Total number of such committees
= $^9C_5 × {}^8C_7 = 126 × 8 = 1008$

48.(2) Total word PRIDE consists of 5 distinct letters.
∴ Number of arrangements = 5|
= 5 × 4 × 3 × 2 × 1 = 120

49.(1) Case I [6 | | | | 5]
Four empty places can be filled by 2,9,7,and4 in4| i.e. 4 × 3 × 2 × 1 = 24 ways
Case II [5 | | | | 6]
Number of arrangements = 24
∴ Required number of arrangements = 24 + 24 = 48

50.(1) Books on Economics are to be kept together. Hence, we are to arrange 3 books on management 4 books on Statistics and one book on Economics.
These can be arranged in 8| ways.
Again, 4 books on Economics can be arranged together in 4| ways.
∴ Total number of arrangements = 8| × 4| = 967680

51.(5) There are 8 letters in the word 'SOFTWARE', including 3 vowels (O,A,E) and 5 consonants (S,F,T,W,R). Considering three vowels as one letter, we have six letters which can be arranged in $^6P_6 = 6|$ ways.
But corresponding to each way of these arrangements the vowels can be put together in 3| ways.
∴ Required number of words
= 6| 3| = 4320

52.(2) 4 boys can be seated in a row in $^4P_4 = 4|$ ways
Now in the 5 gaps 2 girls can be seated in $^5P_2$ ways
Hence, the number of ways in which no two girls sit together
= 4| × $^5P_2$ = 4 × 3 × 2 × 5 × 4
= 480

53.(3) There are 7 letters in the word 'DRASTIC' including 2 vowels (A.I) and 5 consonants (D,R,S,T,C). Considering two vowels as one letter, we have 6 letters which can be arranged in 6| ways. But corresponding to each way of these arrangements, the vowels can be put together in 2| ways
∴ Total arrangements
= 6| × 2| = 1440

54.(4) The word CASUAL has 6 letters in which letter 'A' comes twice.
∴ Number of arrangements = 6| /2|
= (6 × 5 × 4 × 3 × 2 × 1)/(1 × 2) = 360

55.(1) n(F) = 50n (C) = 60
n(FUC) = 100 – 10 = 90
∴ n(F∩C) = n(F) + n(C) – n (FUC)
= 50 + 60 – 90 = 20

56.(3) The word RECTITUDE has 9 letters in which RCTTD are consonants and EIUE are vowels and T and E come twice.
We have to arrange
RCTTD (EEIU)
∴ Number of arrangement
= (6| × 4|)/ (2| × 2|)
= 6 × 5 × 4 × 3 × 2 × 3 × 2
= 4320