

MATHEMATICS

(Two hours and a half)

Answers to this Paper must be written on the paper provided separately.

You will not be allowed to write during the first 15 minutes.

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

Attempt all questions from Section A and any four questions from Section B.

All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer.

Omission of essential working will result in loss of marks.

The intended marks for questions or parts of questions are given in brackets [].

Mathematical tables are provided.

SECTION A (40 Marks)

Attempt all questions from this Section.

Question 1

- (a) A shopkeeper bought an article for ₹ 3,450. He marks the price of the article 16% above the cost price. The rate of sales tax charged on the article is 10%. Find the:

- (i) marked price of the article.
(ii) price paid by a customer who buys the article. [3]

- (b) Solve the following inequation and write the solution set:
 $13x - 5 < 15x + 4 < 7x + 12, x \in \mathbb{R}$

Represent the solution on a real number line. [3]

- (c) Without using trigonometric tables evaluate:

$$\frac{\sin 65^\circ}{\cos 25^\circ} + \frac{\cos 32^\circ}{\sin 58^\circ} - \sin 28^\circ \cdot \sec 62^\circ + \operatorname{cosec}^2 30^\circ [4]$$

This paper consists of 8 printed pages.

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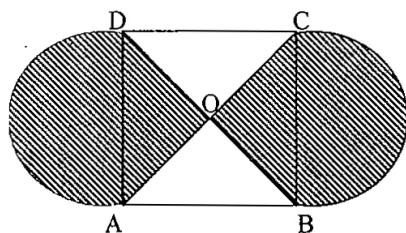
Turn over

Question 2

- (a) If $A = \begin{bmatrix} 3 & x \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 9 & 16 \\ 0 & -y \end{bmatrix}$, find x and y when $A^2 = B$. [3]
- (b) The present population of a town is 2,00,000. Its population increases by 10% in the first year and 15% in the second year. Find the population of the town at the end of the two years. [3]
- (c) Three vertices of a parallelogram ABCD taken in order are A (3, 6), B (5, 10) and C (3, 2) find:
- the coordinates of the fourth vertex D.
 - length of diagonal BD.
 - equation of side AB of the parallelogram ABCD.

Question 3

- (a) In the given figure, ABCD is a square of side 21 cm. AC and BD are two diagonals of the square. Two semi circles are drawn with AD and BC as diameters. Find the area of the shaded region. (Take $\pi = \frac{22}{7}$) [3]



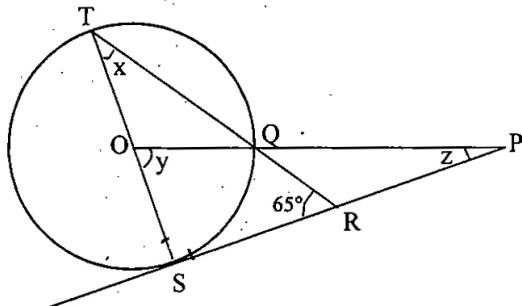
- (b) The marks obtained by 30 students in a class assessment of 5 marks is given below:

| | | | | | | |
|-----------------|---|---|---|----|---|---|
| Marks | 0 | 1 | 2 | 3 | 4 | 5 |
| No. of Students | 1 | 3 | 6 | 10 | 5 | 5 |

Calculate the mean, median and mode of the above distribution.

[3]

- (c) In the figure given below, O is the centre of the circle and SP is a tangent. If $\angle SRT = 65^\circ$, find the value of x, y and z.



[4]

Question 4

- (a) Katrina opened a recurring deposit account with a Nationalised Bank for a period of 2 years. If the bank pays interest at the rate of 6% per annum and the monthly instalment is ₹1,000, find the:
- interest earned in 2 years.
 - matured value.
- (b) Find the value of 'K' for which $x = 3$ is a solution of the quadratic equation, $(K + 2)x^2 - Kx + 6 = 0$. Thus find the other root of the equation.
- (c) Construct a regular hexagon of side 5 cm. Construct a circle circumscribing the hexagon. All traces of construction must be clearly shown.

[3]

[3]

[4]

SECTION B (40 Marks)

Attempt any four questions from this Section

Question 5

- (a) Use a graph paper for this question taking 1 cm = 1 unit along both the x and y axis:
- Plot the points A(0, 5), B(2, 5), C(5, 2), D(5, -2), E(2, -5) and F(0, -5).

- (ii) Reflect the points B, C, D and E on the y-axis and name them respectively as B', C', D' and E'.
 - (iii) Write the coordinates of B', C', D' and E'.
 - (iv) Name the figure formed by B C D E E' D'C'B'.
 - (v) Name a line of symmetry for the figure formed. [5]
- (b) Virat opened a Savings Bank account in a bank on 16th April 2010. His pass book shows the following entries:

| Date | Particulars | Withdrawal (₹) | Deposit (₹) | Balance (₹) |
|------------------------|-------------|----------------|-------------|-------------|
| April 16, 2010 | By cash | - | 2500 | 2500 |
| April 28 th | By cheque | - | 3000 | 5500 |
| May 9 th | To cheque | 850 | - | 4650 |
| May 15 th | By cash | - | 1600 | 6250 |
| May 24 th | To cash | 1000 | - | 5250 |
| June 4 th | To cash | 500 | - | 4750 |
| June 30 th | By cheque | - | 2400 | 7150 |
| July 3 rd | By cash | - | 1800 | 8950 |

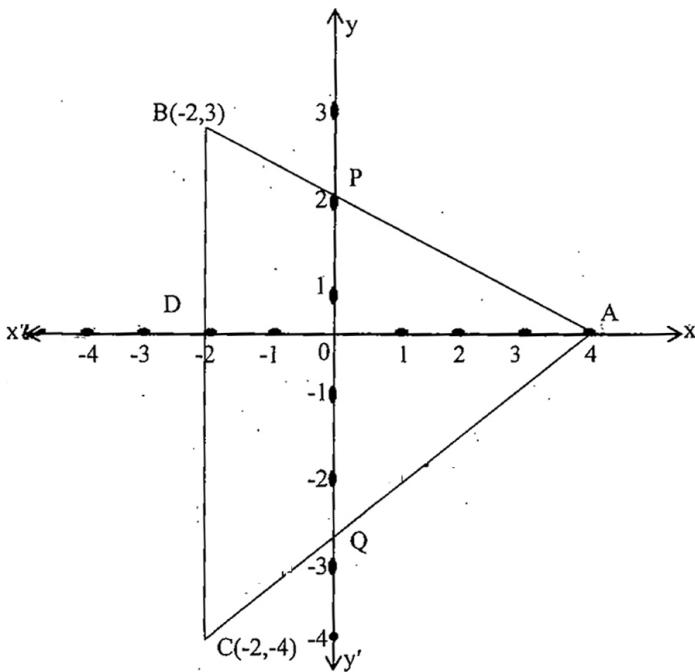
Calculate the interest Virat earned at the end of 31st July, 2010 at 4% per annum interest. What sum of money will he receive if he closes the account on 1st August, 2010? [5]

Question 6

- (a) If a, b, c are in continued proportion, prove that

$$(a + b + c)(a - b + c) = a^2 + b^2 + c^2.$$
 [3]

- (b) In the given figure ABC is a triangle and BC is parallel to the y-axis. AB and AC intersect the y-axis at P and Q respectively.



- (i) Write the coordinates of A.
- (ii) Find the length of AB and AC.
- (iii) Find the ratio in which Q divides AC.
- (iv) Find the equation of the line AC.

[4]

- (c) Calculate the mean of the following distribution:

| Class Interval | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
|----------------|------|-------|-------|-------|-------|-------|
| Frequency | 8 | 5 | 12 | 35 | 24 | 16 |

[3]

Question 7

- (a) Two solid spheres of radii 2 cm and 4 cm are melted and recast into a cone of height 8 cm. Find the radius of the cone so formed.

[3]

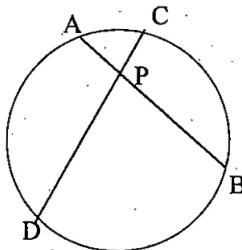
- (b) Find 'a' if the two polynomials $ax^3 + 3x^2 - 9$ and $2x^3 + 4x + a$, leaves the same remainder when divided by $x+3$. [3]

(c) Prove that $\frac{\sin \theta}{1-\cot \theta} + \frac{\cos \theta}{1-\tan \theta} = \cos \theta + \sin \theta$ [4]

Question 8

- (a) AB and CD are two chords of a circle intersecting at P. Prove that

$$AP \times PB = CP \times PD$$



[3]

- (b) A bag contains 5 white balls, 6 red balls and 9 green balls. A ball is drawn at random from the bag. Find the probability that the ball drawn is:

- (i) a green ball
- (ii) a white or a red ball
- (iii) is neither a green ball nor a white ball.

[3]

- (c) Rohit invested ₹ 9,600 on ₹ 100 shares at ₹ 20 premium paying 8% dividend.

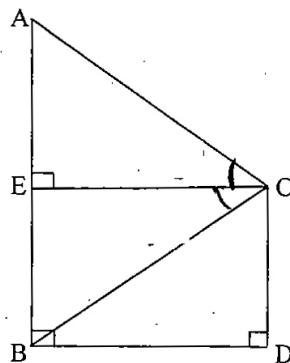
Rohit sold the shares when the price rose to ₹ 160. He invested the proceeds (excluding dividend) in 10% ₹ 50 shares at ₹ 40. Find the:

- (i) original number of shares.
- (ii) sale proceeds.
- (iii) new number of shares.
- (iv) change in the two dividends.

[4]

Question 9

- (a) The horizontal distance between two towers is 120m. The angle of elevation of the top and angle of depression of the bottom of the first tower as observed from the second tower is 30° and 24° respectively.



Find the height of the two towers. Give your answer correct to 3 significant figures.

[4]

- (b) The weight of 50 workers is given below:

| Weight in Kg | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 |
|----------------|-------|-------|-------|-------|--------|---------|---------|
| No. of Workers | 4 | 7 | 11 | 14 | 6 | 5 | 3 |

Draw an ogive of the given distribution using a graph sheet. Take 2 cm = 10 kg on one axis and 2cm = 5 workers along the other axis. Use a graph to estimate the following:

- (i) the upper and lower quartiles.
- (ii) if weighing 95 Kg and above is considered overweight find the number of workers who are overweight.

[6]

Question 10

- (a) A wholesaler buys a TV from the manufacturer for ₹ 25,000. He marks the price of the TV 20% above his cost price and sells it to a retailer at a 10% discount on the marked price. If the rate of VAT is 8%, find the:

- (i) marked price.
- (ii) retailer's cost price inclusive of tax.
- (iii) VAT paid by the wholesaler.

[3]

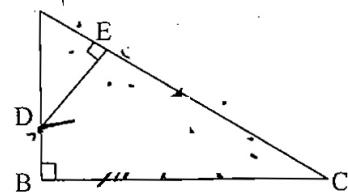
(b) If $A = \begin{bmatrix} 3 & 7 \\ 2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 2 \\ 5 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -5 \\ -4 & 6 \end{bmatrix}$

Find $AB - 5C$.

[3]

- (c) ABC is a right angled triangle with $\angle ABC = 90^\circ$. D is any point on AB and DE is perpendicular to AC. Prove that:-

- $\Delta ADE \sim \Delta ACB$.
- If $AC = 13$ cm, $BC = 5$ cm and $AE = 4$ cm.
Find DE and AD.
- Find, area of ΔADE : area of quadrilateral BCED.



[4]

Question 11

- (a) Sum of two natural numbers is 8 and the difference of their reciprocal is $\frac{4}{15}$.

Find the numbers.

[3]

- (b) Given $\frac{x^3 + 12x}{6x^2 + 8} = \frac{y^3 + 27y}{9y^2 + 27}$. Using componendo and dividendo find x.

[3]

- (c) Construct a triangle ABC with $AB = 5.5$ cm, $AC = 6$ cm and $\angle BAC = 105^\circ$.
Hence:

- Construct the locus of points equidistant from BA and BC.
- Construct the locus of points equidistant from B and C.
- Mark the point which satisfies the above two loci as P. Measure and write the length of PC.

[4]