CBSE Sample Paper-03 (solved)
SUMMATIVE ASSESSMENT –II
MATHEMATICS
Class – IX

Time allowed: 3 hours Maximum Marks: 90

General Instructions:

a) All questions are compulsory.
b) The question paper consists of 31 questions divided into five sections – A, B, C, D and E.
c) Section A contains 4 questions of 1 mark each which are multiple choice questions, Section B contains 6 questions of 2 marks each, Section C contains 8 questions of 3 marks each, Section D contains 10 questions of 4 marks each and Section E contains three OTBA questions of 3 mark, 3 mark and 4 mark.
d) Use of calculator is not permitted.

Section A

1. A point of the form (m,m) always lies on
   (a) The line $x + y = 0$
   (b) The line $x - y = 0$
   (c) On line $x + y = 2m$
   (d) None of the above
2. Which of the following is true?
   (a) The diagonals of a trapezium are always equal
   (b) A trapezium can be parallelogram but a parallelogram cannot be a trapezium
   (c) A parallelogram can be trapezium but a trapezium cannot be a parallelogram
   (d) None of the above
3. How many circles can pass through three given ono-collinear points?
   (a) Only one
   (b) Two
   (c) Three
   (d) Infinitely many
4. The slant height of a right circular cone is 17 cm and the radius is 8 cm. the measure of the height of the cone is
   (a) 9 cm
   (b) 15 cm
   (c) 20 cm
   (d) 25 cm

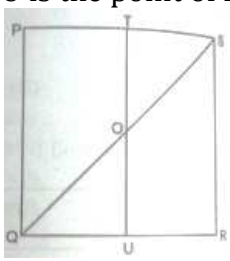
Section B

5. Plot the points A(2, 0), B(2, 2), C(0, 2) and draw the line segments OA, AB, BC and CO. What figure do your obtain?

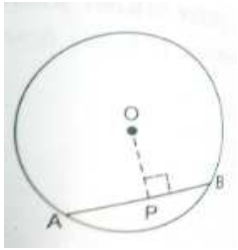
6. Determine the number of sides of polygon whose exterior and interior angles are in the ratio 1: 5.
7. Construct an angle of 105o. Write the Steps of Construction.

   Or

   In a quadrilateral ABCD, the angles A, B, C and D are in the ratio 1: 2: 3: 4. Find the measure of each angles of the quadrilateral.
8. PQRS is a square. T and U are respectively, the mid-point of PS and QR. Find the area of ΔOTS . If PQ = 8 cm, where O is the point of intersection of TU and OS.



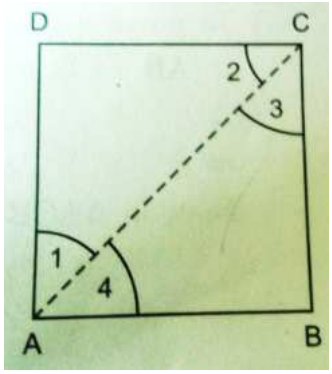
9. In the below diagram O is the centre of the circle. The chord AB = 10 cm is such that OP $\perp$ AB. Find the length of AP.



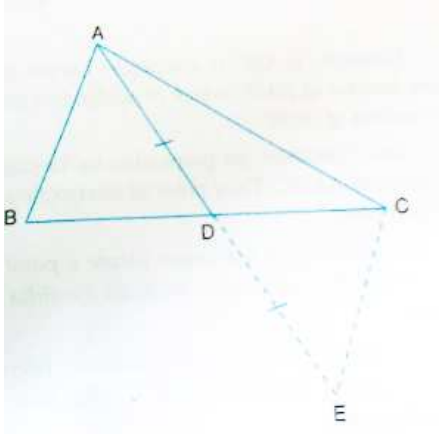
10. The length, breadth and height of a room are 4 m, 3m and 3 m respectively. Find the lateral surface area of the room.

Section C

11. How many spherical lead shots each 4.2 cm in diameter can be obtained from a rectangular solid lead with dimensions 66 cm, 42 m and 21 m?
12. The sum of the 10% of one number and 20% of the other number is equal to the 5 more than the 15% of the sum of two numbers. Write a linear equation in two variables to represent above statement.
13. ABCD is a rectangle in which diagonal Ac bisects $\angle A$ as well as $\angle C$. Show that
    a. ABCD is a square
    b. Diagonal BD bisects $\angle B$ as well as $\angle D$



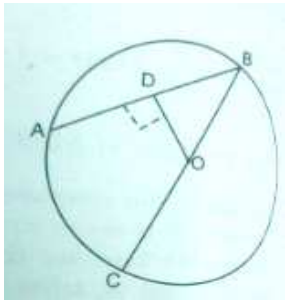
14. In the below figure, AD is a medium of ΔABC. Prove that AB + AC > 2AD



Or

Prove that the sum of the three sides of a triangle is greater than the sum of the three medians.

15. In the below figure, OD is perpendicular to chord AB of a circle whose centre is O. if BC is a diameter, prove that CA = 2OD.



16. Construct a ΔABC whose perimeter is 12 cm and sides are in the ratio 2:3:4.
17. The radius of a cylinder is 7 cm. if its volume is 2002 cm^2, then find its height and total surface area.
18. A tyre manufacturing company kept a record of the distance covered before a tyre needed to be replaced. The table shows the results of 1000 cases.

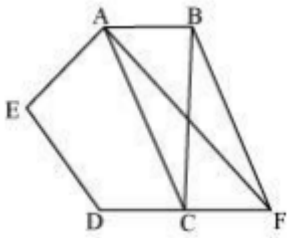
Distance in Km	Less than 4000	4000 to 9000	9001 to 14000	More than 14000
Frequency	20	210	325	445

If you buy a tyre of this company, what is the probability that:

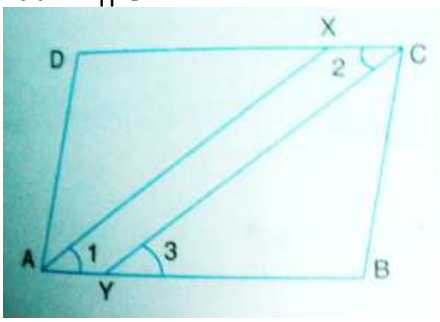
i) It will need to be replaced before it has covered 4000 km?
ii) It will last more than 9000 km?
iii) It will need to be replaced after it has covered somewhere between 4000 km and 14000 km?

Section D

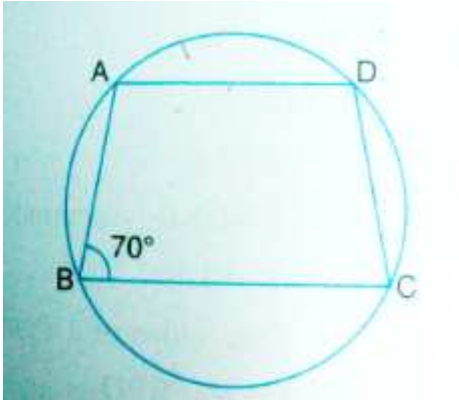
19. In the given figure, ABCDE is a pentagon. A line through B parallel to AC meets DC produced at F. Show that area (AEDF) = ar (ABCDE).



20. Kumar was having a field in the form of a parallelogram PQRS. He divides it into three parts by taking 'A' on RS and joining it to 'P' and 'Q'. such that
    a. One part is exactly half of the given field.
    b. In the remaining two parts, he wants to show wheat and pulses separately and donates their products to an orphanage.
        i. How the above plan can be implemented?
        ii. Which mathematical concept is used in this problem?
        iii. By donating the product of two parts wheat and pulses to an orphanage, which value is depicted by Kumar?
21. At a certain time in a deer park, the number of heads and the number of legs of deer and human visitors were counted and it was found there were 39 heads & 132 legs.
    Find the number of deer and human visitors in the park.
22. Prove that the sum of three altitudes of a triangle is less than the sum of the three sides of the triangles
23. ABCD is a parallelogram and line segment AX; CY bisects the angles A and C respectively. Show that AX || CY.



24. ABCD is a cyclic trapezium with AD || BC. If $\angle B = 70^0$. Determine other three angles of the trapezium.



25. The radius of the base and the height of a right circular cone are 7 cm and 24 cm respectively. Find the volume and total surface area of eh cone.

Or

If the radius of the base of a right circular cone is halved keeping the height same. What is the ratio of the volume of the reduced come to that of the original one?

26. ABCD is a rhombus. Show that diagonal AC bisects $\angle A$ as well as $\angle C$ and diagonal BD bisects $\angle B$ as well as $\angle D$.
27. Prove that the area of the rhombus is equal to half the rectangle contained by its diagonals.
28. An organization selected 2400 families at random and surveyed them to determine a relationship between income level and the number of vehicles in a family. The information gathered is listed in the table

Monthly Income In Rs.	Vehicles per family			
	0	1	2	Above 2
Less than 7000	10	160	25	0
7000 - 10000	0	305	27	2
10000 - 13000	1	535	29	1
13000 - 16000	2	469	59	25
16000 or more	1	579	82	88

Suppose a family is chosen. Find the probability that the family chosen is

c. Earning Rs. 10000 – 13000 per month and owning exactly 2 vehicles
d. Earning Rs. 16000 or more per month and owning exactly 1 vehicle.
e. Earning less than Rs. 7000 per month and does not own any vehicle.
f. Earning Rs. 13000 – 16000 per month and owning more than 2 vehicles.
g. Owning not more than 1 vehicle.

Section E

29. OTBA Question for 3 marks from Statistics. Material will be supplied later.
30. OTBA Question for 3 marks from Statistics. Material will be supplied later.
31. OTBA Question for 4 marks from Statistics. Material will be supplied later.

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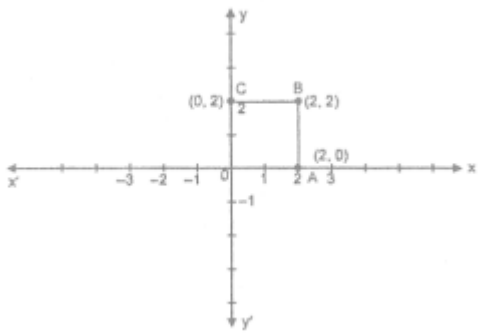
SOLUTIONS:

Section A

1. (b)
2. (c)
3. (a)
4. (b)

Section B

5.



On joining OA, AB, BC and CO we get square of each side 2 units.

6. Let exterior and interior angles be $x^0$and $5x^0$ also $(x + 5x^0) = 1800$, $(x^0 = 300)$

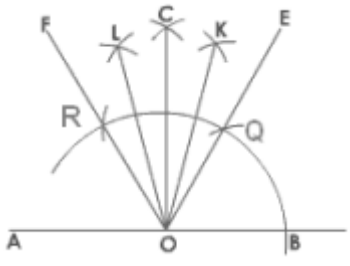
   And $x \cdot n = 360^0$

   Where n is number of sides of polygon.

   So, $30 \times x = 360^0$

   $x = 12$

7.



Steps

a. Draw AB. Make any point O on it.
b. With O as centre, draw an arc which cuts AB at B.

c. With B as centre and same radius, cut an arc at Q and from Q with same radius, cut the arc at R.
d. Join OQ, OR.
e. Bisect $\angle QOR$ by constructing angle bisector OC.
f. Construct OK to bisect $\angle COE$
g. Then $\angle BOK = 75^0$
h. Construct OL to bisect $\angle COF$
i. Then $\angle BOL = 105^0$

Or

Given $\angle A : \angle B : \angle C : \angle D : 1 : 2 : 3 : 4$

$$\angle A = x, \angle B = 2x, \angle C = 3x, \angle D = 4x$$

$$\angle A + \angle B + \angle C + \angle D = 360^0$$

$$x + 2x + 3x + 4x = 360^0$$
$$x = 36^0$$

The angles are

$$\angle A = 36^0$$

$$\angle B = (2 \text{ x } 36)^0 = 72^0$$

$$\angle C = (3 \text{ x } 36)^0 = 108^0$$

$$\angle D = (4 \text{ x } 36)^0 = 144^0$$

8. Given PS = PQ = 8 cm and TU || PQ

$$ST = \frac{1}{2} PS = \frac{1}{2} \text{ x } 8 = 4 \text{ cm}$$
$$PQ = TU = 8 \text{ cm}$$
$$\text{OT} = \frac{1}{2} \text{ x } 8 = 4 \text{ cm}$$
$$\text{Area of } \Delta OTS = \frac{1}{2} \text{ x ST x OT}$$
$$= \frac{1}{2} \text{ x } 4 \text{ x } 4 \text{ cm}^2$$
$$= 8 \text{ cm}^2$$

9. Given OP $\perp$ AB

Therefore P is the mid-point of AB.

$$AP = \frac{1}{2} AB$$

$$AP = \frac{1}{2} \text{ x } 10 \text{ cm} = 5 \text{ cm}$$

10. Given l = 4m, b = 3m and h = 3 m

Lateral surface area = Area of the four wall

$$= 2(l+b)h$$

$$= 2(4+3) \text{ x } 3 \text{ m}^2$$

$$= 42 \text{ m}^3$$

The required lateral surface area of the room is 42 m^3.

Section – C

11. Dimensions of the rectangular solid are 66 cm, 42 cm 21 cm.

Volume of the solid = 66 × 42 × 21 cm3

Diameter of a spherical lead shot = 4.2 cm

⇒ radius = 2.1 cm

$$\text{Volume of a spherical lead shot} = \frac{4}{3} \text{ x } \frac{22}{7} \text{ x } (21)^3$$

$$\therefore \text{Number of lead shots} = \frac{\text{Volume of Rectangular solid}}{\text{Volume of one Spherical shot}}$$

$$= \frac{66 \text{ x } 42 \text{ x } 21 \text{ x } 21}{88 \text{ x } (21)^3}$$

12. Assume First number be x

Second number be y

$$10\% \text{ of the first number} = \frac{10}{100} x = \frac{1}{10} x$$

$$20\% \text{ of second number} = \frac{20}{100} y = \frac{1}{5} y$$

$$\frac{1}{10} x + \frac{1}{5} y = 5 + \frac{15}{100}(x+y)$$

$$\frac{1}{10} x + \frac{1}{5} y = 5 + \frac{15}{100} x + \frac{15}{100} y$$

$$\frac{10x - 15x + 20y - 15y}{100} = 5$$

$$y - x = 100$$

13. Given – rectangle ABCD such that AC bisects $\angle A$ as well as $\angle C$.

That is $\angle 1 = \angle 4$ and $\angle 2 = \angle 3$ (i)

a. Since rectangle is a parallelogram
   Then ABCD is a parallelogram

AB || CD and AC is a transversal.

$\therefore \angle 2 = \angle 4$ (ii)

From (i) and (ii)

$\angle 3 = \angle 4$

AB = BC

$\therefore$ AB = BC = CD = AD

Since ABCD is a rectangle having its entire sides equal.

$\therefore$ ABCD is a square

b. Since ABCD is a square and diagonals of a square bisect the opposite angles.

$\therefore$ BD bisects $\angle B$ as well as $\angle D$

14. Produce AD to E such that AD = DE and join C and E.

In ΔADB and ΔEDC

AD = DE

BD = DC

Then $\angle ADB = \angle EDC$ [vertically opposite angles]

$\therefore \Delta ADB \equiv \Delta EDC$

$\therefore$ AB = EC (i)

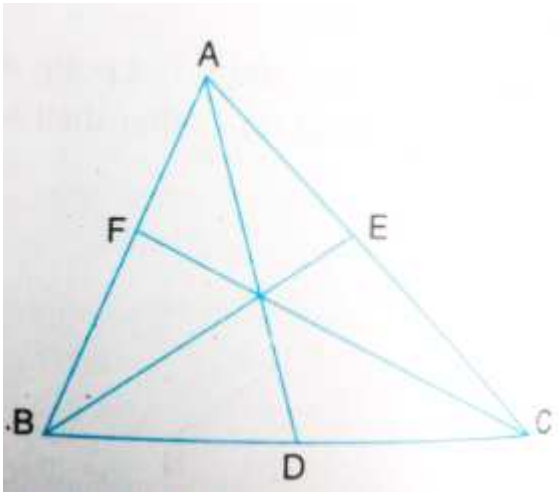
In ΔAEC, AC + EC > AE

$\Rightarrow$ AC + AB > AE

$\Rightarrow$ AB + AC > AE

Hence AB + AC > 2AD

Or



Since AB + AC > 2AD [by constant] (i)

Similarly BC + BA > 2BE[since BE is a median] (ii)

CA + CB > 2CF (iii)

Adding equation (i), (ii) and (iii)

$2(AB + BC + CA) > 2(AD + BE + CF)$

$\Rightarrow AB + BC + CA > AD + BE + CF$

Hence sum of the three sides of triangle ABC > sum of the three medians of triangles ABC.

15. Given – circle whose centre is O. BC is a diameter and AB a chord such that $OD \perp AB$. Let us join AC.

Since the perpendicular from centre of a circle to a chord bisects the chord.

$\therefore$ D is the mid-point of AB

$\therefore$ O is the mid-point of the diameter BC

$\therefore$ OD is the line segment joining the mid-point of two sides of ΔABC

$\therefore$ OD is half of the third side of ΔABC

$$OD = \frac{1}{2} AC$$

$$2OD = AC$$

16. Steps

a. Draw $\overline{XY} = 12cm$
b. Draw $\overline{XZ}$ making an acute angle with XY in the downward direction.
c. From X, get off(2+3+4=9) nine equal distance along XZ.
d. Mark points P, Q and R on XZ such that

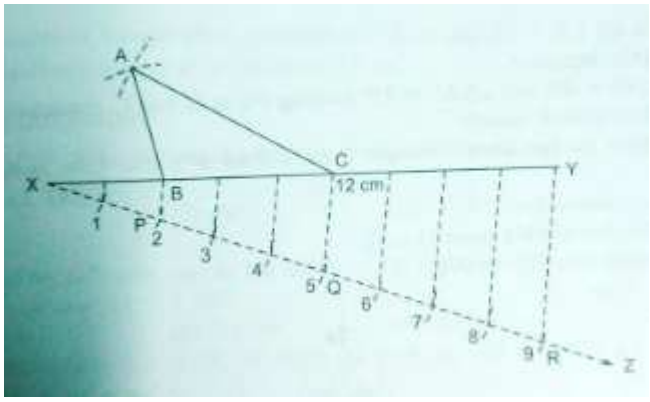
XP = 2 units

PQ = 3 units

QR = 4 units

e. Join RY.
f. Draw QC || Ry and PB || RY.
g. With centre B and radius BX, draw an arc.
h. With centre C and radius CY, draw an arc.
i. Join AB and AC.

Hence ΔABC is the required triangle.



17. Radius (r) = 7 cm

Volume of the cylinder = $\pi r^2 h = \frac{22}{7}$ x 7 x 7 x h

Since $\frac{22}{7}$ x 7 x 7 x h = 2002 [given]

$$h = \frac{2002 \text{ x } 7}{22 \text{ x } 7 \text{ x } 7} cm = 13cm$$

Total surface area of the cylinder = $2\pi r^2 + 2\pi rh = 2\pi r(r+h)$

$$= 2 \text{ x } \frac{22}{7} \text{ x } 7 \text{ x } (7+13)\text{cm}^3$$

$$= 44 + 20 \text{ cm}^3 = 880 \text{ cm}^3$$

18. The total number of tyres = 1000

i) The frequency of a tyre that needs to be replaced before it covers 4000 km is 20.

$$\text{P (tyre to be replaced before it covers 4000 km)} = \frac{20}{1000} = 0.02$$

ii) The frequency of a tyre that will last more than 9000 km is 325 + 445 = 770

iii) The frequency of a tyre that requires replacement between 4000 km and 14000 km is 210 + 325 = 535

$$\text{P(tyre requiring replacement between 4000 km and 14000 km)} = \frac{535}{1000} = 0.535$$

Section – D

19. ΔACB and ΔACF lie on the same base AC and are between the same parallels AC and BF.

Therefore Area (ΔACB) = Area (ΔACF)

Area (ΔACB) + Area (ACDE) = Area (ACF) + Area (ACDE)

Area (ABCDE) = Area (AEDF)

20.

i. Kumar is having the field in the form of parallelogram PQRS. He marks a point 'A' on RS and joins AP and AQ.
Now the field is divided into three parts ΔAPS , ΔPAQ and ΔQAR

ΔPAQ and parallelogram PQRS are on the same base (PQ) and between the same parallels (PQ || RS)

$$ar(\Delta PAQ) = \frac{1}{2} ar(\text{parallelogram PQRS}) \qquad \text{(i)}$$

$$ar(\Delta APS) + ar(\Delta PAQ) + ar(\Delta QAR) = ar(\text{parallelogram PQRS})$$

$$ar(\Delta APS) + \frac{1}{2} ar(\text{parallelogram PQRS}) + ar(\Delta QAR) = ar(\text{parallelogram PQRS})$$

$$ar(\Delta APS) + ar(\Delta QAR) = \frac{1}{2} ar(\text{parallelogram PQRS}) \qquad \text{(ii)}$$

From (i) and (ii) we get

$$ar(\Delta APS) + ar(\Delta QAR) = ar(\Delta PAQ)$$

Hence the field is divided into three desired parts

ii. Area of parallelogram and triangles

iii. charity

21. Let the no. of deers be x
And no. of humans be y

therefore

x + y = 39 ---- (1)
4 x + 2 y = 132 ----- (2)

Multiply (1) and (2)

On solving, we get …

x = 27 and y= 12

∴ No. of deers = 27 and No. of humans = 12

22. In the triangle ABD $\angle D = 90^0$ and $\angle B$ is acute.

$\therefore \angle D > \angle B$

AB > AD --(i)

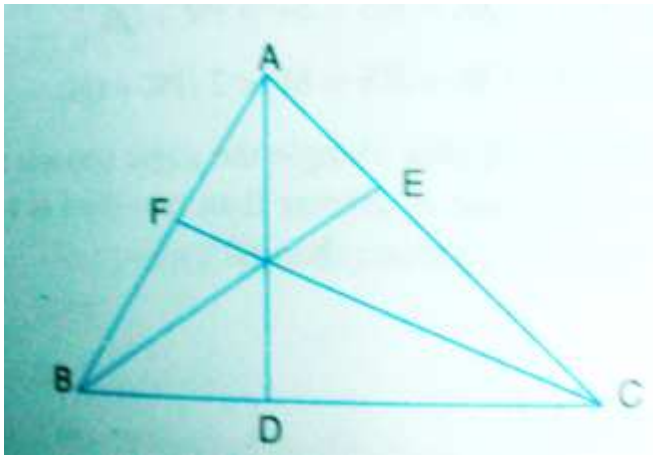
In the triangle ACD

$\angle D = 90^0$ and $\angle C$ is acute.

AC > AD (ii)

Adding (i) and (ii) we get

AB + AC > 2AD --(iii)



Similarly, we can prove that

BC + BA > 2BE --(iv)

CA + CB > 2CF (v)

Adding (iii), (iv) and (5) we get

2(AB + BC + CA) > 2 (AD + BE + CF)

AB + BC + CA > AD + BE + CF

AD + BE + CF < AB + BC + CA

23. From the question we got, ABCD is a parallelogram and line segments AX, CY bisect the angles A and C respectively.

$$\angle A = \angle C$$

$$\frac{1}{2}\angle A = \frac{1}{2}\angle C$$

$$\angle 1 = \angle 2 \qquad \text{(i)}$$

Now AB || DC and CY intersects them

$$\angle 2 = \angle 3 \qquad \text{(ii)}$$

From (i) and (ii) we get

$$\angle 1 = \angle 3$$

Corresponding angles we get

AX || CY

24. ABCD is a cyclic trapezium with AD || BC, $\angle B = 70^0$

$$\angle B + \angle D = 180^0$$

$$70^0 + \angle D = 180^0$$

$$\angle D = 180^0 - 70^0$$

$$\angle D = 110^0$$

Again AD || BC and transversal AB intersects them

$$\angle A + \angle B = 180^0$$

$$110^0 + \angle C = 180^0$$

$$\angle C = 180^0 - 110^0 = 70^0$$

25. Given radius r = 7 cm

Height h = 24 cm

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

$= \frac{1}{3}$ x $\frac{22}{7}$ x $(7)^2$ x 24 = 1232 cm^2

Total surface area of the cone = $\pi r(l+r)$

$= \pi r\left(\sqrt{r^2+h^2}+r\right)$

$= \frac{22}{7}$ x 7 x $\left(\sqrt{7^2+24^2}+7\right)$

= 22 x (25+7) = 22 x 32 = 704 cm^2

Or

Let the radius of the base and the height of the original cone be r and h respectively.

Volume of the original cone (v_1) = $\frac{1}{3}\pi r^2 h$ (i)

For the reduced cone

Radius = $\frac{r}{2}$

Height = h

Volume of the reduced cone (v_2) = $\frac{1}{3}\pi\left(\frac{r}{2}\right)^2 h$

$\frac{1}{4}\left(\frac{1}{3}\pi r^2 h\right) = \frac{1}{4}v_1$

$\therefore \frac{v_2}{v_1} = \frac{1}{4} = 1:4$

Hence the ratio of the volume of the reduced cone to that of the original one is 1: 4

26. Since ABCD is a rhombus

Therefore AD = CD

$\angle DAC = \angle DCA$ (i)

Also AD || BC and transversal AC intersects them

$\therefore \angle DAC = \angle BCA$ (ii)

From the equation (i) and (ii) we get

$\angle DCA = \angle BCA$

AC bisects $\angle C$

Similarly AC bisects $\angle A$

Proceeding similarly as in (i) we prove that BD bisects $\angle B$ as well as $\angle D$

27. ABCD is a rhombus whose diagonals are AC and BD.

Area of the rhombus ABCD = area of triangle ABD + Area of triangle CBD

$$= \frac{(BD)(AO)}{2} + \frac{(BD)(OC)}{2}$$

$$= \frac{(BD)}{2}(AO + OC) = \frac{(BD)(AC)}{2}$$

$$= \frac{1}{2} \text{ product of the length of its diagonals}$$

28. Total number of families selected = 2400

a. Number of families earning Rs. 10000 – 13000 per month and owning exactly 2 vehicles = 29

The probability that the family chosen is earning Rs. 10000 – 13000 per month and owning exactly 2 vehicles = $\frac{29}{2400}$

b. Number of families Earning Rs. 16000 or more per month and owning exactly 1 vehicle = 579

The probability that the family chosen is Earning Rs. 16000 or more per month and owning exactly 1 vehicle = $\frac{579}{2400} = \frac{193}{2400}$

c. Number of families Earning less than Rs. 7000 per month and does not own any vehicle = 10

The probability that the family Earning less than Rs. 7000 per month and does not own any vehicle = $\frac{10}{2400} = \frac{1}{240}$

d. Number of families Earning Rs. 13000 – 16000 per month and owning more than 2 vehicles = 25

The probability of Earning Rs. 13000 – 16000 per month and owning more than 2 vehicles = $\frac{25}{2400} = \frac{1}{96}$

e. Number of families owning not more than 1 vehicle = number of families owning 0 vehicle + Number of families owning 1 vehicle

= (10 + 0 + 1 + 2 + 1) + (160 + 305 + 535 + 469 + 579)

= 14 + 2048 = 2062

The probability that the family chosen owns not more than 1 vehicle = $\frac{2062}{2400} = \frac{1031}{2400}$