

Q.TA. Prove :- If a line intersects two sides of a triangle in two distinct points in such a way that the line segments cut by it on the two sides of a triangle lying in its same closed half plane are proportional to the corresponding sides then the line is parallel to the third side of a triangle.

B. Solve any two of the following 6

1. Simplify :-  $\left(\frac{a^2+b^2}{a^2-b^2} - \frac{a^2-b^2}{a^2+b^2}\right) \div \left(\frac{a+b}{a-b} - \frac{a-b}{a+b}\right)$

2. factorise :  $2ab+2b^2c+2ca+4ab^2+4bc^2+4ca^2+9abc$

3. factorise :  $a^4(b-c)+b^4(c-a)+c^4(a-b)$

C. factorise any two of the following 4

1.  $x^3 + 7x^2 + 21x - 27$

2.  $6u^3 + 11u^2 - u - 6$

3.  $(x+2)(x+3)(x+4)(x+5) - 15$

D. Solve any one of the following 2

1. Simplify  $\frac{1}{x+a} + \frac{1}{x+b} + \frac{1}{x+c} + \frac{ax}{x^2+ax^2} + \frac{bx}{x^2+bx^2} + \frac{cx}{x^2+cx^2}$

2. If  $\frac{ay-bx}{p} = \frac{cx-az}{q} = \frac{bz-cy}{r}$  prove that

$$\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$$

E. Fill in the blanks by selecting the proper alternative from those given in the brackets.

1.  $f: \mathbb{R} \rightarrow \mathbb{R}$   $f(x) = (x-2)^2$  then  $f(x+2) =$   $(x^2, 0, x^2)$

2.  $X = \{3^p / p \in \mathbb{N}\}$   $Y = \mathbb{N}$  and  $f: X \rightarrow Y$ ,  $f(x) = \log_3 x$  then  $R_f =$   $(\mathbb{R}, 1, \mathbb{N})$

3. A plan or design of logical steps and instructions to be executed in solving a problem is called a/an  $(flowchart, computer, algorithm)$

4. Control unit is a part of  $(CPU, memory, monitor)$  in a computer.

Q. 2 A Prove that in congruent circles the chords equidistant from the centres are congruent 4

B. Solve any two of the following 6

1. If  $5a^2 - ab : 2ab - b^2 = 6:1$  find  $a:b$ ?

2. If  $\frac{a}{b} = \frac{c}{d}$  prove that  $\frac{ma - nb}{pa - qb} = \frac{mc - nd}{pc - qd}$

3. The electricity bill partially varies directly as the units of consumption and is partially constant. If the consumption is 80 units the bill amounts to Rs 154. If it is 150 units the bill amounts to Rs 280. What would be the bill amount to for a consumption of 950 units?

C. Solve any two of the following 4

1. The mean of 40 observations was 160. It was detected on rechecking that the value 165 was wrongly copied as 125 for computation of mean. Find the correct mean?

2. Candidates of four schools appear in a mathematics test. Their average scores are shown below

School	No. of candidates	Average score
I	60	75
II	48	80
III	—	55
IV	40	50

If the average score of the candidates of all the four schools is 66. Find the number of candidates that appeared from School III?

3. The mean and median of grouped data are 24.2 and 20.5 respectively. Find mode?

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by how much the level of the field is raised?

Q.3C Solve any two of the following 4

1. If  $\tan \theta = \frac{4}{3}$  find the value of  $\frac{2 \sin \theta - 3 \cos \theta}{2 \sin \theta + 3 \cos \theta}$ .

2. Prove that  $\frac{\tan \theta + \sec \theta - 1}{\tan \theta + \sec \theta + 1} = \frac{1 + \sin \theta}{\cos \theta}$ .

3. If  $\cos \theta + \sin \theta = \sqrt{2} \cos \theta$  show that  $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$ ?

D. Solve any one of the following 2

1. Prove  $\frac{\cos \theta}{\operatorname{cosec} \theta + 1} + \frac{\cos \theta}{\operatorname{cosec} \theta - 1} = 2 \tan \theta$

2. If  $x \propto y$  prove that  $x^2 + y^2 \propto xy$

E. Solve the following.

1. If  $\alpha, \beta$  are the roots of  $x^2 + x + 1 = 0$  evaluate  $\alpha^2 + \beta^2$  ? 4

2. Construct a quadratic equation whose roots are  $\sqrt{3}$  and  $3\sqrt{3}$ .

3. Define: The intercepts made on the transversal by the lines.

4. State Apollonius theorem.

Q.4A. Prove that three times the sum of the squares on the sides of the triangle is equal to four times the sum of the squares on the median of the triangle. 4

B. Solve any two of the following 6

1. Simplify:  $\frac{x^2 + 3x + 2}{x + 4} + \frac{x - 6}{x + 2} - \frac{x^3 + x^2 + 2}{x^2 + 6x + 8} - \frac{x^2 - 8}{x^2 + 6x + 8}$

2. The table below gives the distribution of total household expenditure of manual

WORKERS IN A CITY IN RS

class interval	100-150	150-200	200-250	250-300	300-350	350-400	400-450	450-500
frequency	24	40	33	28	30	22	16	7

find the average expenditure per household?

3. find the median of the following frequency distribution.

2	3	6	10	12	7	15
4	3	4	2	8	13	10

Q4c. Answer any two of the following. 4

1. In a circle of radius 5cm AB & AC are two chords such that  $AB = AC = 6$ cm find the length of chord BC?

2. With the vertices of a triangle ABC as centres, three circles are described, each touching the other two externally. If the sides of the triangle are 9cm, 7cm, 6cm find the radii of the circles?

3. A quadrilateral ABCD is cyclic.  $\overrightarrow{AE}$  is drawn parallel to  $\overline{CD}$  and  $B, A, E$  are collinear. If  $\angle ABC = 92^\circ$ ,  $\angle FAE = 20^\circ$  find  $\angle BCD$ ?

D) Solve any one of the following. 2

1. If the ratio of the roots of the equation  $lx^2 + mx + n = 0$  is  $p : q$  prove that

$$\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} + \sqrt{\frac{m}{l}} = 0$$

2. If  $\alpha, \beta$  are the roots of the equation  $ax^2 + bx + c = 0$  find the value of  $(\alpha+1)(\beta+1)$ ?

1. Three solid spherical beads of radii 3 cm, 4 cm, 5 cm are melted into single spherical bead. Find the radius of a single spherical bead?
2. Two cubes each of 8 cm edge are joined end to end. What is the surface area of a resulting cuboid?
3. Define: secant of a circle.
4. Define: An angle subtended by an arc of a circle at a point of a circle.

Q.5 A. Construct a triangle ABC in which  $BC = 4$  cm,  $\angle A = 75^\circ$  and median AD through A is 3.5 cm long.

B. Solve any two of the following. 6

1. Solve for  $x$

$$\left(x - \frac{1}{x}\right) + 2\left(x + \frac{1}{x}\right) - 11 = 0$$

2. The time taken by a person to cover 150 km was 2.5 hr more than the time taken in the return journey. If he returned at a speed of 10 km/hr more than the speed of going what was the speed per hr in each direction?

3.  $z$  is in compound variation with  $x$  and  $y$  if  $z = 40$  when  $x = 2, y = 4$  find  $z$  for  $x = 5, y = 3$  also if  $z = 30, x = 2$  then find  $y$ ?

C. Attempt any two of the following. 4

1. A vertical stick 15 m long casts a shadow 12 m long on the ground. At the same time, a tower casts a shadow 50 m long on the ground. Find the height of the tower?

2. In a triangle, AD is the bisector of

Q.5C If  $BC = 10\text{cm}$ ,  $BD = 6\text{cm}$  and  $AC = 6\text{cm}$  find  $AB$ ?

3. In a triangle  $ABC$ ,  $m\angle A = 90^\circ$  and  $AD \perp BC$  if  $AC = 75\text{cm}$ ,  $AB = 1\text{m}$ ,  $BD = 1.25\text{m}$  find  $AD$ ?

Q. Attempt anyone of the following. 2

1) The volume of a cylinder is  $924\text{m}^3$  and its curved surface area is  $264\text{m}^2$ . Find the height of the cylinder?

2) 2200 cubic cm of brass is to be drawn into a cylindrical wire of 0.50 cm in diameter. Find the length of the wire?

Q.5E Prove that the quadrilateral formed by 4 angle bisectors of a cyclic quadrilateral  $ABCD$  is also cyclic or.

Q.5F Attempt the following

1.  $PQ$  is the tangent at  $K$  and  $LN$  is a diameter if  $\angle KLN = 30^\circ$  find  $m\angle PKL$ ? 4

2. A chord of length 14 cm is at a distance of 6 cm from the centre of a circle. Find the length of another chord at a distance of 2 cm from the centre?

3. In a circle  $(O, r)$   $AB$  and  $CD$  are two diameters perpendicular to each other. Then find  $AC$ ?

4. Find the length of a tangent drawn from a point 8 cm away from the centre of a circle of radius 6 cm?