Mathematics

Time: 3 Hours. Std X Total Marks 100

Instructions:

(I) There are Five questions in this question paper. All questions are compulsory

(II) Each question contains five sub-questions They are denoted as A, B, C, D and E.

(III) Draw figures wherever necessary. Retain all the lines and arcs of construction of Geometry.

(IV) Figure on the right side indicates total marks of the question.

Q I (A) If a line intersects two sides of a triangle in two distinct points in such a way that the line segment cut by it on the two sides of triangle lying in its same closed half plane are proportional to the corresponding sides, then the line is parallel to the third side of the triangle. (4)

Q I B. Solve any Two of the following (6)

1. $(a+m)(b^2-c^2)+(b+m)(c^2-a^2)+(c+m)(a^2-b^2)$

2. $a^3+b^3+c^3-3abc$

3. Simplify

$$\frac{(3z-x)^2-4y^2}{9z^2-(x+2y)^2}+\frac{(x-2y)^2-9z^2}{x^2-(2y+3z)^2}+\frac{(2y-3z)^2-x^2}{4y^2-(3z+x)^2}$$

Q I C Factorize any Two of the following (4)

1. $6x^3+7x^2-x-2$

2. $a^4-14a^2+4ab-b^2+25$

3. $42(x+y)(x-y) - 13xy$

Q I D. Solve any ONE of the following. (3)

Simplify

1. $\left(\frac{x^2}{3} + \frac{9}{x}\right)\left(\frac{1}{x^2-3x+9}\right) - \frac{x+3}{3x+9}$

2. If $\frac{x^2+y^2+z^2}{x^2+xz+z^2} = \frac{y^2}{xz}$ and $x^2+z^2 \neq 0$ then prove that $E.R = 1$ (4)

Q I E. Fill in the blanks by selecting the proper alternatives from those given in the bracket.

1. Control unit is a part of ___ (CPU, IPD, OPD)
2. If $f: R \to R$ $f(x) = 2x^2+x+m$ and $f(-2) = 0$ then $m =$ ___ $(-6, 6, 2)$
3. The set $\{x / 4 < x \leq 7, x \in R\}$ is denoted by ___ in interval notation. $[(4,7], [4,7], [4,7)$
4. There are mainly ___ parts in computer (two, three, four)

Q II A Prove that in congruent circle congruent chords are equidistant from their centres. (4)

Q II B. Solve ANY TWO of the following (6)

1. If $\frac{a^2+ab+b^2}{c^2+cd+d^2} = \frac{a^2-ab+b^2}{c^2-cd+d^2}$ $(a, b, c, d \neq 0)$

Then prove that $\frac{a}{b} = \frac{c}{d}$ or $\frac{a}{b} = \frac{d}{c}$

2. If $\frac{2x+3y}{3x+2y} = \frac{y-z}{x+z} = \frac{4x-3z}{3z+4y}$ then prove that each ratio is $= \frac{x}{y}$

Q II B. 3. According to the Universal law of Gravitation The force of attraction between the two bodies varies directly as the product of the mass and inversely as the square of the distance between them. The masses of two friends are 35 kg and 40kg and the distance between them is 1 m. The mass of the earth is 6×10^{24} kg. The radius of the earth that is, The distance between the friends and the earth is 6.37×10^{6} m. Find the ratio of the force of attraction between the two friends and the force of attraction between the ~~boy~~ person of 35 kg and the earth.

Q III C solve ANY TWO of the following (4)

1. Observations of some data are $\frac{x}{5}$, x, $\frac{x}{4}$, $\frac{x}{2}$ and $\frac{x}{3}$ ~~And the~~ where $x > 0$. If the median of the data is 4. Find the value of x. And what will be the mean of the data.

2. The grouped data relating to cars owned by 25 families residing in a building are given below. Compute median of the data

No. of cars	0	1	2	3	4
No. of families	4	1	6	11	3

3. ~~The mean of grouped data is~~
3. If for a grouped data $\bar{x} - M = 2$ and $\bar{x} + M = 30$. Find $\bar{x}$, M and Z

Q II D. Solve ANY ONE of the following. (2)

1. If $f : \{0, \frac{1}{2}, \frac{1}{3}, \frac{1}{6}\} \to R$ $f(x) = 64^{x}$ & Find R_f.

Q II D. If $f: A \to B$, $A = \{30^\circ, 45^\circ, 60^\circ\}$, B CR and $f(x) = \frac{1+\tan^2 x}{1+\cot^2 x}$ find R_f. (4)

Q II E. Fill in the blanks by selecting the proper alternative from those given in the bracket

1. If $\frac{x^4+x^2y^2+y^4}{x^3+y^3} = \frac{x^3-y^3}{p(x)} \therefore p(x) =$ ____

$[x^2+y^2,\ x^2-y^2,\ (x+y)(x-y)]$

2. If $x:y = 3:7$ and $y:z = 5:11 \therefore x:y:z =$ ____

$(3:7:77,\ 15:35:77,\ 77, 33, 15)$

3. If x varies directly as y and inversely as the square root of z if $x = 10$ when $y = 5$ and $z = 9$ then $x =$ ____, when $y = 1$ and $z = 3$ $(z > 0)$

$(0, 2\sqrt{3}, \sqrt{3})$

4. $\cos^4\theta - \sin^4\theta =$ ____

$(1+2\sin^2\theta\cos^2\theta,\ \cos^2\theta - \sin^2\theta,\ \cos\theta - \sin\theta)$

Q III A Prove that any angle inscribed in a semicircle is a right angle. (4)

Q III B To solve ANY TWO of the following (6)

1. The angle of elevation, from a point on the ground, of the top and bottom of a pole placed vertically on a multistoried building are α and β respectively. If the length of the pole is 'h' metres. Prove that the height of building is $\frac{h\tan\beta}{\tan\alpha - \tan\beta}$

Q III B·2. A circus tent with a cylindrical base has a conical roof on it. If the radius of the conical roof is 8·4 m and height is 3·5 m, how much canvas will be required for the roof of the tent. Find the cost of canvas if one sq. m costs Rs 30·00

3. A hemispherical bowl of internal radius 9 cm contains some liquid. This liquid is filled in to cylinder shaped small bottles of diameter 3 cm and height 4 cm. How many bottles will be required to fill up them up with the liquid. (4)

Q III C Solve ANY TWO of the following

1. prove that $\frac{3\cos^2 A - 2\sin A - 2}{\cos^2 A} = \frac{1 - 3\sin A}{1 - \sin A}$

2. Evaluate.

$\sin 60^\circ + \cos 60^\circ + \tan 60^\circ + \cot 60^\circ + \sec 60^\circ + \operatorname{cosec} 60^\circ$

3. If $\theta = 30^\circ$ $\alpha = 60^\circ$ and $\beta = 45^\circ$ then find the value of the following.

$\sin^2(90^\circ - \theta) \cdot \cos^2(90^\circ - \alpha) \cdot \tan^2(90^\circ - \beta)$

Q III D. Solve ANY ONE of the Following (2)

1. If $2x - 5y \propto 2x + y$ prove that $x \propto y$ $(x \neq 0, y \neq 0)$

2. prove that $\frac{\sec\theta + 2\sin\theta}{\cos\theta + \sin\theta} = 1 + \tan\theta$ (4)

Q III E. Answer the following Questions

1. Find the least integral value of k for which $3x^2 - 4x + k = 0$ has no solution in R.

2. If the roots of $ax^2 + bx + c = 0$ $(a \neq 0, a, b, c \in R)$ are $-\frac{1}{3}$ and $\frac{1}{7}$. Find the equation and value of a, b and c

(3) Define Centroid of a triangle (4) Define: Transversal

Q IV A The median $\overline{AD}$ and $\overline{BE}$ of $\triangle ABC$ intersect each other in G. The line through G parallel to $\overline{BD}$ intersect $\overline{AC}$ in K. prove that $AC = 6EK$.

Q IV B. Solve ANY TWO of the following. (6)

1. Find the median of the following grouped data.

class	200-299	300-399	400-499	500-599	600-699	700-799	800-899
frequency	3	61	118	136	129	51	2

2. Frequency distribution of the weight of 100 wrestlers is given below. Find the mean.

weight in kg	60-64	65-69	70-74	75-79	80-84	85-89
frequency	13	28	35	12	9	3

3. Simplify $2 - \left[\frac{1}{x+y} \div \left\{\frac{x}{2}\left(\frac{1}{x-y} - \frac{1}{x+y}\right) \div \frac{x^2y + xy^2}{x^2 - y^2}\right\}\right]$

Q IV C. Solve ANY ~~ONE~~ TWO of the following (4)

1. In $\odot(P, r)$ a 6 cm long chord lies 8 cm away from the centre. Find the distance of a 16 cm long chord from the centre P.

2. $\angle ABC$ is inscribed in a semicircle of $\odot(Q, r)$. $\triangle ABC$ is an isosceles triangle and $AB = 8$. Find r.

3. In $\triangle ABC$, $\angle B$ is a right angle, $AC = 25$, $AB = 7$. Find the radius of the incircle of $\triangle ABC$.

IV D Answer ANY ONE of the following. (2)

1. Show that sum of any positive real number and its reciprocal can not be less than 2

2. Find the roots of the equation in R.

$$\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$$

IV E Do as directed (4)

1. Define semi circle
2. Define Tangent to a circle
3. If the area of a base of a cone is 154 sq cm and its height is 15 cm. Find its volume.
4. Give the formula to find the total surface area of cylinder-

V A. construct (4)

$\overline{AB}$ is given. Consider a right angle ΔPQR such that the length of the hypotenuse $\overline{PR} = 5AB$ and $PQ = 3AB$

V B. Solve ANY TWO of the following. (6)

1. Solve in R $2\left(\frac{5x+2}{5x-2}\right)^2 + 5\left(\frac{5x+2}{5x-2}\right) = 3\left(x \neq \frac{2}{5}\right)$

2. The number obtained by adding the squares of a rational number and its reciprocal is greater by $\frac{1}{4}$ than the sum of the rational number and its reciprocal. Find the number

3. The petrol consumed per hour by a vehicle varies directly as the square of its speed Going at the speed of 40km/hour it consumed 16 litres of petrol in 2 hrs How much petrol will it consume in 4 hrs going at the speed of 50km/hr

Q V C Solve any Two of the following (4)

1. In ΔPQR $\overrightarrow{QX}$ the bisector of $\angle Q$ meets $\overline{PR}$ in X. If $\frac{PQ}{QR} = \frac{3}{5}$ and $XR = 25$ Then find PR.

2. In ΔABC $D \in \overline{AB}$, $CD = 9$ $BD = 12$ and $BC = 18$ Find the perimeter of ΔADC if $\angle CAB \cong \angle BCD$

3. $\Delta ABC \sim \Delta PQR$. If the area of $\Delta ABC = 18$ the area of $\Delta PQR = 32$ and $PQ = 8$. Find AB

Q V D solve ANY ONE of the following (2)

1. In ΔABC $\overline{AC}$ is the hypotenuse. $\overline{BD}$ is the perpendicular bisector of $\overline{AC}$ (cut) If $A-D-C$ and $BD = 5$ Find AB and BC

2. How many beads of radius 1 mm can be made from a sphere of radius 10 cm.

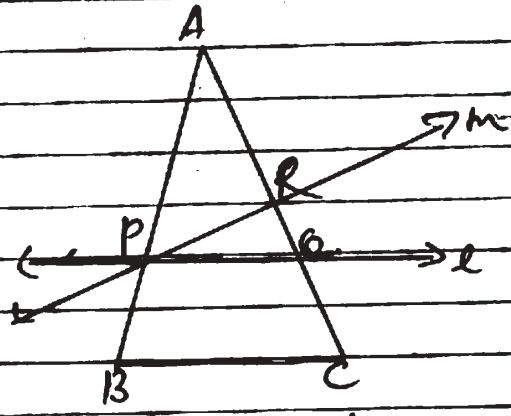
Q V E. Tangents at the points A and B of a circle with centre O intersect each other in P. prove that $\square AOBP$ is a cyclic quadrilateral (4)

Or

Q V E. Answer the following questions

1. specify: seperation of a plane by the circle.
2. ΔABC is inscribed in a circle with centre O. If $m(\angle AOB = 140$ and $m\angle BOC = 108$ Find the measure of the angles of ΔABC.
3. $O(p, 6.4)$ and $O(q, 2.8)$ touch each other Find pq.
4. Two different chords $\overline{AB}$ and $\overline{CD}$ of a circle intersect inside the circle in point P. If $AP = 8.4$ $PB = 4.2$ $PD = 12.6$. Find CD.

Q1A



Given: A line 'l' intersect the sides $\overline{AB}$ and $\overline{AC}$ of Δ ABC resp. in two distinct points P($\neq$B) and Q in such a way that $\frac{AP}{AB} = \frac{AQ}{AC}$ (1)

To prove. $l \parallel \overline{BC}$

Proof A line intersects the sides $\overline{AB}$ and $\overline{AC}$ of Δ ABC. The two distinct points P and Q of l being resp on $\overline{AB}$ and $\overline{AC}$ are in the plane of Δ ABC.

$\therefore$ l is in the plane of Δ ABC

l and BC are coplanar $\therefore$ There are two alternatives

(1) $l \parallel \overline{BC}$ (2) l is not parallel to $\overline{BC}$

If $l \parallel BC$ the theorem is proved.

suppose 'l' is not parallel to $\overline{BC}$ Then from the point 'P' outside $\overline{BC}$ we have line m other than 'l' such that $m \parallel BC$

The line intersects $\overline{AB}$ in P but it doesn't intersect $\overline{BC}$ because $m \parallel \overline{BC}$ (1)

$\therefore$ The line m intersect AC (Ref)

suppose the line m intersect $\overline{AC}$ in R. Now in Δ ABC line m intersect $\overline{AB}$ in P and $\overline{AC}$ in R and is parallel to $\overline{BC}$

$\therefore \frac{AP}{AB} = \frac{AR}{AC}$ Ref

but $\frac{AP}{AB} = \frac{AQ}{AC}$ given. (1)

$\therefore \frac{AR}{AC} = \frac{AQ}{AC}$

$\therefore AR = AQ$

Now $Q \in \overline{AC}$ and $R \in \overline{AC}$

Here the points Q and R are the points on $\overleftrightarrow{BC}$ at equal distance from the ~~fixed~~ origin A.
But such a point Q or R is unique accordig to point plotting Theorem. ①
$\therefore R = Q \therefore \overrightarrow{AQ} = \overrightarrow{AR}$ so m = l.
But $m \parallel \overleftrightarrow{BC} \therefore l \parallel \overleftrightarrow{BC}$ proved.

Q.I.B.1 Factorise

$(a+m)(b^2-c^2)+(b+m)(c^2-a^2)+(c+m)(a^2-b^2)$

$= a(b^2-c^2)+b(c^2-a^2)+c(a^2-b^2)+m(b^2-c^2+c^2-a^2+a^2-b^2)$

$= ab^2-ac^2+bc^2-ba^2+ca^2-cb^2$ 1

$= a^2c-a^2b-ac^2+ab^2+c^2b-b^2c$

$= a^2(c-b)-a(c^2-b^2)+bc(c-b)$

$= (c-b)(a^2-ac+ab+bc)$ 1

$= (c-b)\,a\,(a-c)-b(a-c)$

$= (c-b)(a-c)(a-b)$

$= (a-b)(b-c)(c-a)$ 1

2) $a^3+b^3+c^3-3abc$

$= (a+b)^3-3ab(a+b)+c^3-3abc$ (by replacing $a^3+b^3 = (a+b)^3-3ab(a+b)$)

$= m^3-3abm+c^3-3abc$ (by taking a+b as m) 1

$= m^3+c^3-3abm-3abc$

$= (m+c)(m^2-mc+c^2)-3ab(m+c)$

$= (a+b+c)(a^2+2ab+b^2-ac-bc+c^2)-3ab(a+b+c)$ 1
(resubstituting the values)

$= (a+b+c)(a^2+2ab+b^2-ac-bc+c^2-3ab)$

$= (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$ 1

Q.12 (B) (2) $\frac{(3z-x)^2-4y^2}{9z^2-(x+2y)^2} + \frac{(x-2y)^2-9z^2}{x^2-(2y+3z)^2} + \frac{(2y-3z)^2-x^2}{4y^2-(3z+x)^2}$

$= \frac{(3z-x-2y)(3z-x+2y)}{(3z-x-2y)(3z+x+2y)} + \frac{(x-2y-3z)(x+2y+3z)}{(x-2y-3z)(x+2y+3z)}$ 1

$+ \frac{(2y-3z-x)(2y-3z+x)}{(2y-3z-x)(2y+3z+x)}$

$= \frac{3z-x+2y+x-2y+3z+2y-3z+x}{2y+3z+x}$ 1

$= \frac{2y+3z+x}{3z+2y+x}$ 1

$= 1$ Ans

Q.13 (C) Factorise

$P(x) = 6x^3+7x^2-x-2$

$P(1) = 6+7+1-2$

$P(-1) = 0 \therefore x+1$ is a factor

$6x^3+7x^2-x-2$

$= 6x^3+6x^2+x^2+x-2x-2$

$= 6x^2(x+1)+x(x+1)-2(x+1)$ 1

$= (x+1)(6x^2+x-2)$

$= (x+1)(6x^2+4x-3x-2)$

$= (x+1)[2x(3x+2)-1(3x+2)]$ 1

$= (x+1)(3x+2)(2x-1)$ Ans 1

$\overline{PM} \perp \overline{AB}$ and M is the foot of the perpendicular.
$\therefore$ M is the Midpoint of $\overline{AB}$ (B-12) (given)
$\therefore AM = \frac{1}{2} AB$ (I)

Similarly $\overline{QN} \perp \overline{CD}$ and N is the foot of $\perp^{or}$ given
$\therefore$ N is Midpoint of $\overline{CD}$
$\therefore CN = \frac{1}{2} CD$ (II)

Also $\overline{AB} \cong \overline{CD}$ given
$\therefore AB = CD$
$\therefore \frac{1}{2} AB = \frac{1}{2} CD$ — (III)
$\therefore$ From (I), (II) & (III)
$AM = CN$.
In $\triangle AMP$ and $\triangle QNC$
$\angle PMA \cong \angle QNC$ (Rt $\angle$s)
$\angle AP \cong \angle CQ$ (radii of congruent circles)
$\overline{AM} \cong \overline{CN}$ ($\because AM = CN$)
$\therefore AMP \leftrightarrow CNQ$ is a congruence by RHS
$\therefore \overline{PM} \cong \overline{NQ}$
$\therefore PM = QN$ Proved.

Q II B (i) $\frac{a^2+ab+b^2}{c^2+cd+d^2} = \frac{a^2-ab+b^2}{c^2-cd+d^2}$ $(a, b, c, d \neq 0)$ given

$\therefore \frac{a^2+ab+b^2}{a^2-ab+b^2} = \frac{c^2+cd+d^2}{c^2-cd+d^2}$ (by Rule of alternendo)

$\therefore \frac{a^2+ab+b^2+a^2-ab+b^2}{a^2+ab+b^2-a^2+ab-b^2} = \frac{c^2+cd+d^2+c^2-cd+d^2}{c^2+cd+d^2-c^2+cd-d^2}$ (by Rule of componendo and dividendo)

$\therefore \frac{2a^2+2b^2}{2ab} = \frac{2c^2+2d^2}{2cd}$

$\therefore \frac{a^2+b^2}{ab} = \frac{c^2+d^2}{cd}$

$\therefore a^2cd + b^2cd = ab c^2 + ab d^2$

$\therefore a^2cd - ab c^2 - ab d^2 + b^2cd = 0$

$\therefore ac(ad - bc) - bd(ad - bc) = 0$

$\therefore (ad - bc)(ac - bd) = 0$

$\therefore ad - bc = 0$ or $ac - bd = 0$

$\therefore ad = bc$ or $ac = bd$

$\therefore \frac{a}{b} = \frac{c}{d}$ or $\frac{a}{b} = \frac{d}{c}$ proved.

II 8(2) $\frac{2x+3y}{3x+2y} = \frac{y-z}{x+z} = \frac{4x-3z}{2x+4y}$ given

$\therefore \frac{2x+3y}{3x+2y} = \frac{3y-3z}{3x+3z} = \frac{4x-3z}{3z+4y}$ (multiply 2nd ratio by $\frac{3}{3}$)

$\therefore$ By $\frac{2x+3y+3y-3z+4x-3z}{3x+2y+3x+3z+3z+4y}$ result of equal ratio

$= \frac{6x}{6y}$

$= \frac{x}{y}$ proved.

Q II B. 3) Let m_1, m_2 be the mass of two body bodies and F = force of attraction & distance between them.

$\therefore F \propto \frac{m_1 m_2}{R^2}$

$\therefore F = \frac{G m_1 m_2}{R^2}$ (G is gravitational constant)

Q.I(2) $a^4 - 14a^2 + 49 - b^2 + 2b$

$= a^4 - 10a^2 + 25 - 4a^2 + 4ab + b^2$

$= (a^2 - 5)^2 - (4a^2 - 4ab + b^2)$

$= (a^2 - 5)^2 - (2a - b)^2$

$= (a^2 - 2a + b - 5)(a^2 + 2a - b - 5)$ Ans

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$42(x - y)(x + y) - 13xy$

$= 42x^2 - 42y^2 - 13xy$

$= 42x^2 - 13xy - 42y^2$

$= 42x^2 - 49xy + 36xy - 42y^2$

$= 7x(6x - 7y) + 6y(6x - 7y)$

$= (6x - 7y)(7x + 6y)$ Ans

Q.II Simplify $\left(\frac{x^2}{3} + \frac{9}{x}\right)\left(\frac{1}{x^2 - 3x + 9}\right) - \frac{x+3}{3x+9}$

$= \left(\frac{x^3 + 27}{3x}\right)\left(\frac{1}{x^2 - 3x + 9}\right) - \frac{x+3}{3(x+3)}$

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$= \frac{(x+3)(x^2 - 3x + 9)}{3x} \times \frac{1}{x^2 - 3x + 9} - \frac{1}{3}$

$= \frac{x+3}{3x} - \frac{1}{3}$

$= \frac{x + 3 - x}{3x}$

$= \frac{1}{x}$ Ans

2) $\frac{x^2+y^2+z^2}{x^2+xz+z^2} = \frac{y^2}{xz}$ $(x^2+z^2 \neq 0)$ given

$\therefore$ ER $= \frac{x^2+y^2+z^2/y^2}{x^2+xz+z^2/xz}$ result of equal ratio

$= \frac{x^2+z^2}{x^2+z^2}$

$\therefore$ ER $= 1$ proved.

Q I E.(1) CPU

(2) $f(x) = 2x^2+x+m$ $f(-2) = 0 \therefore m = -6$

$0 = 8-2+m$

$0 = 6+m$

$-6 = m$

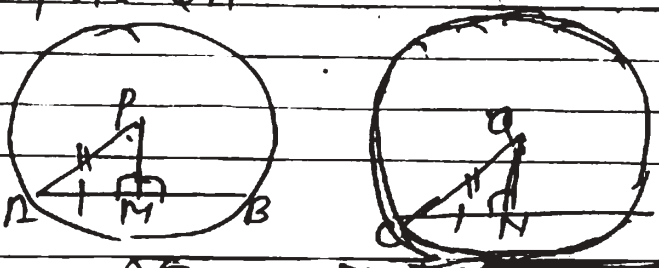
3) [4 7]

(4) Three.

Q II A Prove that in congruent circles congruent chords are equidistant from their centre

Given: $\overline{AB}$ and $\overline{CD}$ are resp congruent chords in of congruent circle with centre P and Q $\overline{PM} \perp \overline{AB}$ and $\overline{QN} \perp \overline{CD}$ and M and N are the feet of $\perp$ or from P and Q on the chords $\overline{AB}$ and $\overline{CD}$ resp

To prove: $PM = QN$



Let $F = F_1$ when $m_1 = 35$ kg $m_2 = 40$ kg and $R = 1$

Then $F_1 = \frac{35 \times 40 \times G}{1}$

$F_1 = 1400\,G$

III) If $F = F_2$ when $m_1 = 35$ kg $m_2 = 6 \times 10^{24}$ and

$R = 6.37 \times 10^6$ m.

$F_2 = \frac{35 \times 6 \times 10^{24} \times G}{(6.37 \times 10^6)^2}$

$F_2 = \frac{21 \times 10^{13}}{(6.37)^2} G$

$\therefore \frac{F_1}{F_2} = \frac{1400 \times (6.37)^2}{21 \times 10^{13}}$

$= \frac{(6.37)^2 \times 2}{3 \times 10^{11}}$

$\frac{F_1}{F_2} = \frac{27}{10^{11}}$ Ans

Q II (ii) Observation is ascending order

$\frac{n}{5}, \frac{n}{4}, \frac{n}{3}, \frac{n}{2}$ and n (where $n > 0$).

$\therefore n =$ 5 (added)

$M =$ value of $\frac{n+1}{2}^{th}$ obs.

$M =$ 3rd obs $= \frac{n}{3}$

But $M = 4$ given

$\therefore \frac{n}{3} = 4$

$\therefore n = 12$

$\therefore$ obs are 2, 4, 3, 4, 6 and 12

$\Sigma x_i = 27.4$

$n = 5$

$\bar{x} = \frac{\Sigma x_i}{n}$

$= \frac{27.4}{5}$

$\bar{x} = 5.48$

$\therefore x = 12$

$\bar{x} = 5.48$

II (c)(2)

No of cars x_i	No of families f_i	Cumulative frequency
0	4	4
1	1	5
2	6	11
3	11 ←	22
4	3	25
	25	

$n = 25$ (odd)

M = value of $\frac{n+1}{2}^{th}$ obs.

= value of 13^{th} obs.

$M = 3$ cars

3) $\bar{x} - M = 2$ ... (1)

$\bar{x} + M = 30$ ... (2)

$2\bar{x} = 32$

$\therefore \bar{x} = 16$

$\therefore M = 14$

$Z = 3M - 2\bar{x}$

$= 42 - 32$

$\therefore Z = 10$

$\therefore \bar{x} = 16$

$M = 14$

$Z = 10$

$f(\frac{1}{3}) = 64^{\frac{1}{3}} = 4$ 1

$f(\frac{1}{2}) = 64^{\frac{1}{2}} = 2$

Q II D (2) $f: A \to B$ $A = \{30°, 45°, 60°\}$, B.C.R

$f(x) = \frac{1 + \tan^2 x}{1 + \cot^2 x}$ $\therefore Rf = \{\frac{1}{3}, 1, 3\}$

~~$f(30°) = 1$~~

$f(x) = \frac{\sec^2 x}{\operatorname{cosec}^2 x}$ 1

$f(x) = \tan^2 x$.

$f(30°) = \tan^2 30° = \frac{1}{3}$

$f(45°) = \tan^2 45° = 1$

$f(60°) = \tan^2 60° = 3$

$\therefore Rf = \{\frac{1}{3}, 1, 3\}$ 1

Q II E. $\frac{x^4 + x^2y^2 + y^4}{x^3 + y^3} \times \frac{x^3 - y^3}{f(x)}$ $\therefore f(x) = x^2 - y^2$

$\frac{(x^2 + xy + y^2)(x^2 - xy + y^2)}{(x + y)(x^2 - xy + y^2)} \times = \frac{(x - y)(x^2 + xy + y^2)}{f(x)}$ 1

$\therefore f(x) = x^2 - y^2$

2) $\frac{x}{y} = \frac{3}{7}$ and $\frac{y}{z} = \frac{5}{11}$ $\therefore x : y : z = 15 : 35 : 77$

$7x = 3y \quad 11y = 5z$

$77x = 33y = 15z$

$\frac{77x}{11 \times 7 \times 5 \times 3} = \frac{33y}{11 \times 7 \times 5 \times 3} = \frac{15z}{7 \times 5 \times 11 \times 7}$

$\frac{x}{15} = \frac{y}{35} = \frac{z}{77}$

$\therefore 15 : 35 : 77$

3) $x \propto y$, $x = 10$, $y = 5$, $z = 9$ $\therefore x = \frac{2\sqrt{3}}{\sqrt{z}}$

$x = \frac{ky}{\sqrt{z}}$ $x = 2$, $y = 1$, $z = 3$

$10 = \frac{k \times 5}{3}$ $x = \frac{k \times 1}{\sqrt{3}}$

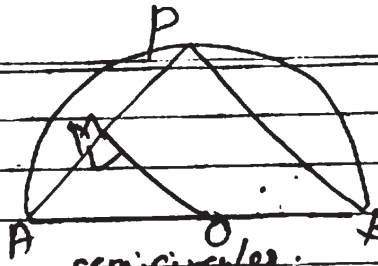
$k = 6$ $= \frac{6 \times \sqrt{3} \times 1}{\sqrt{3}}$

$= 2\sqrt{3}$

Q III A: Prove that an angle inscribed in a semi circle is a right angle.

Given: $\overline{AB}$ is a semi circle of a circle with centre O. $\angle APB$ is an angle inscribed in the semi circle.

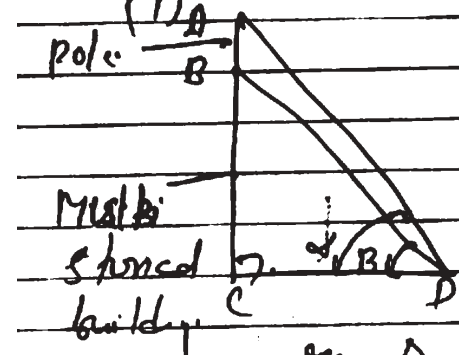
To Prove: $\angle APB$ is a right angle.



semicircular

Proof: $\overline{AB}$ is an arc of a circle with centre O.
∴ its corresponding chord is the diameter.
Then O is the mid point of $\overline{AB}$. If M is the mid point of $\overline{AP}$, then $\overline{OM}$ is the line segment joining the centre and the mid point of $\overline{AP}$ the chord.
∴ $\overline{OM} \perp \overline{AP}$ ∴ ∠ is the ⊥ bisector
∴ m∠AMO = 90 ... (i)
Now M and O are resp the mid points of $\overline{AP}$ and $\overline{AB}$ in △APB.
∴ $\overline{OM} \parallel \overline{PB}$ by ∆ theorem.
∴ ∠AMO ≅ ∠APB (Corresponding angles made by transversal $\overline{PA}$ of $\overline{OM} \parallel \overline{PB}$)
∴ m∠AMO = m∠APB
∴ m∠APB = 90 by (i)
∴ ∠APB is a rt angle. Proved

Q III B



AB = pole = h m
BC = multi storied building
m∠CDA = α m∠CDB = β
BC = ?
In △ ACD, m∠ACD = 90°
m∠ADC = α
∴ $\tan\alpha = \frac{AC}{CD}$ ∴
∴ $\tan\alpha = \frac{AB+BC}{CD}$ (A-B-C)

$\therefore \tan\alpha = \frac{h+BC}{CD}$

$\therefore CD = \frac{h+BC}{\tan\alpha}$ ...(1) $\frac{1}{2}$

In $\triangle BCD$, $m\angle CDB = \beta$

$\therefore m\angle CDB = \beta$ $\therefore \tan\beta = \frac{BC}{CD}$

$CD = \frac{BC}{\tan\beta}$ ...(2) $\frac{1}{2}$

From (1) & (2)

$\frac{h+BC}{\tan\alpha} = \frac{BC}{\tan\beta}$ 1

$\therefore h\tan\beta + BC\tan\beta = BC\tan\alpha$

$\therefore h\tan\beta = BC(\tan\alpha - \tan\beta)$

$\therefore BC = \frac{h\tan\beta}{\tan\alpha - \tan\beta}$ proved

Q III B(2) $h = 7.5$ m

$b = 8.4$ m

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

$= \sqrt{(7.5)^2 + (8.4)^2}$

$= \sqrt{12.25 + 70.56}$

$= \sqrt{82.81}$ 1

$= 9.1$ m.

Curved surface area of cone $= \pi rl$

$= \frac{22}{7} \times \frac{12}{1} \times 9.1$

$= 22 \times 12 \times 1.3$

$= 343.2$ sq. m. 1

Area : cost

1 sq.m : ₹ 30

240.24 sq.m : 240.24 × 30

₹ 7207.20

₹ 7207.20 Ans

2) Let the no of bottles be n,

Vol of Hemispherical bowl = n × vol of cylindrical bottle

$\frac{2}{3}\pi r_1^3 = n \times \pi r_2^2 h$

$\frac{2}{3} \times 3 \times 3 \times 3 = n \times \frac{3}{2} \times \frac{3}{2} \times 4$

$6 \times 3 \times 3 = 9n$

$\therefore n = \frac{6 \times 3 \times 3}{9}$

$\therefore n = 54$ bottles

Q.III (1) LHS = $\frac{3\cos^2 A - 2\sin A - 2}{\cos^2 A}$

$= \frac{3(1-\sin^2 A) - 2\sin A - 2}{1-\sin^2 A}$

$= \frac{3(1+\sin A)(1-\sin A) - 2(\sin A + 1)}{(1-\sin A)(1+\sin A)}$

$= \frac{(1+\sin A)(3 - 3\sin A - 2)}{(1+\sin A)(1-\sin A)}$

$= \frac{1 - 3\sin A}{1 - \sin A}$

$= R.H.S$

$\therefore L.H.S = R.H.S$

$\frac{3\cos^2 A - 2\sin A - 2}{\cos^2 A} = \frac{1 + 3\sin A}{1 - \sin A}$ Proved

④ Evaluate

$\sin 60^\circ + \cos 60^\circ + \tan 60^\circ + \cot 60^\circ + \sec 60^\circ + \operatorname{cosec} 60^\circ$

$= \frac{\sqrt{3}}{2} + \frac{1}{2} + \sqrt{3} + \frac{1}{\sqrt{3}} + 2 + \frac{2}{\sqrt{3}}$

$= \frac{\sqrt{3}+1}{2} + \frac{3}{\sqrt{3}} + \sqrt{3} + 2$

$= \frac{\sqrt{3}+1}{2} + \sqrt{3} + 2$

$= \frac{\sqrt{3}+1+4\sqrt{3}+4}{2}$

$= \frac{5\sqrt{3}+5}{2}$

$= \frac{5(\sqrt{3}+1)}{2}$ Q.E.D.

③ $\sin^2(90^\circ - \theta) \cdot \cos\theta (90^\circ - \alpha) \cdot \tan^2(90^\circ - \beta)$

$= \cos^2\theta \cdot \sin^2\alpha \cdot \cot^2\beta$

$= \cos^2 30^\circ \cdot \sin^2 60^\circ \cot^2 45^\circ$

$= \left(\frac{\sqrt{3}}{2}\right)^2 \times \left(\frac{\sqrt{3}}{2}\right)^2 \times 1^2 = \frac{9}{16}$ Q.E.D.

Q III D $2x - 5y \propto 2x + y$ $(a \neq 0)(a \neq 0)$ given

$\therefore 2x - 5y = k(2x + y)$ $(k \neq 0)$

$\therefore 2x - 2kx = ky + 5y$

$\therefore 2x(1-k) = y(k+5)$

$\therefore \frac{x}{y} = \frac{(k+5)}{2(1-k)}$

$\therefore \frac{x}{y} =$ a.N.2.C $(k \neq 1 \ \& \ k \neq -5)$

$\therefore x \propto y$ proved

Condition

If $k = 1$ then $y = 0$ but $y \neq 0$ given

$\therefore k \neq 1 \ \therefore 1 - k \neq 0$

If $k = -5$ then $x = 0$ but $x \neq 0$

$\therefore k \neq -5 \ \therefore k + 5 \neq 0 \ \therefore \frac{k+5}{2(1-k)} \neq 0$

(2) Prove that

$\frac{\cos\theta + 2\sin\theta}{\cos\theta - \sin\theta} = 1 + \tan\theta$

LHS: $\frac{\cos\theta + 2\sin\theta}{\cos\theta - \sin\theta}$

$= \frac{\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}}{\cos\theta - \sin\theta}$

$= \frac{1 + 2\sin\theta\cos\theta}{\cos\theta - \sin\theta\cos\theta}$

$= \frac{\sin\theta\cos\theta \times \cos\theta}{(\sin\theta+\cos\theta)\cos\theta}$

$= \frac{\sin\theta+\cos\theta}{\cos\theta}$

$= \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\cos\theta}$

$= \tan\theta + 1$

$= 1 + \tan\theta$

$\therefore$ LHS = RHS

$\therefore \frac{\cos\theta+\sin\theta}{\cos\theta+\sin\theta} = 1+\tan\theta$ (Proved)

Q.III E.

1) no solution in k

$\Delta < 0$ $\quad 3x^2 - 4x + k = 0$

$b^2 - 4ac < 0$ $\quad a=3\ b=-4\ c=k$

$\therefore 16 - 4\times 3\times k < 0$

$\therefore 16 - 12k < 0$

$\therefore -12k < -16$

$\therefore 12k > 16$

$\therefore k > \frac{16}{12}$

$\therefore k > \frac{4}{3}$

$k > 1\frac{1}{3}$

least integer $= 2$

2) $\alpha = -\frac{1}{3}$ $\beta = \frac{1}{7}$

$\alpha+\beta = -\frac{1}{3}+\frac{1}{7}$ $\alpha\beta = -\frac{1}{21}$

$= \frac{-7+3}{21} = -\frac{4}{21}$

$x^2 - (\alpha+\beta)x + \alpha\beta = 0$

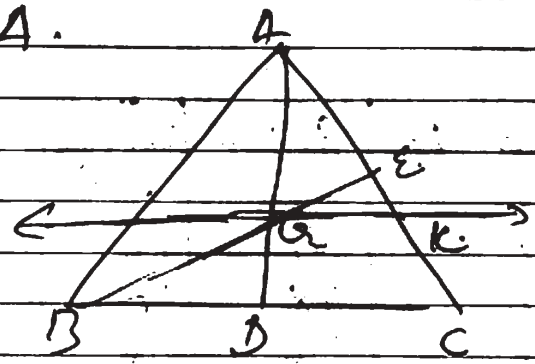
$x^2 + \frac{4}{21}x - \frac{1}{21} = 0$

$21x^2 + 4x - 1 = 0$

3) Centroid : The point of concurrent of all the three medians of a triangle is called centroid.

4) Transversal : If a line intersect two distinct coplanar distinct coplanar lines l_1, l_2 in two distinct points A and B. Then line 't' is called transversal of l_1 and l_2

Q IV A.



Given: In $\triangle ABC$ median $\overline{AD}$ and $\overline{BE}$ intersect in G. A line passing through G and parallel to $\overline{BD}$, intersect $\overline{AC}$ in K.

Prof. To Prove: $AK = 6EK$.

Proof: In $\triangle ABC$ G is the centroid and BE is the median.

$\therefore$ B - G - E.

Now a line passing through G and parallel to BD intersect AC at K.

$\therefore$ E - K - C ($\because$ B - G - E. line intersect $\overline{AC}$)

Now in $\triangle ABC$, E - G - B, E - K - C and $\overline{GK} \parallel \overline{BC}$

$\frac{EG}{BE} = \frac{EK}{EC}$ By

$\frac{EG}{3EG} = \frac{EK}{EC}$ ($\because$ BE is the median and G is the centroid $\therefore$ BE = 3GE)

$\therefore \frac{1}{3} = \frac{EK}{EC}$

$\therefore \frac{1}{3} = \frac{EK}{\frac{1}{2}m}$ ($\because$ E is the mid pt of AC)

$\therefore \frac{1}{2}m = 3EK$

$\therefore m = 6EK$. (Proved)

Q.4 (B) (ii)

Class	Boundary pt	Frequency	Cumulative frequency
200-250	199.5	3	3
300-350	299.5	61	64
400-450	399.5	118	182
500-550	499.5	136	318
600-650	599.5	125	443
700-750	699.5	51	494
800-850	799.5	2	500
		500	

$n = 500$ (even)

Median class is which $\frac{n}{2}$

$= 250^{th}$ observation

$l = 494.5$

$F = 182$

$f = 136$

$n = 500$

$c = 10$

$M = l + \left(\frac{\frac{n}{2} - F}{f}\right) \times c$

$= 494.5 + \left(\frac{250 - 182}{136}\right) \times 10$

$= 494.5 + \left(\frac{68}{136}\right) \times 10$

$= 494.5 + 50$

$M = 544.5$ Kg

(8)

Wt in kg	Mid value	f_i	$u_i = \frac{x_i - A}{c}$	$f_i u_i$
60-64	62	13	-2	-26
65-69	67	28	-1	-28
70-74	72 A	35	0	0
75-79	77	12	1	12
80-84	82	9	2	18
85-89	87	3	3	9
		$\sum f_i = 100$		$\sum f_i u_i = -15$

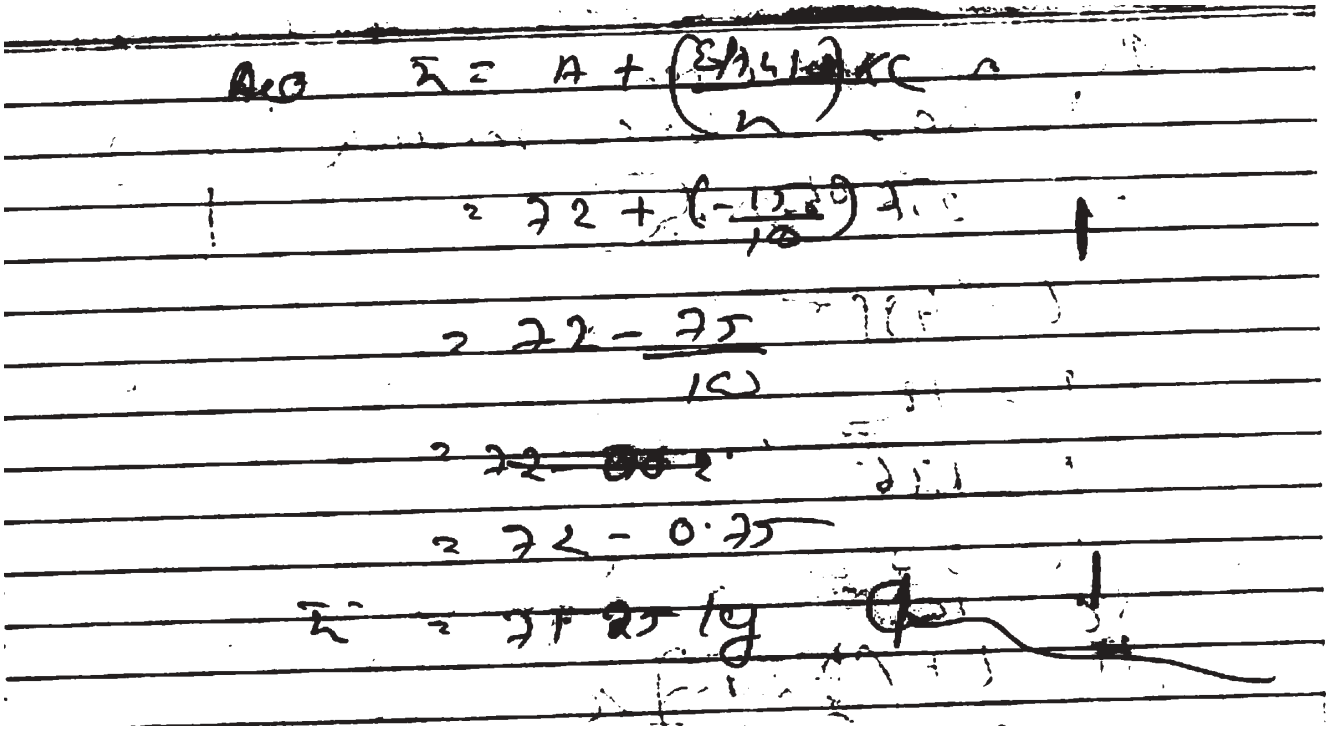
$A = 72$

$n = 100$

$c = 5$

$\sum f_i u_i = -15$

A



$$2) \quad 2-\left[\frac{1}{x+y} \div \left\{\frac{3}{2}\left(\frac{1}{x-y}-\frac{1}{x+y}\right) \div \frac{x^2y+xy^2}{x^2-y^2}\right\}\right]$$

$$= 2-\left[\frac{1}{x+y} \div \left\{\frac{3}{2}\left(\frac{x+y-x+y}{(x-y)(x+y)}\right) \div \frac{xy(x+y)}{(x-y)(x+y)}\right\}\right]$$

$$= 2-\left[\frac{1}{x+y} \div \left\{\frac{3}{2} \times \frac{2y}{(x-y)(x+y)} \times \frac{x-y}{xy}\right\}\right]$$

$$2-\left[\frac{1}{x-y} \div \left\{\frac{1}{x+y}\right\}\right]$$

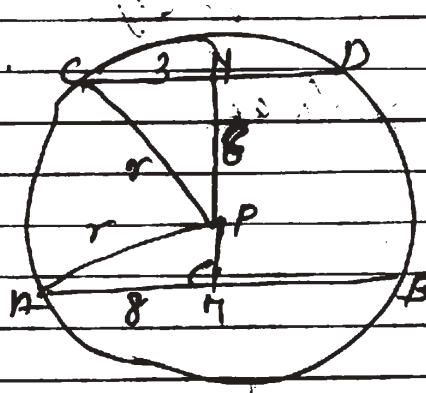
$$= 2-\left[\frac{1}{x-y} \times x+y\right]$$

$$= 2-1$$

$$= 1$$

Q IV C.

(1)



$\overline{AB}$ and $\overline{CD}$ are two parallel chords of $\odot(P, r)$

$PM \perp AB$ and $PN \perp CD$

$\therefore$ In $\triangle PNC$, $PC^2 = PN^2 + CN^2$

$= 64 + 9$

$PC^2 = 73$

Now In Δ PMA,

$PA^2 = PO^2 + MO^2$

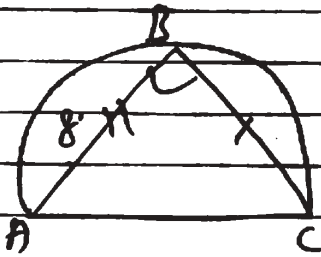
$(\sqrt{73})^2 = PO^2 + 8^2$

$73 - 64 = PM^2$

$9 = PM^2$

$3 = PM$

Radius of circle 16 cm & 3 cm away from the centre.

(9) 

∠ABC is inscribed in a semi circle give

∴ the ∠ABC is a right ∠d ∠

Now AC is the hypotenuse

Since AB = BC = 8

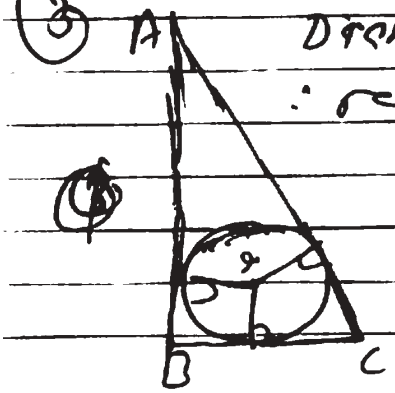
$AC^2 = AB^2 + BC^2$

$= 64 + 64$

$AC = 8\sqrt{2}$

Diameter = $8\sqrt{2}$

∴ radius = $4\sqrt{2}$ cm

(3) 

(4) In Δ ABC, ∠B = 90°

∴ acc to Pythagoras

$AC^2 = AB^2 + BC^2$

$25^2 = 49 + BC^2$

$\therefore BC^2 = 25^2 - 7^2$

$= 625 - 49$

$BC = 576$

$BC = 24$ cm

Req inradius of $\triangle ABC = \frac{AD + BC - AC}{2}$

$= \frac{24 + 7 - 25}{2}$

$= \frac{6}{2}$

$= 3$ cm Ans

Q. IV 26) Let the positive real no be n & its reciprocal $\frac{1}{n}$.

Let their sum $n + \frac{1}{n}$.

If the sum is less than 2

$\therefore n + \frac{1}{n} < 2$

$\therefore n^2 + 1 < 2n$

$\therefore n^2 - 2n + 1 < 0$

$\therefore (n-1)^2 < 0$

$\therefore$ This is against the universal fact hence our supposition is fault $\therefore n + \frac{1}{n} \not< 2$ proved.

(ii) $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$

Comp. with $ax^2 + bx + c = 0$ $a = \sqrt{3}$ $b = -2\sqrt{2}$

$\Delta = b^2 - 4ac$

$= 8 - 4 \times \sqrt{3}(-2\sqrt{3})$

$= 8 + 24$

$\Delta = 32$

$\sqrt{\Delta} = \pm 4\sqrt{2}$

$\alpha = \frac{-b + \sqrt{\Delta}}{2a}$ $\beta = \frac{-b - \sqrt{\Delta}}{2a}$

$= \frac{2\sqrt{2} + 4\sqrt{2}}{2\sqrt{3}}$ $\beta = \frac{2\sqrt{2} - 4\sqrt{2}}{2\sqrt{3}}$

$= \frac{6\sqrt{2}}{2\sqrt{3}}$ $\beta = \frac{-2\sqrt{2}}{2\sqrt{3}}$

$= \sqrt{6}$ $\beta = -\sqrt{\frac{2}{3}}$

roots are $\sqrt{6}$ and $-\sqrt{\frac{2}{3}}$

Q IV 1) A semi circle is the set of A and B are any two distinct points in a circle and AB is a chord. Then the centre of the circle. Then the set of all points of the circle lying in the closed half plane of AB is called semi circle.

2) Tangent of a circle: A line in the plane of circle intersecting the circle in one point is called tangent to the circle.

3) Volume of core

Vol of core = $\frac{1}{3}$ × base area × ht of cone

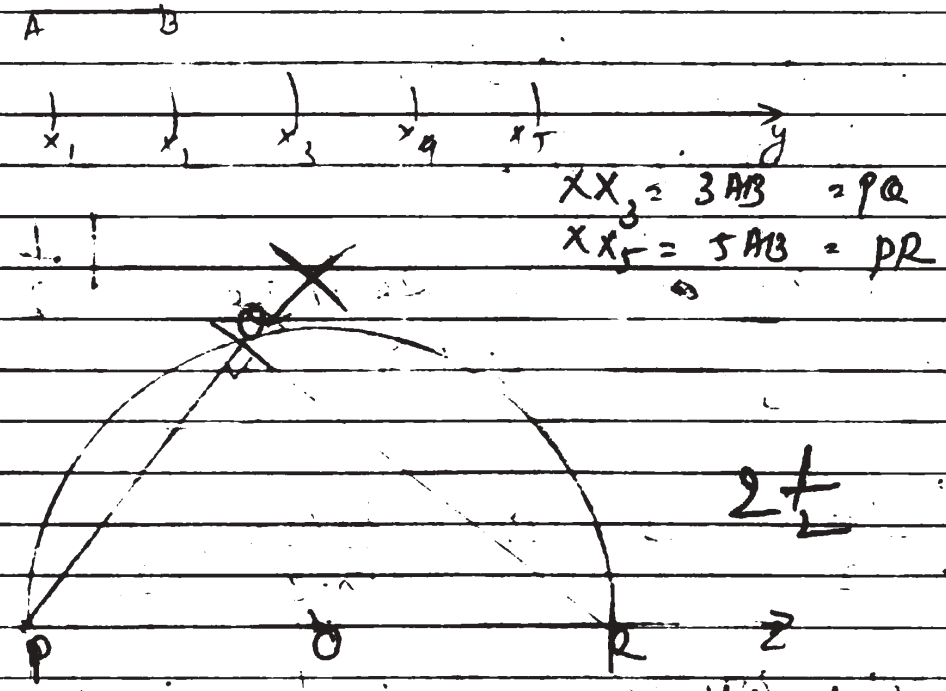
= $\frac{1}{3} \times 154 \times 15$

= 770 cubic cm

4) Total surface area of cylinder

= $2\pi r(h+r)$

Q.IV A. Construction



2 ½

Steps:

1. Draw $\overrightarrow{XY}$ and obtain points x_3 and x_5 on $\overrightarrow{XY}$ such that $XX_3 = 3AB$ and $XX_5 = 5AB$.
2. Construct $\overrightarrow{PZ}$
3. Construct O ($PQ = XX_3 = 3AB$) to intersect $\overrightarrow{PZ}$ at R.

Justification

① Construction of congruent segment

Ruler postulate

Compass postulate

and ruler work interpolation

Q 11 (b) ④ construct Q as the mid point of PR by construction the ⊥ bisector of $\overline{PR}$.

const. of mid point of a line segment postulate & compass

⑤ const O(0, OP)

⑥ const O(P, $\frac{1}{3}$PR) to intersect O(0, OP) in the point Q lying in one of half plane of $\overline{PR}$

postulate & compass

⑦ construct $\overline{OP}$ and $\overline{OQ}$

postulate of straight ruler.

Then Δ PQR is the req. Δ.

Q V B (1)

$2\left(\frac{5x+2}{5x-2}\right)^2 + 5\left(\frac{5x+2}{5x-2}\right) = 3$ $(1\frac{1}{2})$

$\therefore 2c^2 + 5c - 3 = 0$ (by Taking $\frac{5x+2}{5x-2}$ as c)

$\therefore 2c^2 + 6c - c - 3 = 0$

$\therefore 2c(c+3) - 1(c+3) = 0$

$\therefore (c+3)(2c-1) = 0$

$\therefore c+3 = 0$ or $2c-1 = 0$ $\frac{1}{2}$

$c = -3$ $c = \frac{1}{2}$

$\frac{5x+2}{5x-2} = -3$ or $\frac{5x+2}{5x-2} = \frac{1}{2}$

$\therefore 5x+2 = -15x+6$ $10x+4 = 5x-2$

$\therefore 20x = 4$ $5x = -6$

$\therefore x = \frac{1}{5}$ $\therefore x = -\frac{6}{5}$ $\frac{1}{2}$

roots are $\frac{1}{5}, -\frac{6}{5}$

Q Let x and $\frac{1}{x}$ be the reciprocal

$\therefore x^2 + \frac{1}{x^2} = \frac{7}{4}$ ... $x + \frac{1}{x}$

$\therefore \left(x + \frac{1}{x}\right)^2 - 2 = \frac{7}{4}$ ... $x + \frac{1}{x}$

$\therefore a^2 = \frac{7}{4} + 2$ (a for $x + \frac{1}{x}$)

$\therefore 4a^2 - 8 - 7 = 4a$

$\therefore 4a^2 - 4a - 15 = 0$

$\therefore 4a^2 - 10a + 6a - 15 = 0$

$2a(2a - 5) + 3(2a - 5) = 0$

$\therefore (2a - 5)(a + 3) = 0$

$\therefore 2a = 5 \quad 2a = -3$

$a = \frac{5}{2}$ or $a = \frac{-3}{2}$

$\therefore x + \frac{1}{x} = \frac{5}{2}$ $\quad x + \frac{1}{x} = \frac{-3}{2}$

$\therefore 2x^2 + 2 = 5x$ or $2x^2 + 2 + 3x = 0$

$\therefore 2x^2 - 5x + 2 = 0$ $\quad 2x^2 - 3x + 2 = 0$

$2x^2 - 4x - x + 2 = 0$ $\quad a = 2, b = -3, c = 2$

$2x(x - 2) - 1(x - 2) = 0$ $\quad \Delta = b^2 - 4ac$

$(x - 2)(2x - 1) = 0$ $\quad = 9 - 4 \times 2 \times 2$

$x = 2$ or $x = \frac{1}{2}$ $\quad = 9 - 16$

$\Delta < 0$ $\therefore$ no real x

∴ The required rational numbers are
2 and $\frac{1}{2}$.

3) Let the petrol consumed be P ltr by a vehicle be C litres and speed of vehicle be S km/hr

∴ $C \propto S^2$

∴ $C = kS^2$ — Petrol consumed

∴ $8 = k \times 40 \times 40$ — $\frac{50}{4}$ ltr

$k = \frac{8}{40 \times 40}$ — 4 ltr $= \frac{50}{4} \times 4$

$k = \frac{1}{200}$ — $= 50$ litres

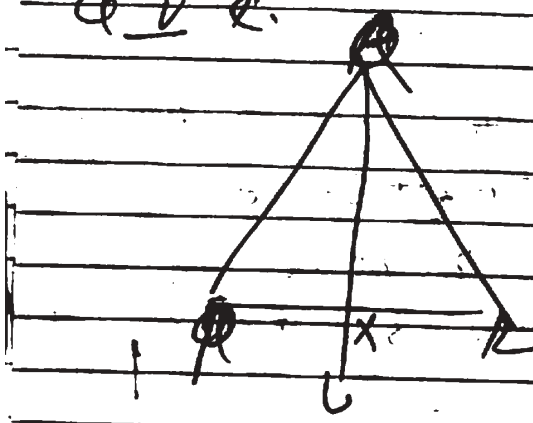
$C = kS^2$

$= \frac{1}{200} \times 50 \times 50$

$C = \frac{50}{4}$ litres

Ans

Q V R.



QX is PQR the bisector of ∠Q which meets PR at X.

Given

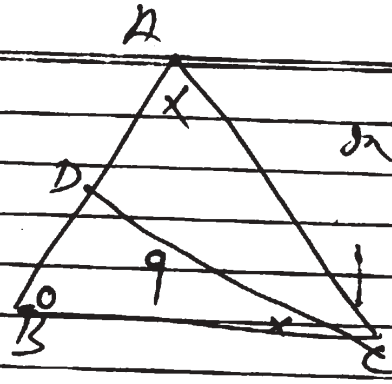
$\frac{PQ}{QR} = \frac{PX}{XR}$

$\frac{3}{5} = \frac{PX}{25}$ ∴ $PX = \frac{75}{5}$

$PX = 15$

∴ $PR = PX + XR$

$PR = 15 + 25 = 40$ A



2) In $\triangle ABC$ & $\triangle CBD$

$\angle CAB = \angle BCD$ given

$\angle ABC = \angle CBD$ same angle

$\therefore ABC \sim CBD$ by AA

$\therefore \frac{AB}{BC} = \frac{BC}{BD} = \frac{AC}{CD}$

$\therefore \frac{AB}{18} = \frac{18}{12}$

$AB = \frac{18 \times 18}{12}$

$AB = 27$

$AD = AB - BD$

$AD = 27 - 12 = 15$

$AB = 27$

$BD = 12$

$AD = 15$

$\frac{18}{12} = \frac{AC}{9}$

$AC = \frac{18 \times 9}{12}$

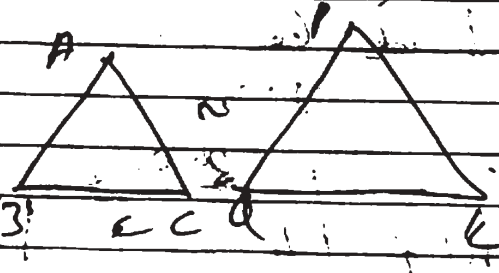
$AC = 13.5$

$CD = 9$

Perimeter of $\triangle ABC = AD + CD + AC$

$= 15 + 9 + 13.5$

Perimeter of $\triangle ABC = 37.5$ A



3) $\triangle ABC \sim \triangle DQL$ given

$\therefore$ Area of $\triangle ABC$ / Area of $\triangle DQL = \frac{AB^2}{DQ^2}$ 2.2

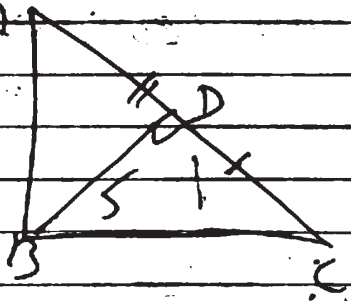
$\therefore \frac{18}{32} = \frac{AB^2}{64}$

$AB^2 = \frac{18 \times 64}{32}$

$AB^2 = 36$

$AB = 6$ cm

Q V. D: A



$\therefore$ BD is rt $\angle$ or bisects of hypotenuse in $\triangle$ cyclic $\triangle$ ABC $\therefore$ AC = 2BD = 10

Also AD = BD = CD = 5

Also $\overline{AB} \perp \overline{BD}$

$\therefore$ AB is tgt

$AB^2 = BD \cdot AC$ | $BC^2 = CD \times AC$

$= 5 \times 10$ | $= 5 \times 10$

$AB^2 = 50$

$AB = 5\sqrt{2}$ | $BC = 5\sqrt{2}$

$\therefore$ AB = $5\sqrt{2}$

BC = $5\sqrt{2}$

V D(2). Let r be no of beads in a

bead. | sphere

$r_2 = 0.1m = 1cm$ | $r_1 = 2cm$

Vol of sphere $\propto$ Vol of bead

$\frac{4}{3}\pi r_1^3 : n \times \frac{4}{3}\pi r_2^3 \Rightarrow 1 : n \times \frac{1}{8}$

$\frac{1}{1000} : \frac{1}{8}$

$n = 8000$

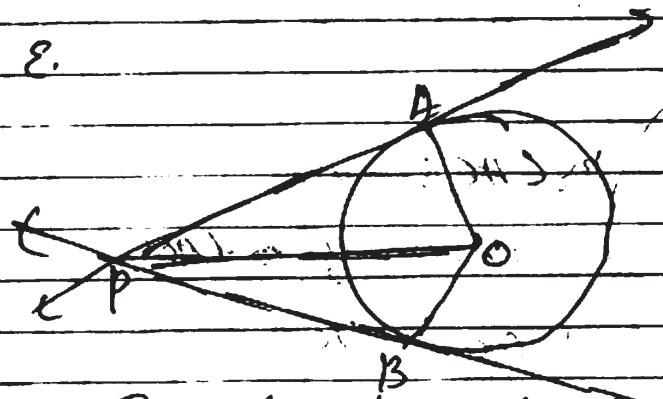
$\frac{1}{1000}$ of 1000 m

$g = h \times \frac{1}{1000}$

1000 : h

No of beads : 1000

Q V E.



given Tangents at points A and B of a circle with centre O intersect in P.

To Prove □ AOBP is a cyclic quadrilateral

Proof: $\overline{AP}$ is a tangent and $\overline{OA}$ is radius from the point of contact A

$\therefore m(\angle OAP) = 90$ similarly $m(\angle OBP) = 90$

Now in □ AOBP $m(\angle OAP) + m(\angle OBP) = 180$

Now a pair of opposite angles of □ OAPB is supplementary

$\therefore$ □ OAPB is cyclic □ by converse

$\therefore$ □ OAPB is cyclic □ proved.

Q V E.

1 separation of a plane by a circle

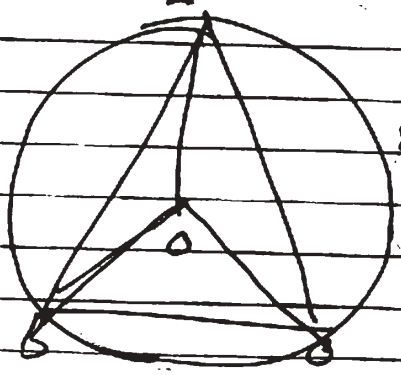
A circle separates the plane of circle in three distinct disjoint sets.

(1) The circle

(2) The interior of the circle

(3) The exterior of the circle

2)



$m\angle AOB = 140$

$m\angle ACB = \frac{1}{2} m\angle AOB$

$m\angle ACB = 70$

$\therefore m\angle BOC = 108$

$\therefore m\angle BAC = \frac{1}{2} m\angle BOC$

$\therefore m\angle BAC = 72$

In $\triangle ABC$, $m\angle C = 180 - (m\angle ACB + m\angle OAC)$

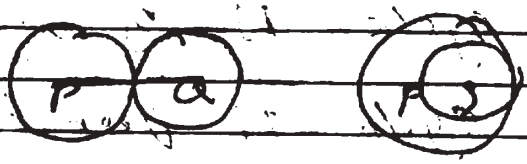
$= 180 - (70 + 56)$

$= 180 - 126$

$= 54^0$

$\therefore m\angle A = 54$ $m\angle B = 56$ $m\angle C = 70^0$

3)



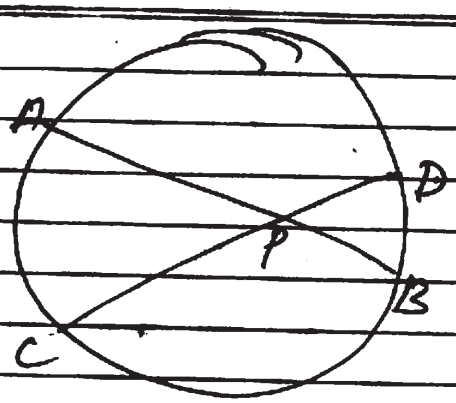
$PQ = r_1 + r_2$ or $PQ = r_1 - r_2$

$= 6.4 + 2.8$ $= 6.6 - 2.8$

$PQ = 9.2$ or 3.6

$\therefore 9.2$ or 3.6

4)



Now Two chords $\overline{AB}$ and $\overline{CD}$ intersect internally in point P.

$PA \cdot PB = PC \times PD$

$8.4 \times 4.2 = PC \times 12.6$

$\frac{8.4 \times 4.2}{12.6} = PC$

$PC = 2.8$

$CD = CP + PD$

$= 2.8 + 12.6$

$CD = 15.4$ Ans