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26

## 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.*

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*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.*

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### SECTION A (40 Marks)

*Attempt **all** questions from this Section.*

#### Question 1

- (a)  $(x-2)$  is a factor of the expression  $x^3 + ax^2 + bx + 6$ . When this expression is divided by  $(x-3)$ , it leaves the remainder 3. Find the values of  $a$  and  $b$ . [3]
- (b) What number must be added to each of the numbers 6, 15, 20 and 43 to make them proportional? [3]
- (c) If the interest is compounded half yearly, calculate the amount when the Principal is Rs.7,400, the rate of interest is 5% per annum and the duration is one year. [4]

#### Question 2

- (a) Mr. R.K. Nair gets Rs.6,455 at the end of one year at the rate of 14% per annum in a recurring deposit account. Find the monthly instalment. [3]

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This Paper consists of 7 printed pages and 1 blank page.

Turn over

(b)  $A = \{x : 11x - 5 > 7x + 3, x \in \mathbb{R}\}$  and

$B = \{x : 18x - 9 \geq 15 + 12x, x \in \mathbb{R}\}.$

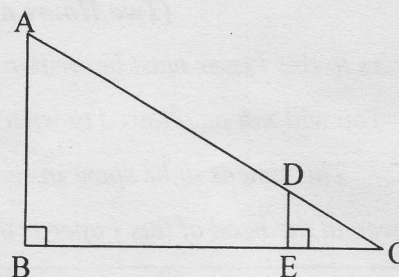
Find the range of set  $A \cap B$  and represent it on a number line.

[3]

- (c) In the given figure, AB and DE are perpendicular to BC.

If  $AB = 9$  cm,  $DE = 3$  cm and

$AC = 24$  cm, calculate AD.



[4]

### Question 3

- (a) Use a graph paper for this question. (Take 10 small divisions = 1 unit on both axes).

P and Q have co-ordinates (0,5) and (-2,4).

- P is invariant when reflected in an axis. Name the axis.
- Find the image of Q on reflection in the axis found in (i).
- (0,k) on reflection in the origin is invariant. Write the value of k.
- Write the co-ordinates of the image of Q, obtained by reflecting it in the origin followed by reflection in x-axis.

[3]

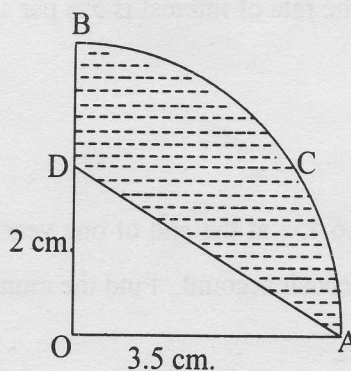
- (b) If the mean of the following distribution is 7.5, find the missing frequency 'f':-

Variable :    5    6    7    8    9    10    11    12

Frequency: 20   17   f   10   8    6    7    6

[3]

- (c) In the figure given below, OACB is a quadrant of a circle. The radius  $OA = 3.5$  cms.  $OD = 2$  cm. Calculate the area of the shaded portion.



[4]

Question 4

- (a) Draw a histogram to represent the following data:-

Pocket money in Rs.	No. of Students
150 - 200	10
200 - 250	5
250 - 300	7
300 - 350	4
350 - 400	3

[3]

- (b) Prove that  $(1 + \tan A)^2 + (1 - \tan A)^2 = 2 \sec^2 A$ .

[3]

- (c) The catalogue price of a computer set is Rs. 45,000. The shopkeeper gives a discount of 7% on the listed price. He gives a further off-season discount of 4% on the balance. However, sales tax at 8% is charged on the remaining amount. Find:-

- (i) The amount of sales tax a customer has to pay,  
(ii) The final price he has to pay for the computer set.

[4]

**SECTION B (40 Marks)**

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

Question 5

- (a) Solve the following equation and give your answer up to two decimal places:-

$$x^2 - 5x - 10 = 0$$

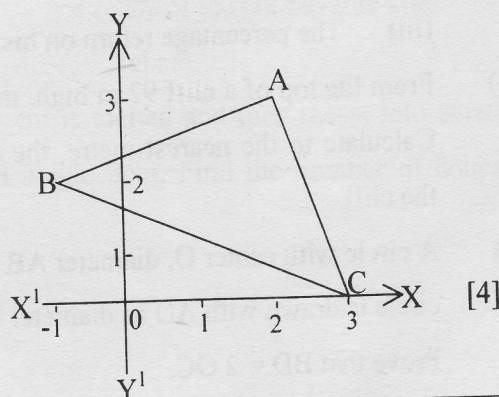
[3]

- (b) PQR is a right-angled triangle with PQ = 3 cm and QR = 4 cm. A circle which touches all the sides of the triangle is inscribed in the triangle. Calculate the radius of the circle.

[3]

- (c) In the adjoining figure, write

- (i) the co-ordinates of A, B and C.  
(ii) the equation of the line through A and // to BC.

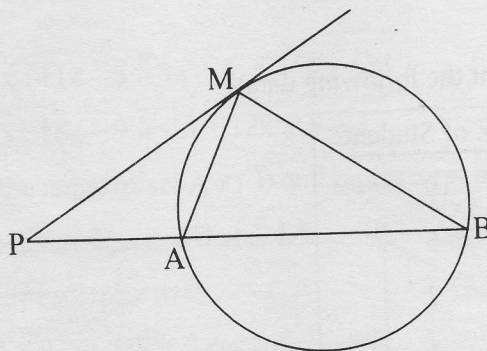


[4]



Question 6

(a)



In the figure, PM is a tangent to the circle and  $PA = AM$ . Prove that:-

(i)  $\triangle PMB$  is isosceles.

(ii)  $PA \cdot PB = MB^2$ .

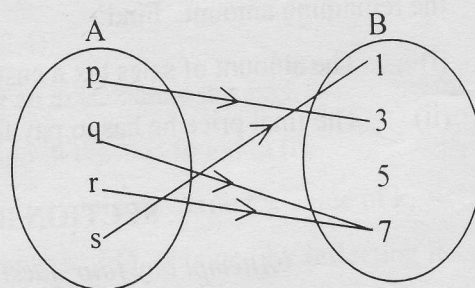
[3]

(b) Find the value of  $x$  given that  $A^2 = B$

$$A = \begin{bmatrix} 2 & 12 \\ 0 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 4 & x \\ 0 & 1 \end{bmatrix}$$

[3]

(c) Write down the relation denoted by the arrow diagram, by listing the ordered pairs. State the domain, co-domain and the range of the relation.



Is the relation a function? If so, state its type.

[4]

Question 7

(a) Mr. Tiwari invested Rs. 29,040 in 15% Rs.100 shares quoted at a premium of 20%. Calculate:-

(i) The number of shares bought by Mr. Tiwari.

(ii) Mr. Tiwari's income from the investment.

(iii) The percentage return on his investment.

[3]

(b) From the top of a cliff 92 m high, the angle of depression of a buoy is  $20^\circ$ . Calculate to the nearest metre, the distance of the buoy from the foot of the cliff.

[3]

(c) A circle with center O, diameter AB and a chord AD is drawn. Another circle is drawn with AO as diameter to cut AD at C.

Prove that  $BD = 2 OC$ .

[4]

Question 8

(a) Mr. Rakesh Sharma receives his annual salary as given below:-

- Basic Salary : Rs.6,000 per month.
- Dearness Allowance : Rs.5,000 per month.

Savings:

- Contribution towards Provident Fund: Rs.13,200 per year.
- Contribution towards L.I.C. premium: Rs. 5,000 per year.

Donations:

- To Prime Minister's Relief Fund : Rs.2,000 (eligible for 100% tax exemption)

Calculate:-

- (i) Mr. Sharma's taxable income,
- (ii) The tax Mr. Sharma has to pay for the financial year.

Tax slab:-

Upto Rs.50,000	:	No tax.	
Rs.50,001 to Rs. 60,000	:	10% of 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.	
Rebate in tax	:	20% of the total savings or Rs.14,000 whichever is less.	
CESS	:	2% of the tax payable after rebate.	[6]

- (b) A metallic sphere of radius 10.5 cm is melted and then recast into small cones, each of radius 3.5cm and height 3cm. Find the number of cones thus obtained. [4]



Question 9

- (a) Use a graph paper for this question.

The graph of a linear equation in  $x$  and  $y$ , passes through  $A(-1, -1)$  and  $B(2, 5)$ . From your graph, find the values of  $h$  and  $k$ , if the line passes through  $(h, 4)$  and  $(\frac{1}{2}, k)$ .

[3]

- (b) In an isosceles triangle  $ABC$ , with  $AB = AC$ ,  $BD$  is the perpendicular from  $B$  to the side  $AC$ . Prove that  $BD^2 - CD^2 = 2CD \cdot AD$ .

[3]

- (c) A page from the passbook of Mrs. Rama Bhalla is given below:-

Date	Particulars	Withdrawals		Deposit		Balance		Signature
Year 2004		Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	
January 1	B/F	--	--	--	--	2000.00		
January 9	By cash	--	--	200.00		2200.00		
February 10	To cheque	500.00		--	--	1700.00		
February 24	By cheque	--	--	300.00		2000.00		
July 29	To cheque	200.00		--	--	1800.00		
November 7	By cash	--	--	300.00		2100.00		
December 8	By cash	--	--	200.00		2300.00		

Calculate the interest due to Mrs. Bhalla for the period from January 2004 to December 2004, at the rate of 5% per annum.

[4]

Question 10

- (a) Using a ruler and compass only:-

- (i) Construct a triangle  $ABC$  with

$BC = 6$  cm,  $\angle ABC = 120^\circ$  and  $AB = 3.5$  cm.

- (ii) In the above figure, draw a circle with  $BC$  as diameter. Find a point 'P' on the circumference of the circle which is equidistant from  $AB$  and  $BC$ .

Measure  $\angle BCP$ .

[4]

- (b) Using a graph paper, draw an Ogive for the following distribution which shows a record of the weight in kilograms of 200 students.

Weight	Frequency
40 — 45	5
45 — 50	17
50 — 55	22
55 — 60	45
60 — 65	51
65 — 70	31
70 — 75	20
75 — 80	9

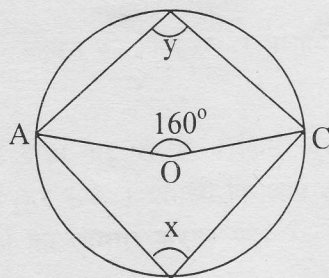
Use your Ogive to estimate the following:-

- The percentage of students weighing 55 kg or more,
- The weight above which the heaviest 30% of the students fall,
- The number of students who are (1) under-weight and (2) over-weight, if 55.70 kg is considered as standard weight.

[6]

#### Question 11

(a)



In the above figure, O is the centre of the circle and  $\angle AOC = 160^\circ$ .

Prove that  $3\angle y - 2\angle x = 140^\circ$ .

[3]

- (b) Without using mathematical tables, find the value of x if

$$\cos x = \cos 60^\circ \cos 30^\circ + \sin 60^\circ \sin 30^\circ.$$

[3]

- (c) By increasing the speed of a car by 10 km/hr, the time of journey for a distance of 72 km. is reduced by 36 minutes. Find the original speed of the car.

[4]



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