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ICSE 2011 : MATHEMATICS

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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

Question 1.

- (a) Find the value of 'k' if $(x - 2)$ is a factor of :

$$x^3 + 2x^2 - kx + 10$$

Hence determine whether $(x + 5)$ is also a factor.

[3]

- (b) If $A = \begin{bmatrix} 3 & 5 \\ 4 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$, is the product AB possible? Give a reason. If yes, find AB .

[3]

- (c) Mr. Kumar borrowed ₹ 15,000 for two years. The rate of interest for the two successive years are 8% and 10% respectively. If he repays ₹ 6,200 at the end of the first year, find the outstanding amount at the end of the second year.

[4]

Question 2.

- (a) From a pack of 52 playing cards all cards whose numbers are multiples of 3 are removed. A card is now drawn at random.

What is the probability that the card drawn is :

(i) a face card (King, Jack or Queen)

(ii) an even numbered red card?

[3]

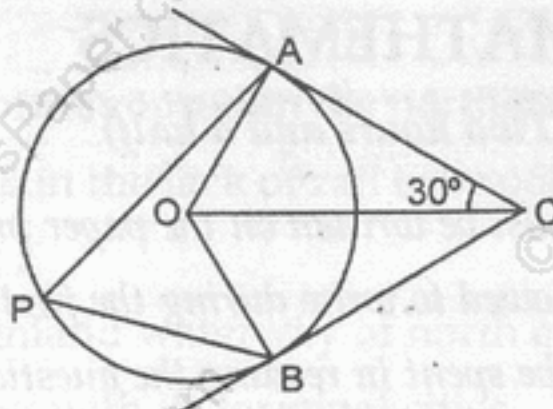
- (b) Solve the following equation :

$$x - \frac{18}{x} = 6. \text{ Give your answer correct to two significant figures.}$$

[3]

- (c) In the given figure, O is the centre of the circle. Tangents at A and B meet at C. If $\angle ACO = 30^\circ$, find :

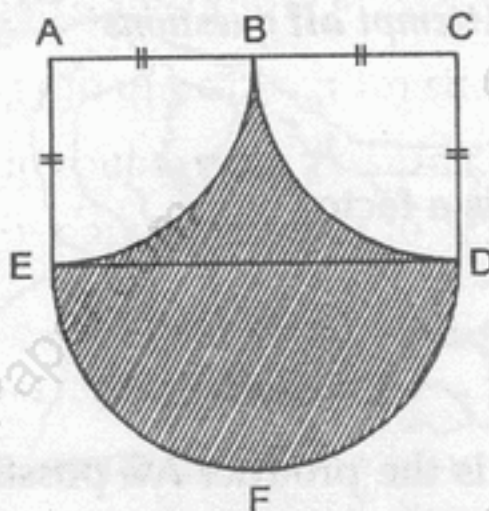
- (i) $\angle BCO$
 (ii) $\angle AOB$
 (iii) $\angle APB$



Question 3.

- (a) Ahmed has a recurring deposit account in a bank. He deposits ₹ 2,500 per month for 2 years. If he gets ₹ 66,250 at the time of maturity, find :
 (i) The interest paid by the bank.
 (ii) The rate of interest.
- (b) Calculate the area of the shaded region, if the diameter of the semi circle is equal to 14 cm.

Take $\pi = \frac{22}{7}$.



- (c) ABC is a triangle and G(4, 3) is the centroid of the triangle. If A = (1, 3), B = (4, b) and C = (a, 1), find 'a' and 'b'. Find the length of side BC.

Question 4.

- (a) Solve the following inequation and represent the solution set on the number line
 $2x - 5 \leq 5x + 4 < 11$, where $x \in \mathbb{I}$
- (b) Evaluate without using trigonometric tables.

$$2\left(\frac{\tan 35^\circ}{\cot 55^\circ}\right)^2 + \left(\frac{\cot 55^\circ}{\tan 35^\circ}\right)^2 - 3\left(\frac{\sec 40^\circ}{\operatorname{cosec} 50^\circ}\right)$$

- (c) A Mathematics aptitude test of 50 students was recorded as follows :

| Marks | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
|-----------------|-------|-------|-------|-------|--------|
| No. of Students | 4 | 8 | 14 | 19 | 5 |

Draw a histogram for the above data using a graph paper and locate the mode

SECTION - B (40 MARKS)

(Attempt any four questions from this Section)

Question 5.

- (a) A manufacturer sells a washing machine to a wholesaler for ₹ 15,000. The wholesaler sells it to a trader at a profit of ₹ 1,200 and the trader in turn sells it to a consumer at a profit of ₹ 1,800. If the rate of VAT is 8% find :
- The amount of VAT received by the State Government on the sale of this machine from the manufacturer and the wholesaler.
 - The amount that the consumer pays for the machine. [3]
- (b) A solid cone of radius 5 cm and height 8 cm is melted and made into small spheres of radius 0.5 cm. Find the number of spheres formed. [3]
- (c) ABCD is a parallelogram where $A(x, y)$, $B(5, 8)$, $C(4, 7)$ and $D(2, -4)$. Find :
- Co-ordinates of A
 - Equation of diagonal BD. [4]

Question 6.

- (a) Use a graph paper to answer the following questions. (Take 1 cm = 1 unit on both axes)
- Plot $A(4, 4)$, $B(4, -6)$ and $C(8, 0)$, the vertices of a triangle ABC.
 - Reflect ABC on the y-axis and name it as $A'B'C'$.
 - Write the co-ordinates of the images A' , B' and C' .
 - Give a geometrical name for the figure $AA' C' B' BC$.
 - Identify the line of symmetry of $AA' C' B' BC$. [5]
- (b) Mr. Choudhury opened a Saving's Bank Account at State Bank of India on 1st April 2007. The entries of one year as shown in his pass book are given below.

| Date | Particulars | Withdrawals (in ₹) | Deposits (in ₹) | Balance (in ₹) |
|-----------------------------|-------------|-----------------------|--------------------|-------------------|
| 1 st April 2007 | By Cash | - | 8550.00 | 8550.00 |
| 12 th April 2007 | To Self | 1200.00 | - | 7350.00 |
| 24 th April 2007 | By Cash | - | 4550.00 | 11900.00 |
| 8 th July 2007 | By Cheque | - | 1500.00 | 13400.00 |
| 10 th Sept. 2007 | By Cheque | - | 3500.00 | 16900.00 |
| 17 th Sept. 2007 | To Cheque | 2500.00 | - | 14400.00 |
| 11 th Oct. 2007 | By Cash | - | 800.00 | 15200.00 |
| 6 th Jan. 2008 | To Self | 2000.00 | - | 13200.00 |
| 9 th March 2008 | By Cheque | - | 950.00 | 14150.00 |

If the bank pays interest at the rate of 5% per annum, find the interest paid on 1st April, 2008. Give your answer correct to the nearest rupee. [5]

Question 7.

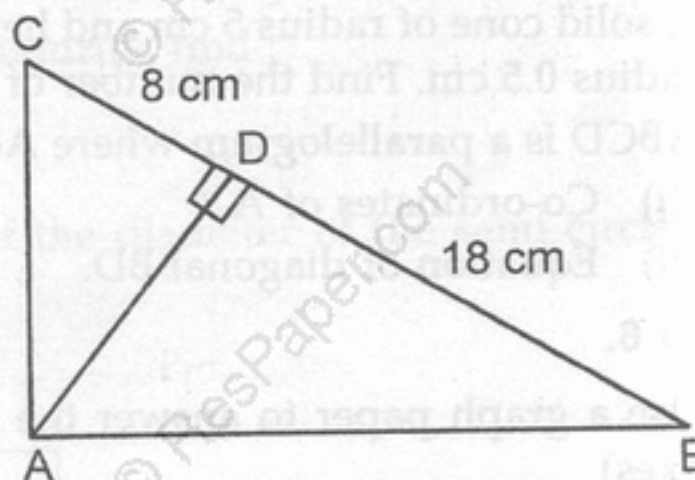
- (a) Using componendo and dividendo, find the value of x .

$$\frac{\sqrt{3x+4} + \sqrt{3x-5}}{\sqrt{3x+4} - \sqrt{3x-5}} = 9$$

[3]

- (b) If $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 4 & -2 \\ -1 & 3 \end{bmatrix}$ and I is the identity matrix of the same order and A^t is the transpose of matrix A , find $A^t \cdot B + BI$. [3]

- (c) In the adjoining figure ABC is a right angled triangle with $\angle BAC = 90^\circ$.
 (i) Prove $\triangle ADB \sim \triangle CDA$.
 (ii) If $BD = 18$ cm, $CD = 8$ cm find AD .
 (iii) Find the ratio of the area of $\triangle ADB$ is to area of $\triangle CDA$.



Question 8.

- (a) (i) Using step-deviation method, calculate the mean marks of the following distribution. [5]
 (ii) State the modal class.

| Class interval | 50-55 | 55-60 | 60-65 | 65-70 | 70-75 | 75-80 | 80-85 | 85-90 |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Frequency | 5 | 20 | 10 | 10 | 9 | 6 | 12 | 8 |

- (b) Marks obtained by 200 students in an examination are given below :

| Marks | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
|-----------------|------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| No. of Students | 5 | 11 | 10 | 20 | 28 | 37 | 40 | 29 | 14 | 6 |

Draw an ogive for the given distribution taking 2 cm = 10 marks on one axis and 2 cm = 20 students on the other axis. Using the graph, determine

- (i) The median marks.
 (ii) The number of students who failed if minimum marks required to pass is 40.
 (iii) If scoring 85 and more marks is considered as grade one, find the number of students who secured grade one in the examination. [5]

Question 9.

- (a) Mr. Parekh invested ₹ 52,000 on ₹ 100 shares at a discount of ₹ 20 paying 8% dividend. At the end of one year he sells the shares at a premium of ₹ 20. Find

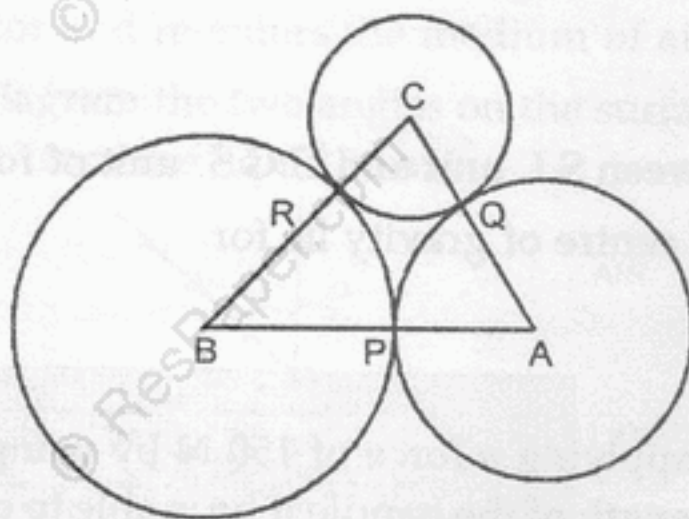
- (i) The annual dividend.
 (ii) The profit earned including his dividend. [3]
 (b) Draw a circle of radius 3.5 cm. Mark a point P outside the circle at a distance of 6 cm from the centre. Construct two tangents from P to the given circle. Measure and write down the length of one tangent. [3]
 (c) Prove that $(\operatorname{cosec} A - \sin A)(\sec A - \cos A) \sec^2 A = \tan A$. [4]

Question 10.

- (a) 6 is the mean proportion between two numbers x and y and 48 is the third proportional of x and y . Find the numbers. [3]
 (b) In what period of time will ₹ 12,000 yield ₹ 3,972 as compound interest at 10% per annum, if compounded on an yearly basis? [3]
 (c) A man observes the angle of elevation of the top of a building to be 30° . He walks towards it in a horizontal line through its base. On covering 60 m the angle of elevation changes to 60° . Find the height of the building correct to the nearest metre. [4]

Question 11.

- (a) ABC is a triangle with $AB = 10$ cm, $BC = 8$ cm and $AC = 6$ cm (not drawn to scale). Three circles are drawn touching each other with the vertices as their centres. Find the radii of the three circles. [3]



- (b) ₹ 480 is divided equally among ' x ' children. If the number of children were 20 more then each would have got ₹ 12 less. Find ' x '. [3]
 (c) Given equation of line L_1 is $y = 4$.
 (i) Write the slope of line L_2 if L_2 is the bisector of angle O.
 (ii) Write the co-ordinates of point P.
 (iii) Find the equation of L_2 . [4]

