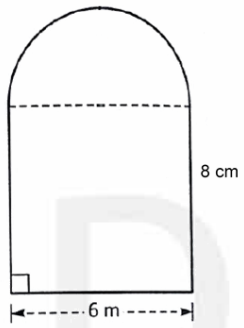
Mathematics Sample Paper - 2

Section – I [40 marks]

Question 1

1. The cross-section of a railway tunnel is a rectangle 6 m board and 8 m high surmounted by a semi-circle as shown in the figure. The tunnel is 35 m long. Find the cost of plastering the internal surface of the tunnel (excluding the floor) at the rate of Rs. 2.25 per m^2. [3]



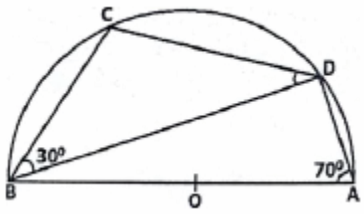
2. If $2x + 3 : 5x + 4$ is the triplicate ratio of 3: 4, find the value of x. [3]
3. $A = \{x : 3(1 - x) < 2(x - 2), x \in N\}$ and $B = \{x : 5 > 4(x - 3), x \in W\}$, find the range of set $A \cap B$ and represent it on a number line. [4]

Question 2

1. Two dice are thrown simultaneously. Find the probability that. [3]
   (i) Both the dice show the same number.
   (ii) The first die shows 6.
   (iii) The sum of the numbers on the dice is 9.
2. If $2x^3 + ax^2 - 11x + b$ leaves remainders 0 and 42 when divided by (x – 2) and (x – 3) respectively: [3]
   (i) Find the values of a and b.
   (ii) With these values of a and b factorise the above expression completely.
3. If $A(5, -1), B(-3, -2)$ and $C(-1, 8)$ are the vertices of triangle ABC, find the length of the median through A and the coordinates of the centroid. [4]

Question 3

1. In the figure, C & D are points on the semicircle described on BA as diameter. Calculate angle ABD and angle BDC. [3]



2. The age of a father is twice the square of the age of his son. Eight years hence, the age of the father will be 4 years more than three times the age of the son. Find their present ages. [3]
3. If $x^3 - 2x^2 + ax + b$ has a factor $(x + 2)$ and leaves a remainder 9 when divided by $(x + 1)$, find the values of a and b. With these values of a and b, factorise the given polynomial completely. [4]

Question 4

1. Prove the following: [3]
$$\frac{\tan\theta - \cot\theta}{\sin\theta\cos\theta} = \tan^2\theta - \cot^2\theta$$
2. Solve $2x - \frac{1}{x} = 7$ and give your answer correct to 3 significant figures. [3]
3. Use a graph paper to answer the following question. (Take 2cm = 1 unit on both the axes)
Plot P (2, 4), Q (–2, 2). Reflect points P and Q. in x-axis to get P' and Q'. [4]
(i) Write the co-ordinates of P' and Q'.
(ii) Give a geometrical name to the figure formed by joining points PQQ P
(iii) Name two invariant points under reflection in the x axis.
(iv)Write the equation of the axis of symmetry.

Section – II [40 marks]

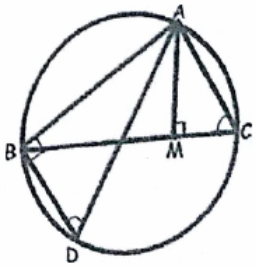
Attempt any four questions from them.

Question 5

1. In the given circle, AD is the diameter and AM ⊥ BC. Prove: [3]
(i) ΔAMC ~ΔABD

(ii) $AB.AC = AD.AM$

2. Construct a cyclic quadrilateral ΔBCDin which $AB = 5cm$, $BC = 8cm$, $\angle ABC = 60°$ and D is equidistant from B and C. [3]



3. The angle of elevation of top of a tower from appoint A on the ground is θ. On walking 85m towards the tower, the angle of elevation is found to be 2θ. If $\tan 2\theta = \frac{8}{15}$, calculate the height of the tower and the distance of tower from A. [4]

Question 6

1. Vi raj deposits a certain sum of money each month in a Recurring Deposit Account of a hank. If the rate of interest is of 8% per annum and he gets Rs.8088 from the hank after 3 years at the time of maturity, find the value of his monthly installment and the interest he gets from the Bank. [3]
2. Find the mean of the given distribution using step-deviation method. [3]

Class	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80
Frequency	5	12	20	16	10	8	5	4

3. A man bought 3200 shares of rupees 10 paying 15% p.a. He sold them when the price became rupees 2.8 and invested the proceeds in rupees 50 shares paying 11% p.a, at 12% premium. Find the annual change in the income. [4]

Question 7

1. I he length arid width of a swimming pool are 40m and 30m respectively and it has capacity to contain $3000m^3$ of water. A small model of the swimming pool is made arid its volume is $2.4cm^3$, Find the height of the model. [3]
2. Ari employer finds that if he increases the weekly wage of each worker by Rs.30 arid employs one worker less, he reduces his weekly wage bill from Rs,8160 to Rs,7810, Taking weekly wage of each worker as x, find out the weekly wage of each worker. [3]

3. Construct an isosceles triangle ABC such that AB = 6cm and BC = AC = 4cm. Bisect ∠C internally and mark a point P on this bisector such that CP = 4.5cm the points Q and R which are 4.5cm from P and also 4.5cm from the line AB. Construct; another circle passing through A, B and C. [4]

Question 8

1. Using a graph paper draw an ogive for the following distribution which shows the marks obtained out of 80 in an examination by 60 students. Use the scale of 2cm to represent 10 marks and 2cm to represent 10 students. [3]

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of students	3	8	12	14	10	6	5	2

Estimate:

(i) Median marks

(ii) Inter quartile range

(iii) Number of students who scored more than 40% marks.

2. If $A = \begin{bmatrix} 2 & 3 \\ 0 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} -8 \\ 8 \end{bmatrix}$ such that 2 AX = B. find: [4]

(i) The order of matrix 'x'.

(ii) Matrix 'x'.

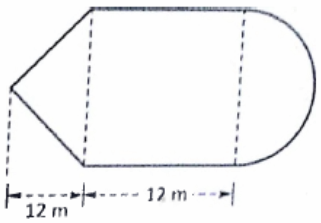
Questions 9

1. AB is the diameter and AC is the chord of the circle such that angle BAC = 30°. The tangent at C intersects AB produced at D. Prove that BC = BD. [3]
2. ABCD is a rhombus. The coordinates of A and C are (3, 6) and (–1, 2) respectively. Write the equation of BD. [3]
3. The given figure shows the cross-section of a cone, a cylinder and a hemisphere all with the same diameter 10 cm, and the other dimensions are as shown. Calculate: [4]

(i) The total surface area,

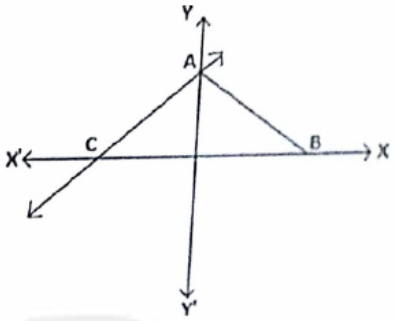
(ii) The total volume of the solid and

(iii) The density of the material if its total weight is 1.7 kg.



Question 10

1. Find two numbers a and b whose mean proportion is 6 and third proportional is 48. [3]
2. In the adjoining figure the equation of line AC is $4y = 3x + 8$. Find: [3]
   (i) The co – ordinates of A
   (ii) Equation of line AB perpendicular to AC
   (iii) The co – ordinates of B.



3. Write down the coordinates of the point R that divides the line joining P (– 4, 1) and Q (17, 10) in the ratio 1:2. [4]
   (i) Calculate the distance OR where O is the origin.
   (ii) In what ratio does the Y-axis divide the line PQ.

Question 11

1. Find a and b, if 12, a + b, 2a and b are in A.P. [3]
2. Find five geometric means between 1 and 27. [3]
3. AB is a tangent to the circle at Q. PQRS is a cyclic quadrilateral. If angle PSQ = 38°, angle PQR = 110°. Find: [4]
   (i) Angle QPR
   (ii) Angle PQA
   (iii) Angle ROQ