MATHS SAMPLE PAPER

PART-A

Section-I

Section I has 16 questions of 1 mark each.

1. Write linear equation representing a line which is parallel to y-axis and is at a distance of 2 units on the left side of y-axis.

2. Find whether (0, −3) is a solution of linear equation, x − y + 3 =0?

3. Construct an acute angle and draw its bisector.

4. The edge of a solid cube is 6 cm. How many cubes of 6cm edge can be formed from this cube?

5. The curved surface area of a right circular cylinder of height 21 cm is 957cm^2. Find the diameter of the base of the cylinder.

6. Find the radius of largest sphere that is carved out of the cube of side 8 cm.

7. Find the semi perimeter of a triangle with sides 9 cm, 12 cm and 30 cm.

8. The area of a triangle is 48cm^2. Its base is 12cm, Find its altitude.

9. There are 5 red and 3 black balls in a bag. Find the probability of drawing a black ball.

10. Angles of a triangle are in the ratio 2 : 4 : 3, Find the smallest angle of the triangle.

11. In parallelogram ABCD, $m\angle A = (5x - 20)°$ and $m\angle C = (3x + 40)°$. $Find$ the value of x.

12. Convert $2\frac{5}{12}$ in decimal form.

13. $(x-y)(x+y)(x^2+y^2)(x^4+y^4)$ is equal to _____.

14. A point whose ordinate is 4 and lies on the y – axis is _____.

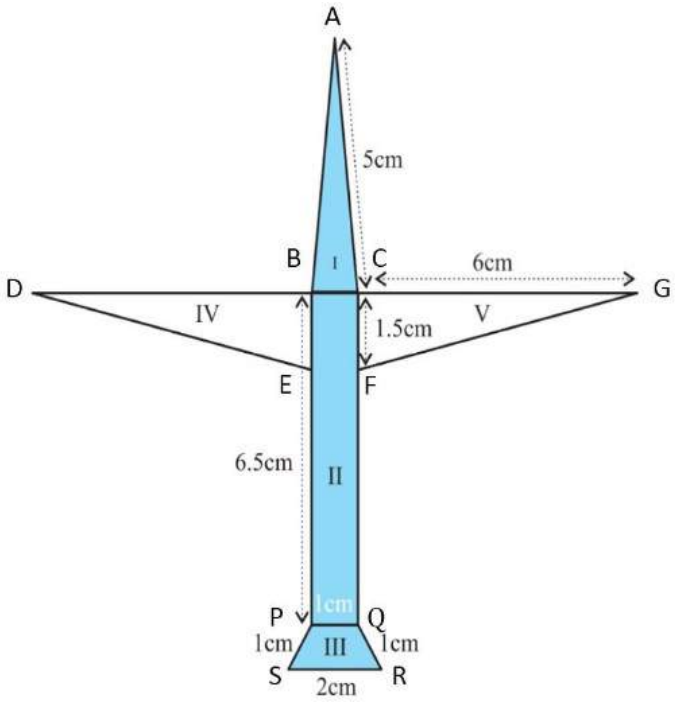
15. Any point on the y – axis is of the form (y, 0). (True/False).

16. A diagonal of a rectangle is inclined to one side of the rectangle at 25°. The acute angle between the diagonals is _____.

Section II

Case-study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

17. Radha made a picture of an aero plane with coloured paper as shown in Figure. Find the total area of the paper used.



(a) What is the area of part I?

(i) $\sqrt{6.1875}$ cm^2

(ii) $\sqrt{6.7185}$ cm^2

(iii) $\sqrt{6.8175}$ cm^2

(iv) $\sqrt{6.5187}$ cm^2

(b) What is the area of part II?

(i) 5.6 cm^2

(ii) 6.5 cm^2

(iii) 3.6 cm^2

(iv) 1.56 cm^2

(c) What is the half area of part IV?

(i) 5.42 cm^2

(ii) 4.50 cm^2

(iii) 3.21 cm^2

(iv) 6.47 cm^2

(d) What is the area of part III?

(i) 1 cm^2

(ii) 1.23 cm^2

(iii) 1.8 cm^2

(iv) 1.5 cm^2

(e) What is the area of the whole paper plane?

(i) 18.75 cm^2

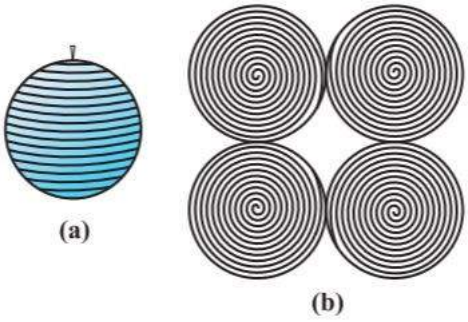
(ii) 19.50 cm^2

(iii) 16.25 cm^2

(iv) 17.55 cm^2

18. Have you ever played with a top or have you at least watched someone play with one? You must be aware of how a string is wound around it. Now, let us take a rubber ball and drive a nail into it. Taking support of the nail, let us wind a string around the ball. When you have reached the 'fullest' part of the ball, use pins to keep the string in place, and continue to wind the string around the remaining part of the ball, till you have completely covered the ball. Mark the starting and finishing points on the string, and slowly unwind the string from the surface of the ball. Now, measure the diameter of the ball, from which you easily get its radius. Then on a sheet of paper, draw four circles with radius equal to the radius of the ball. Start filling the circles one by one, with the string you had wound around the ball.

What have you achieved in all this? The string, which had completely covered the surface area of the sphere, has been used to completely fill the regions of four circles, all of the same radius as of the sphere. So, what does that mean? This suggests that the surface area of a sphere of radius r = 4 times the area of a circle of radius r = $4 \times (\pi r^2)$



(a). The surface area of sphere of radius 5.6 cm is

(i) 96.8 π cm^2
(ii) 94.08 π cm^2
(iii) 90.08 π cm^2
(iv) none of these

(b). Find the radius of a sphere whose surface area is 154 m^2.

(i) 3.5 cm
(ii) 3.5 m
(iii) 7 cm
(iv) 7 m

(c). If a solid sphere of radius 10 cm is moulded into 8 spherical balls of equal radii, then the surface area of each ball (in sq. cm) is

(i) 100π
(ii) 75π
(iii) 60π
(iv) 50π

(d). A wooden sphere has its radius 3.5 cm. If the density of the wood is 0.9 g per cm^3, then the mass of the wooden sphere is

(i) 150 g
(ii) 161.7 g
(iii) 158.3 g
(iv) 172.3 g

(e). The diameter of mars is one third of the diameter of the Saturn. What is the ratio of their surface area?

(i) 9: 1
(ii) 2: 3
(iii) 3: 2
(iv) 1: 9

19. Consider a situation when two students Mary and Hari received their test copies. The test had five questions, each carrying ten marks. Their scores were as follows:

Question Numbers	1	2	3	4	5
Mary	10	8	9	8	7
Hari	4	7	10	10	10

Upon getting the test copies, both of them found their average scores as follows: Mary's average score = 42/5 = 8.4 Hari's average score = 41/5 = 8.2 Since Mary's average score was more than Hari's, Mary claimed to have performed better than Hari, but Hari did not agree. He arranged both their scores in ascending order and found out the middle score as given below:

Mary	7	8	**8**	9	10
Hari	4	7	**10**	10	10

Hari said that since his middle-most score was 10, which was higher than Mary's middle-most score, that is 8, his performance should be rated better. But Mary was not convinced. To convince Mary, Hari tried out another strategy. He said he had scored 10 marks more often (3 times) as compared to Mary who scored 10 marks only once. So, his performance was better. Now, to settle the dispute between Hari and Mary, let us see the three measures they adopted to make their point. The average score that Mary found in the first case is the mean. The 'middle' score that Hari was using for his argument is the median. The most often scored mark that Hari used in his second strategy is the mode.

(a) If the mean of five observations x, x+2, x+4, x+6 and x+8 is 11, then the mean of last three observations is

(i). 9
(ii). 11
(iii). 13
(iv). none of these

(b) What is the mean of squares of first five natural numbers?

(i). 11
(ii). 12
(iii). 13
(iv). 14

(c) If the median of the scores $\frac{x}{2}, \frac{x}{3}, \frac{x}{4}, \frac{x}{5}$ and $\frac{x}{6}$ (where x > 0) is 6, then find the value of $\frac{x}{6}$.

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

(d) The mean of n observations is $\overline{X}$. If k is added to each observation, then the new mean is

(i). $\overline{X}$
(ii). $\overline{X} + k$
(iii). $\overline{X} - k$
(iv). $k\overline{X}$

(e) For the set of numbers 2, 2, 4, 5 and 12, which of the following statements is true?

(i). Mean = Median
(ii). Mean > Mode
(iii). Mean < Mode
(iv). Mode = Median

20. An organisation 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 below:

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 follows the given criteria.

(a) Earning Rs 10000 – 13000 per month and owning exactly 2 vehicles.
(i) 13/2400

(ii) 12/1300

(iii) 29/2400

(iv) 19/2400

(b) Earning Rs 16000 or more per month and owning exactly 1 vehicle.
(i) 540/2400

(ii) 560/2400

(iii) 579/2400

(iv) 581/2400

(c) Earning less than Rs 7000 per month and does not own any vehicle.
(i) 1/240

(ii) 13/240

(iii) 17/240

(iv) 19/240

(d) Earning Rs 13000 – 16000 per month and owning more than 2 vehicles.
(i) 1/84

(ii) 1/96

(iii) 2/190

(iv) 4/36

(e) Owning not more than 1 vehicle

(i) 1031/1200

(ii) 1032/1200

(iii) 1033/1200

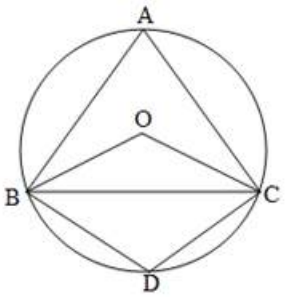
(iv) 2061/2400

PART–B

Section III

21. Write the factors of the polynomial $4x^2 + y^2 + 4 + 4xy + 8x + 4y$.

22. In the given figure, O is the centre of the circle and BA = AC. If ∠ABC = 50°, find ∠BOC and ∠BDC.



23. Using ruler and compass, construct ∠XYZ = 105°.

24. A cone is 8.4 cm high and the radius of its base is 2.1 cm. It is melted and recast into a sphere. Find the radius of sphere.

25. A die is rolled 150 times and its outcomes are recorded as below:

Outcome	1	2	3	4	5	6
Frequency	25	30	15	28	32	20

Find the probability of getting:

(i) An odd number

(ii) A multiple of 4

26. Check whether 7/6 can be an empirical probability or not. Give reasons.

Section IV

27. Find two integral solutions of 13x + 17y = 221. Represent this equation by a graph. Does it pass through origin?

28. Plot A(3, 0), B(0, 2), C(-3, 0) and D(0, -2) on a graph paper. Join A to B, B to C, C to D and D to A to form a quadrilateral ABCD. Is ABCD is rhombus?

29. Small spherical balls, each of diameter 0.6 cm, are formed by melting a solid sphere of radius 3 cm. Find the number of balls thus obtained.

30. Draw a line segment SR of length 10 cm. Divide it into 4 equal parts, using compass and ruler.

31. There are 100 students in a class. The mean height of the class is 150 cm. If the mean height of 60 boys is 70 cm, find the mean height of the girls in the class.

32. If adjacent angles A and B of parallelogram ABCD are in the ratio 7:5, then find all the angles of parallelogram.

33. A Room is 30m long, 24 m broad and 18 m high. Find:
(a) length of the longest rod that can be placed in the room.
(b) its total surface area.
(c) its volume.

Section V

34. Draw the graphs of the following equations on the same graph sheet: $x - y = 0$, $x + y = 0$, $y + 5 = 0$. Also, find the area enclosed between these lines.

35. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.

36. A group of 21 school students shared the ice-cream brick in lunch break to celebrate the Independence Day. If each one takes a hemispherical scoop of ice-cream of 3 cm radius, find the volume of ice-cream eaten by them. If the dimensions of the ice-cream brick are 10cm × 10cm × 12cm, how much volume of cream is left?

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HINTS & SOLUTIONS

Maths Sample paper

1. x = -2

2. No

3. Construct any angle less than 90° and draw its bisector.

4. 1

5. 29/2 cm

6. 4 cm

7. 51/2 cm

8. 8 cm

9. 3/8

10. 40°

11. 20°

12. 29/12 $\rightarrow 2.41\overline{6}$

13. $x^8 - y^8$

14. (0, 4)

15. False

16. 50°

17. (a) (i) $\sqrt{6.1875}$ cm^2

(b) (ii) 6.5 cm^2

(c) Bonus 4.5/2 cm^2

(d) (iv) 1.5 cm^2

(e) (ii) 19.50 cm^2

18. (a) (iv) None of these

(b) (i) 3.5 cm

(c) (i) 100π

(d) (ii) 161.7 g

(e) (iv) 1:9

19. (a) (iii) 13

(b) (i) 11

(c) (ii) 4

(d) (ii) $\bar{x} + k$

(e) (ii) Mean > Mode

20. (a) (iii) 29/2400

(b) (iii) 579/2400

(c) (i) 1/240

(d) (ii) 1/96

(e) (i) 1031/1200

21. Let x = 0.001 ……. (1)

Multiplying both sides by 1000, we get

1000 x = 1.001 …… (2)

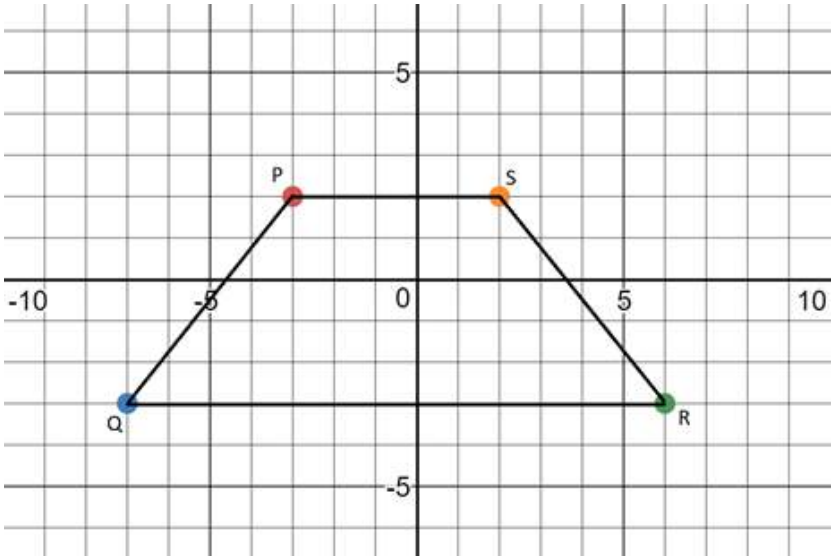
Subtracting equation (1) from equation (2), we get

1000x − x = 1.001 − 0.001

⇒ 999x = 1

$$\Rightarrow x = \frac{1}{999}$$

22.



The figure obtained is Trapezium.

23. Given: 2x + 5y = 19……(i)

ordinate is $1\frac{1}{2}$ times its abscissa

$\Rightarrow y = 1\frac{1}{2}x = \frac{3}{2}x$

Putting $y = \frac{3}{2}x$ in eq. (i)

We have

$2x + 5\frac{3}{2}x = 19$

$\Rightarrow \frac{19}{2}x = 19 \Rightarrow x = 2$.

Putting x = 2 in eq. (i)

We have

$2 \times 2 + 5y = 19$

$y = \frac{19-4}{5} = 3$.

Therefore point (2, 3) is the required solution.

24. Given ABCD is parallelogram in which DP is perpendicular to AB and DQ is perpendicular to BC.

Given,

$\angle PDQ = 60°$

In quad. DPBQ, by angle sum property we have,

$\angle PDQ + \angle Q + \angle P + B = 360°$

$60° + 90° + 90° + \angle B = 360°$

$240° + \angle B = 360°$

$\angle B = 360° - 240°$

$\therefore \angle B = 120°$

So $\angle B = \angle D = 120°$ (opposite angles in parallelogram are equal)

Since, AB||CD (opposite sides are parallel in parallelogram),

$\angle B + \angle C = 180°$ (Sum of adjacent interior angles is $180°$)

$\therefore 120° + \angle C = 180°$

$\angle C = 180° - 120°$

$\therefore \angle C = 60°$

So $\angle C = \angle A = 60°$

25. Step 1:

Draw a line and mark AB=4cm

Step 2:

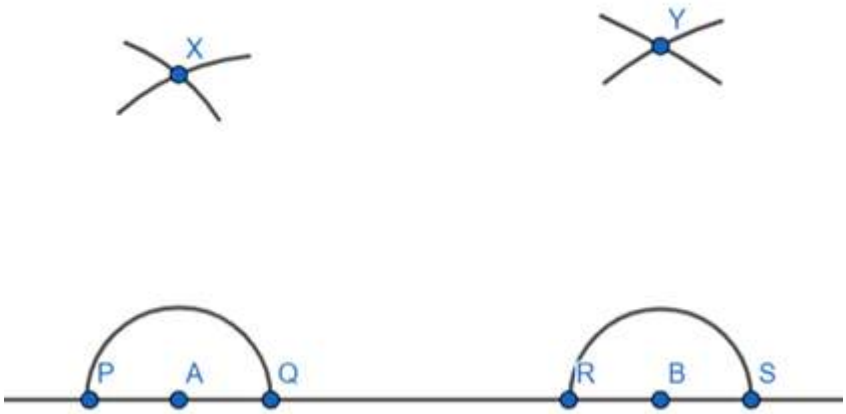
With A as center draw an arc that intersects the line at P and Q.

Similarly with B as center draw an arc that intersects the line at R and S.

Step 3:

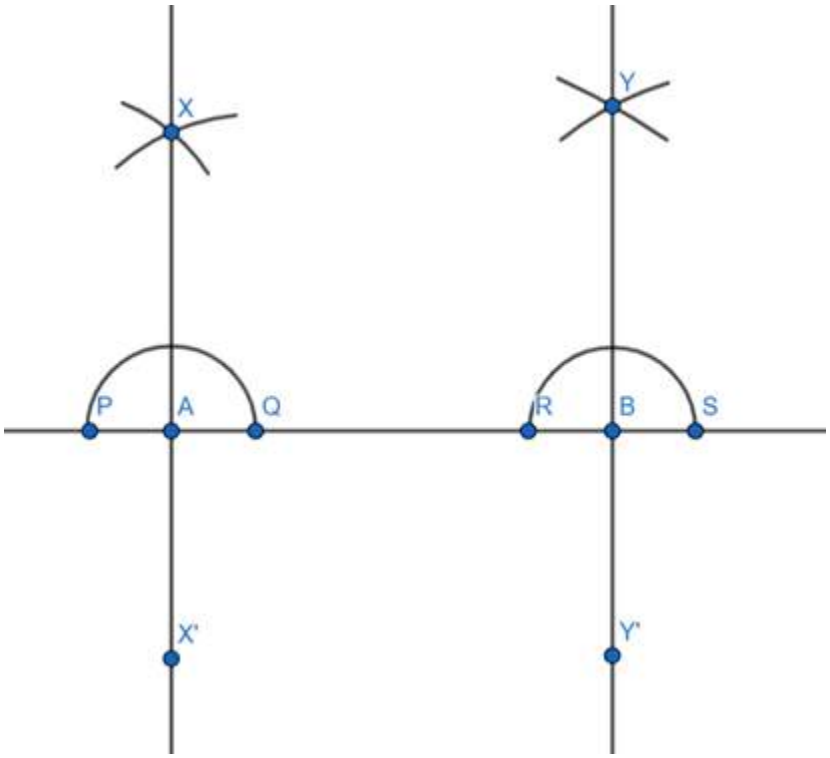
With P as center and radius more than half of PQ draw an arc and with Q as center and equal radius draw an arc and let the arcs intersect at X.

Similarly, With R as center and radius more than half of RS draw an arc and with S as center and equal radius draw an arc and let the arcs intersect at Y.



Step 4:

Join AX and BY.



Yes the lines XX’ and YY’ are parallel to each other as they both are perpendicular to the same line AB.

26. Total number of balls played = 30

Numbers of boundary hit = 6

Number of times she missed the boundary = 30 – 6 = 24

Hence, The probability of she didn't hit a boundary

$$= \frac{No.\ of\ times\ she\ didn't\ hit\ a\ boundary}{Total\ no.\ of\ balls}$$

= 24/30
Divide numerator and denominator by 6 to get, = 4/5

27.

$x-1)\ x^4 + 1\ (x^3 + x^2 + x + 1$
$x^4 - x^3$
$-\quad +$
$x^3 + 1$
$x^3 - x^2$
$-\quad +$
$x^2 + 1$
$x^2 - x$
$-\quad +$
$X + 1$
$x - 1$
$-\quad +$
2

The quotient is $x^3 + x^2 + x + 1$ and the remainder is 2.

Put x = 1 in $x^4 + 1$ to obtain the remainder $(1)^4 + 1 = 2$

Hence Remainder theorem stands verified.

28. It is given to us –

l and m are two parallel lines.

t is a transversal intersecting l and m at A and B respectively.

Here, ∠EAB and ∠ABH, ∠FAB and ∠GBA, are a pair of alternate interior angles which are equal to each other.

⇒ ∠EAB = ∠ABH, and ∠FAB = ∠GBA - - - - (i)

AP and BQ are the bisectors of the angles ∠EAB and ∠ABH respectively.

⇒ ∠EAP = ∠PAB, and ∠ABQ = ∠QBH - - - - (ii)

From equation (i), we have

$\angle EAB = \angle ABH$

$\Rightarrow \angle EAP + \angle PAB = \angle ABQ + \angle QBH$ (From the figure)

$\Rightarrow 2 \times \angle PAB = 2 \times \angle ABQ$ [From equation (ii)]

$\Rightarrow \angle PAB = \angle ABQ$ - - - - (iii)

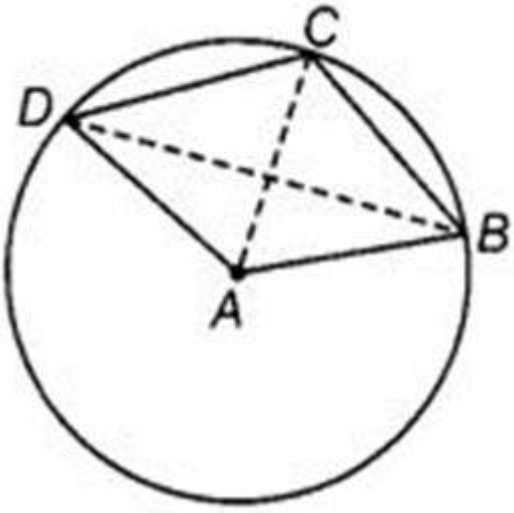
Now, t is a transversal intersecting two lines AP and BQ at A and B respectively.

$\Rightarrow \angle PAB$ and $\angle ABQ$ are a pair of alternate interior angles.

Thus, from equation (iii) we can say that $\angle PAB$ and $\angle ABQ$ are a pair of alternate interior angles, which are equal to each other.

Thus, it is true that AP || BQ.

29. Join CA and BD.



Since arc DC subtends $\angle DAC$ at the center and $\angle CAB$ at point B in the remaining part of the circle, we have:

$\angle DAC = 2\angle CBD$ ……(1)

(Reason: In a circle, angle subtended by an arc at the center is twice the angle subtended by it at any other point in the remaining part of the circle.)

Similarly, arc BC subtends $\angle CAB$ at the center and $\angle CDB$ at point D in the remaining part of the circle, we have:

$\angle CAB = 2\angle CDB$ ……(2)

(Reason: In a circle, angle subtended by an arc at the center is twice the angle subtended by it at any other point in the remaining part of the circle.)

From equation (1) and (2), we have:

$\angle DAC + \angle CAB = 2\angle CDB + 2\angle CBD$

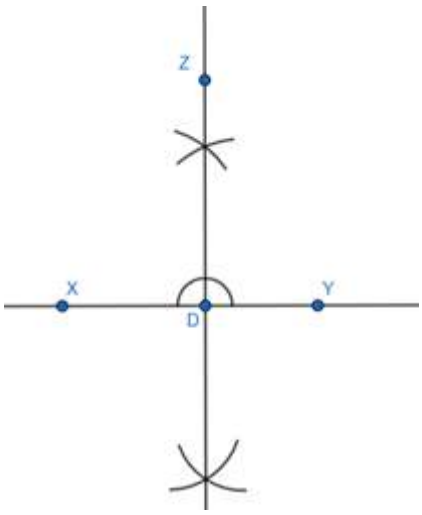
$\Rightarrow \angle BAD = 2(\angle CDB + \angle CBD)$

$\Rightarrow (\angle CDB + \angle CBD) = 1/2\ (\angle BAD)$

30. Step 1:
Draw a line XY.

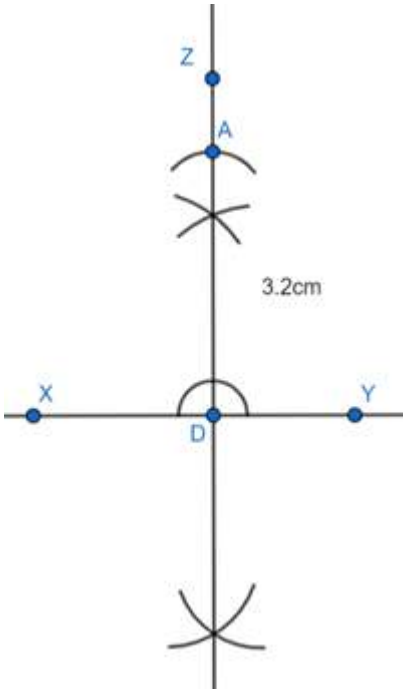
Step 2:

Mark a point D on XY and construct DZ perpendicular to XY.



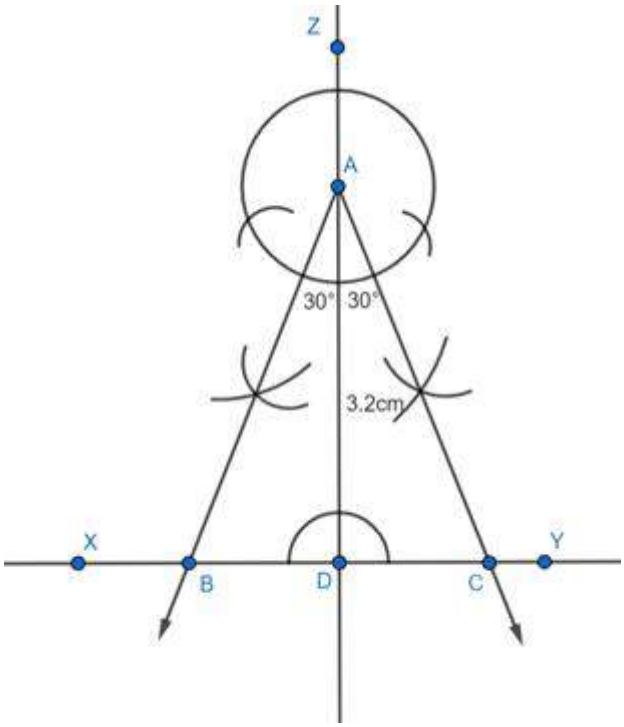
Step 3:

With center D and radius 3.2cm cut an arc on DZ at A.



Step 4:

With A as center, draw ∠UAD=30 intersecting XY at B and ∠VAD=30° intersecting XY at C.



ABC is the required triangle.

31. Given: radius of each sphere, r = 2 cm

Then, volume of a sphere is given by

Volume of 1 sphere = $4/3\ \pi r^3$

There are 16 spheres.

So, volume of 16 spheres = $16 \times 4/3\ \pi r^3$

$= 16 \times 4/3 \times 3.14 \times 2^3$

$= 535.89\ cm^3$

Volume of rectangular box = $16 \times 8 \times 8 = 1024\ cm^3$ [∵, dimensions of rectangular box = 16 cm × 8 cm × 8 cm]

To find volume of the liquid that is filled in rectangular box, we need to find the space left in the rectangular box after the space occupied by the spheres.

So, Volume of the liquid = (Volume of the rectangular box) – (Volume of the 16 spheres)

⇒ Volume of the liquid = $1024 - 535.89 = 488.11\ cm^3$

Thus, volume of this liquid is $488.11\ cm^3$.

32. The parts of the questions are solved below:

(i) The frequency is given as follows:

DIGITS	FREQUENCY
0	2
1	5
2	5
3	8
4	4
5	5
6	4
7	4
8	5
9	8
Total	50

(ii) The digit having the least frequency occurs the least and the digit with highest frequency occurs the most.

Hence,

We can say that:

0 has its frequency as 2 and thus occurs least frequently while 3 and 9 have their frequency 8 and hence occur most frequently.

33. Total Outcomes = 200

The required probabilities are –

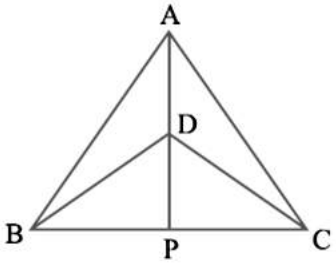
(i) 0.36

(ii) 0.86

(iii) 0.165

34. It is given in the question that:

$\Delta ABC \; and \; \Delta DBC$ are two isosceles triangles



(i) In $\Delta ABD \; and \; \Delta ACD$,

AD = AD (Common)

AB = AC (Triangle ABC is isosceles)

BD = CD (Triangle DBC is isosceles)

Three sides equal (SSS)Definition: Triangles are congruent if all three sides in one triangle are congruent to the corresponding sides in the other.

Therefore,

By SSS axiom,

$\Delta ABD \cong \Delta ACD$

(ii) In $\Delta ABP \; and \; \Delta ACP,$

AP = AP (Common)

∠PAB = ∠PAC (By c.p.c.t)

AB = AC (Triangle ABC is isosceles)

Side-Angle-Side (SAS) Rule. Side-Angle-Side is a rule used to prove whether a given set of triangles are congruent. If two sides and the included angle of one triangle are equal to two sides and included angle of

another triangle, then the triangles are congruent
Therefore,

By SAS axiom,

$\Delta ABP \cong \Delta ACP$

(iii) ∠PAB = ∠PAC (By c.p.c.t)

AP bisects ∠A (i)

Also,

In $\Delta BPD \text{ and } \Delta CPD,$

PD = PD (Common)

BD = CD (Triangle DBC is isosceles)

BP = CP ($\Delta ABP \cong \Delta ACP$ so by c.p.c.t)

Side-Side-Side (SSS) Rule. Side-Side-Side is a rule used to prove whether a given set of triangles are congruent. The SSS rule states that: If three sides of one triangle are equal to three sides of another triangle, then the triangles are congruent.
Therefore,

By SSS axiom,

$\Delta BPD \cong \Delta CPD$

$Thus,$

∠BDP = ∠CDP (By c.p.c.t) (ii)

By (i) and (ii), we can say that AP bisects ∠A as well as ∠D

(iv) ∠BPD = ∠CPD (By c.p.c.t)

And,

BP = CP (i)

Also,

∠BPD + ∠CPD = 180^o (BC is a straight line)

2∠BPD = 180^o

∠BPD = 90^o (ii)

From (i) and (ii), we get

AP is the perpendicular bisector of BC

Hence, Proved.

35. Given: Internal diameter of hemispherical tank = 14 m

$$\text{Internal radius of hemispherical tank} = \frac{14}{2} = 7\text{m}$$

Tank contains 50kl = 50m^3 of water (since, 1kl = 1m^3)

$$\text{Volume of a hemispherical tank} = \frac{2}{3}\pi r^3$$

Where $\pi = \frac{22}{7}$

r = radius of hemispherical tank

Thus, $$\text{Volume of a hemispherical tank} = \frac{2}{3} \times \frac{22}{7} \times (7)^3 = \frac{2156}{3} = 718.66\ \text{m}^3$$

Volume of water pumped into the tank = Volume of hemispherical tank – 50m^3

Volume of water pumped into the tank = 718.66 – 50 = 668.66 m^3

36. Calculation of mean:

Salary (in Rs) X_i	No. of workers (f_i)	$(f_i x_i)$
3000	16	48000
4000	12	48000
5000	10	50000
6000	8	48000
7000	6	42000
8000	4	32000
9000	3	27000
10000	1	10000
	$\sum f_i = 60$	$\sum f_i x_i = 305000$

Therefore,

$$Mean = \frac{\sum f_i x_i}{\sum f_i}$$

where f_i is the frequency of i^{th} row, and x_i is the data value at the i^{th} row

Mean= $\frac{\sum fiXi}{\sum fi} = \frac{305000}{60} = 5083.33$

Thus, the mean salary of 60 workers is Rs 5083.33(approx).

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