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MATHEMATICS - 1999
(Two hours and a half)

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SECTION - A (40 Marks)

*Answer **all** questions from this Section.*

Question 1

(a) A trader lose 10% on his cost price by selling tea at Rs. 225 per kg. At what price per kg should he sell it to gain 10% on his cost price? [3]

(b) When a discount of 20% is given on the market price of an article, a shopkeeper makes a profit of 25% on his cost price. What would be his percentage profit on cost if the article was sold at the market price? [4]

Question 2

A man invests Rs. 5000 for three years at a certain rate of interest, compounded annually. At the end of one year it amounts to Rs. 5,600. Calculate:
(i) The rate of interest per annum. [2]

A man invests Rs. 5000 for three years at a certain rate of interest, compounded annually. At the end of one year it amounts to Rs. 5,600. Calculate:
(ii) The interest occurred in the second year. [2]

A man invests Rs. 5000 for three years at a certain rate of interest, compounded annually. At the end of one year it amounts to Rs. 5,600. Calculate:
(iii) The amount at the end of the third year. [2]

Question 3

Use graph paper for this question. Take 2 cm = 1 unit on both axes.
(i) Plot the points A (l, 1), B (5, 3) and C (2, 7). [1]

Use graph paper for this question. Take 2 cm = 1 unit on both axes.
(ii) Construct the locus of points equidistant from A and B. [1]

Use graph paper for this question. Take 2 cm = 1 unit on both axes.
(iii) Construct the locus of points equidistant from AB and AC. [1]

Use graph paper for this question. Take 2 cm = 1 unit on both axes. [1]

(iv) Locate the point P such that PA = PB and P is equidistant from AB and AC.

Use graph paper for this question. Take 2 cm = 1 unit on both axes. [1]
(v) Measure and record the length PA in cm.

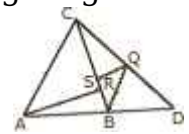
Question 4 [5]

Use a ruler and compass only in this question,
(i) Construct the quadrilateral ABCD in which AB = 5 cm, BC = 7 cm and ∠ABC = 120°, given that AC is its only line of symmetry.
Use a ruler and compass only in this question,

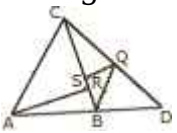
(ii) Write down the geometrical name of the quadrilateral.
Use a ruler and compass only in this question,
(iii) Measure and record the length of BD in cm.

Question 5

In the figure given alongside P is a point on AB such that AP : PB = 4 : 3, [3]
PQ is parallel to AC.
(i) Calculate the ratio PQ : AC, giving reasons for your answer.

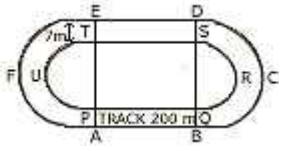


In the figure given alongside P is a point on AB such that AP : PB = 4 : 3, [3]
PQ is parallel to AC.
(ii) In ΔARC; ∠ARC = 90° and in ΔPQS, ∠PSQ = 90°
Given : QS = 6 cm. Calculate the length of AR.

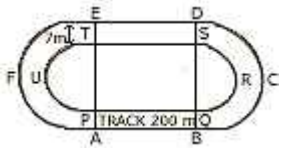


Question 6

The figure alongside, shows a running track surrounding a grassed enclosure PQRSTU. The enclosure consists of rectangle PQST with a semi-circular region at each end. PQ = 200 m; PT : 70m. [3]
(i) Calculate the area of the grassed enclosure in m^2



The figure alongside, shows a running track surrounding a grassed enclosure PQRSTU. The enclosure consists of rectangle PQST with a semi-circular region at each end. PQ = 200 m; PT : 70m. [3]
(ii) Given that the track is of constant width 7m, calculate the outer perimeter ABCDEF of the track (Taken π to be 22/7).



Question 7

Use graph paper of this question. [1]
(i) Plot the points A (3, 5) and B (-2, -4). Use 1 cm = 1 unit on both axes.

Use graph paper of this question. [1]

(ii) A' is the image of A when reflected in the *x*-axis. Write down the co-ordinates of A' and plot it on the graph paper.

Use graph paper of this question. [1]
(iii) B' is the image of B when reflected in the *y*-axis. followed by reflection in the origin, Write down the co-ordinates of B' and plot it on the graph paper.

Use graph paper of this question. [1]
(iv) Write down the geometrical name of the figure AA' BB'.

Use graph paper of this question. [1]
Name two invariant points under reflection in the *x*-axis.

SECTION - B (40 Marks)
*Answer any **four** questions from this Section.*

Question 8

(a) Find the 2 × 2 matrix X which satisfies the equation. [4]

$$\begin{bmatrix} 3 & 7 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} 0 & 2 \\ 5 & 3 \end{bmatrix} + 2X = \begin{bmatrix} 1 & -5 \\ -4 & 6 \end{bmatrix}$$

(b) Find the equation of the line passing through (0, 4) and parallel to the line $3x + 5y + 15 = 0$. [3]

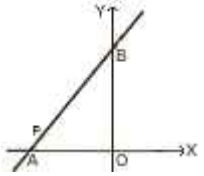
(c) In the figure given below PQRS and PXYZ are parallelograms. Prove that they are of equal area. [3]

Question 9

(a) Solve the inequation: [3]

$12 + 1\frac{5}{6}x \leq 5 + 3x, x \in R.$

Represent the solution on a number line.



(b) In the figure given alongside, line APB meets the X - Y axis at A, Y axis at B, P is the point (−4, 2) and AP : PB = 1 : 2, Write down co-ordinates of A and B. [4]

(c) Use logarithm to evaluate [3]

$$\frac{\sqrt{0.874}}{0.0591}$$

correct to three significant figures.

Question 10 [10]

(a) Use graph paper for this question.
(i} Draw the graphs of $3x - y - 2 = 0$ and $2x + y - 8 = 0$. Take 1 cm = 1 unit on both axes and plot only three points per line.
(a) Use graph paper for this question.

(ii) Write down the co·ordinates of the point of intersection and the area of the triangle formed by the lines and the x-axis.
(b) The marks obtained by a set of students in an examination are given below:

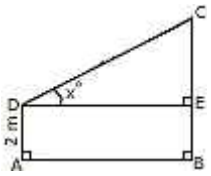
Marks	5	10	15	20	25	30
No. of students	6	4	6	12	x	4

Given that the mean mark of the set is 18, calculate the numerical value of x.

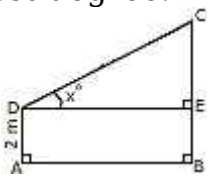
Question 11 [10]

(a) A trader buys x articles for a total cost of Rs. 600.
(i) Write down the cost of one article in terms of x. If the cost of per article were Rs. 5 more, the number of articles that can be bought for Rs. 600 would be four less.
(a) A trader buys x articles for a total cost of Rs. 600.

(ii) Write down the equation in x for the above situation and solve it to find x.
(b) With reference to the figure given alongside a man stands on the ground at point A, which is on the same horizontal plane as B, the foot of a vertical pole BC. The height of the pole in 10 m. The man's eye is 2 m above the grounds He observes the angle of elevation at C, the top of the pole as x°, where tan x° = 2/5. Calculate:
(i) The distance AB in metre.

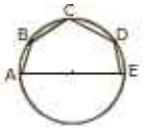


(b) With reference to the figure given alongside a man stands on the ground at point A, which is on the same horizontal plane as B, the foot of a vertical pole BC. The height of the pole in 10 m. The man's eye is 2 m above the grounds He observes the angle of elevation at C, the top of the pole as x°, where tan x° = 2/5. Calculate:
(ii) The angle of elevation of the top of the pole when he is standing 15 m from the pole. Give your answer to the nearest degree.



Question 12

(a) In the figure AE is alongside, AE is the diameter of the circle. Write D [3]
down the numerical value of ∠ABC + ∠CDE. Give reasons for your answer.



(b) Use a ruler and compass only in this question. (i) Draw a circle, [4]
centre O and radius 4 cm. (iii) Mark a point P such that OP = 7 cm. Construct the two tangents to the circle from P. Measure and record the length of one
of the tangents.

(c) A man invest Rs. 1,680 in buying shares of nominal value Rs. 24 and [3]
selling at 12% premium, The dividend on the shares is 15% per annum.
(i) Calculate the number of shares he buys; (ii) Calculate the dividend he receives annually.

Question 13 [10]

(a) Given: A = {a, b, c, d; B = {1, 2, 3, 4},
(i) From ordered pairs showing a l to 1 function from A to B.
(a) Given: A = {a, b, c, d; B = {1, 2, 3, 4},

(ii) From ordered pairs showing a many to 1 function from A to B.
(a) Given: A = {a, b, c, d; B = {1, 2, 3, 4},

(iii) Explain why it is not possible to construct ordered pairs which represent a many to 1 onto function from A to D.
(b) With reference to figure given alongside, a metal container in the form of a cylinder is surmounted by a hemisphere of the same radius. The internal height of the cylinder is 7m and the internal radius is 3·5 m. Calculate:

(i) The total area of the internal surface, excluding the base.

(b) With reference to figure given alongside, a metal container in the form of a cylinder is surmounted by a hemisphere of the same radius. The internal height of the cylinder is 7m and the internal radius is 3·5 m. Calculate:
(ii) The internal volume of the container in m^3. (Take π to be 22/7)

Question 14

(a) The centre ofa circle of radius 13 units is the point (3, 6), P (7, 9) is a point inside the circle. APB is a chord of the circle such that AP = PB. Calculate the length of AB. [4]

(b) Use graph paper for this question. [2]
The table given below shows the monthly wages of some factory workers:
(i) Using the table, calculate the cumulative frequencies of workers.

Wages in Rs. (Class)	No. of workers (frequency)	Cumulative frequency $f(x)$
6500 - 7000	10	-
7000 - 7500	18	-
7500 - 8000	22	-
8000 - 8500	25	-
8500 - 9000	17	-
9000 - 9500	10	-
9500 - 10000	8	-

(b) Use graph paper for this question. [2]
The table given below shows the monthly wages of some factory workers:

(ii) Draw the cumulative frequency curve.
Use 2 cm = Rs. 500, starting the origin at Rs. 6,500 on x - axis, and 2 cm

= 10 worker at y - axis.

Wages in Rs. (Class)	No. of workers (frequency)	Cumulative frequency $f(x)$
6500 - 7000	10	-
7000 - 7500	18	-
7500 - 8000	22	-
8000 - 8500	25	-
8500 - 9000	17	-
9000 - 9500	10	-
9500 - 10000	8	-

(b) Use graph paper for this question. [2]
The table given below shows the monthly wages of some factory workers:
Use 2 cm = Rs. 500, starting the origin at Rs. 6,500 on x - axis, and 2 cm = 10 worker at y - axis.
(iii) Use your graph to write down the median wage in Rs.

Wages in Rs. (Class)	No. of workers (frequency)	Cumulative frequency $f(x)$
`500 - 7000	10	-
000 - 7500	18	-
7500 - 8000	22	-
8000 - 8500	25	-
8500 - 9000	17	-
9000 - 9500	10	-
9500 - 10000	8	-