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ICSE 2004 : 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 the 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) The compound interest on a certain sum of money at 5% per annum for two years is Rs 246/-. Calculate the simple interest on the same sum for three years at 6% per annum.

[4]

Question 2

- (a) Ms. Chawla goes to a shop to buy a leather coat which costs Rs 735/-. The rate of sales tax is 5%. She tells the shopkeeper to reduce the price of the coat, such that she has to pay only Rs 735/- inclusive of sales tax. Find the reduction needed in the price of the coat.

[3]

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

[3]

find the matrix X, such that $A + X = 2B + C$.

Question 3

(a) Use the factor theorem to factorise completely $x^3 + x^2 - 4x - 4$. [3]

(b) What number should be subtracted from each of the following numbers, 23, 30, 57 and 78 so that the remainders are in proportion? [3]

Question 4

Use a graph paper for this question [5]

A (1, 1), B (5, 1), C (4, 2) and D (2, 2) are the vertices of a quadrilateral.

Name the quadrilateral ABCD. A, B, C and D are reflected in the origin on to A', B', C' and D' respectively. Locate A', B', C' and D' on the graph sheet and write their co-ordinates.

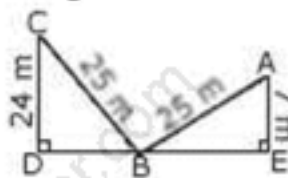
Are D, A, A' and D' collinear?

Question 5

(a) KM is a straight line of 13 units. If K has the co-ordinates (2, 5) and M has the co-ordinates (x, -7), find the possible values of x. [4]

(Type in the answers separated by commas. Leave no spaces around the commas.)

(b) In the figure given, AB = BC = 25 m. [3]
If AE = 7 m and CD = 24 m, find the length of DE.

**Question 6**

(a) Without using tables, find the value of: [2]
 $14 \sin 30^\circ + 6 \cos 60^\circ - 5 \tan 45^\circ$

(b) For the following set of numbers find the median: [3]
10, 75, 3, 81, 17, 27, 4, 48, 12, 47, 9, 15

Question 7

(a) A sheet is 11 cm long and 2 cm wide. Circular pieces 0.5 cm in diameter are cut from it to prepare discs. Calculate the number of discs that can be prepared. [3]

(b) AC and BD are two perpendicular diameters of a circle ABCD. Given that the area of the shaded portion is 308 cm^2 , calculate: [2]

(i) the length of AC and

(b) (ii) the circumference of the circle. [2]

(Take $\pi = 22 / 7$)

(Type in the answers separated by commas. Leave no spaces around the commas.)

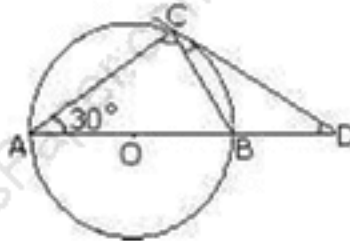
**SECTION B (40 Marks)**

Attempt any **four** questions from this Section.

Question 8

(a) Solve the equation $3x^2 - x - 7 = 0$ and give your answer correct to two decimal places. [3]
(Type in the answers separated by commas. Leave no spaces around the commas.)

(b) In the figure, AB is a diameter and AC is a chord of a circle such that $\angle BAC = 30^\circ$. [3]
The tangent at C intersects AB produced at D. Prove that $BC = BD$.



(c) P (3, 4), Q (7, -2) and R (-2, -1) are the vertices of triangle PQR. Write down the equation of the median of the triangle, through R. [4]

Question 9

(a) The entries in a Savings Bank Pass Book are as given below:

[5]

Date	Particulars	Withdrawals Rs. P.	Deposits Rs. P.	Balance Rs. P.
01.01.03	B/F	--	--	14000.00
01.02.03	By cash	--	11500.00	25500.00
12.02.03	To cheque	5000.00	--	20500.00
05.04.03	By cash	--	3750.00	24250.00
15.04.03	To cheque	4250.00	--	20000.00
09.05.03	By cash	--	1500.00	21500.00
04.06.03	By cash	--	1500.00	23000.00

Calculate the interest for six months (January to June) at 4% per annum on the minimum balance on or after the tenth day of each month.

(b) P and Q are centres of circles of radius 9 cm and 2 cm respectively. $PQ = 17$ cm. R is the centre of a circle of radius x cms, which touches the above circles externally. Given that $\angle PRQ = 90^\circ$, write an equation in x and solve it.

[5]

Question 10

[10]

(a) Mr. Raman's income from his salary for the year 2001-2002 is Rs 3,05,000/-. His savings and donations are as given below:-

Savings:

- Contribution towards Provident Fund: Rs. 40,000/-
- Contribution towards L.I.C. premium: Rs. 24,000/- per year
- Investment in National Saving Certificates: Rs. 15,000/-

Donations:

- To Prime Minister's Relief Fund: Rs. 10,000/- (eligible for 100% tax exemption)
- To religious institutions: Rs. 8,000/- (eligible for 50% tax exemption).

If a sum of Rs. 4,000/- per month was deducted every month towards tax from his salary for the first 11 months of the year, calculate Mr. Raman's income tax liability in the last month of the year.

Tax slab:-

Upto Rs. 50,000	: No tax.
Rs. 50,001 to Rs. 60,000	: 10% of the income exceeding Rs. 50,000.
Rs. 60,001 to Rs. 1,50,000	: Rs. 1,000 + 20% of the income exceeding Rs. 60,000.
Above Rs. 1,50,000	: Rs. 19,000 + 30% of the income exceeding Rs. 1,50,000.

Standard Deduction	: Rs. 20,000.
Surcharge	: A surcharge of 2% is levied if the taxable income is above Rs. 60,000.
Tax Rebate	: An amount equal to 20% of the money deposited in P.F., L.I.C., N.S.C. etc., subject to a maximum of Rs 12,000/- is deducted from the income tax.

(b) The line joining P (-4, 5) and Q (3, 2), intersects the y axis at R. PM and QN are perpendiculars from P and Q on the X axis. Find:

(i) the ratio PR : RQ

(b) (ii) the co-ordinates of R

(b) (iii) the area of the quadrilateral PMNQ.

(Type in the answers separated by commas. Leave no spaces around the commas. Leave no spaces around the : (colon) symbol.)

Question 11

[10]

(a) Given that $x \in I$, solve the inequation and graph the solution on the number line:

$$3 \geq \frac{x-4}{2} + \frac{x}{3} \geq 2$$

(b) In the given figure, DE // BC.

(i) Prove that $\triangle ADE$ and $\triangle ABC$ are similar.

(b) (ii) Given that $AD = \frac{1}{2} BD$, calculate DE, if $BC = 4.5$ cm.

(c) For the following frequency distribution draw a histogram. Hence calculate the mode.

Class	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30
Frequency	2	7	18	10	8	5

Question 12

[10]

(a) A function f is defined by $f(x) = x^2 + 3$, $x \in N$ and $x \leq 5$; find:

(i) the range of $f(x)$

(a) A function f is defined by $f(x) = x^2 + 3$, $x \in N$ and $x \leq 5$; find:

(ii) $f(2) - f(4)$.

(Type in the answers separated by commas. Leave no spaces around the commas.)

(b) Prove $\frac{\sin A}{1 + \cos A} + \frac{1 + \cos A}{\sin A} = 2 \operatorname{cosec} A$.

- (c) A girl fills a cylindrical bucket 32 cm in height and 18 cm in radius with sand. She empties the bucket on the ground and makes a conical heap of the sand. If the height of the conical heap is 24 cm. find: (i) its radius
(c) (ii) its slant height. (Leave your answer in square root form).
(Type in the answers separated by commas. Copy and paste the $\sqrt{\quad}$ (square root) symbol from the question. Leave no spaces in your answer.)

Question 13

- (a) A man invested Rs. 45,000/- in 15% Rs. 100/- shares quoted at Rs. 125/-. When the market value of these shares rose to Rs 140/-, he sold some shares, just enough to raise Rs 8,400/-. Calculate: [2]

(i) the number of shares he still holds

- (a) (ii) the dividend due to him on these remaining shares. [2]

(Type in the answers separated by commas. Leave no spaces around the commas.)

- (b) Classify the relation denoted by the arrow diagram:- [2]



- (c) Two people standing on the same side of a tower in a straight line with it, measure the angles of elevation of the top of the tower as 25° and 50° respectively. If the height of the tower is 70 m, find the distance between the two people. [4]

Question 14

[10]

- (a) Using a ruler and compass only, construct a triangle ABC such that $AB = 5$ cm, $\angle ABC = 75^\circ$ and the radius of the circumcircle of triangle ABC is 3.5 cm.

On the same diagram, construct a circle, touching AB at its middle point, and also touching the side AC.

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

Marks	Number of students

0 - 10	05
10 - 20	10
20 - 30	11
30 - 40	20
40 - 50	27
50 - 60	38
60 - 70	40
70 - 80	29
80 - 90	14
90 - 100	06

Using a graph paper, draw an Ogive for the above distribution. Use your Ogive to estimate:-

- (i) the Median
- (b) (ii) the lower quartile
- (b) (iii) the number of students who obtained more than 80% marks in the examination
- (b) (iv) the number of students who did not pass, if the pass percentage was 35. Use the scale as 2 cm = 10 marks on one axis and 2 cm = 20 students on the other axis.

(Type in the answers separated by commas. Leave no spaces around the commas.)