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) Solve the following inequation and represent the solution set on the number line.

$$-3 < -\frac{1}{2} - \frac{2x}{3} \le \frac{5}{6}, \quad x \in R.$$ [3]

(b) Tarun bought an article for Rs.8000 and spent Rs.1000 for transportation. He marked the article at Rs.11,700 and sold it to a customer. If the customer had to pay 10% sales tax, find

   (i) The customer's price

   (ii) Tarun's profit percent. [3]

(c) Mr. Gupta opened a recurring deposit account in a bank. He deposited Rs.2500 per month for two years. At the time of maturity he got Rs.67,500. Find

   (i) the total interest earned by Mr. Gupta.

   (ii) the rate of interest per annum. [4]

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

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Question 2

(a) Given A = $\begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix}$, B = $\begin{bmatrix} 6 \\ 1 \end{bmatrix}$, C = $\begin{bmatrix} -4 \\ 5 \end{bmatrix}$ and D = $\begin{bmatrix} 2 \\ 2 \end{bmatrix}$

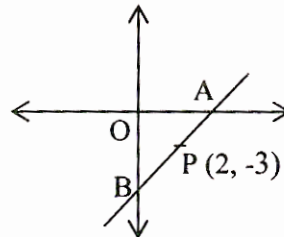Find   AB + 2C − 4D   [3]

(b) Nikita invests Rs.6000 for two years at a certain rate of interest compounded annually. At the end of first year it amounts to Rs.6720. Calculate

   (i)   the rate of interest.

   (ii)   the amount at the end of the second year.   [3]

(c) A and B are two points on the x-axis and y-axis respectively. P(2, -3) is the mid point of AB. Find the

   (i)   Coordinates of A and B.

   (ii)   Slope of line AB.

   (iii)   equation of line AB.   [4]

Question 3

(a) Cards marked with numbers 1, 2, 3, 4, …. 20 are well shuffled and a card is drawn at random. What is the probability that the number on the card is

   (i)   a prime number

   (ii)   divisible by 3

   (iii)   a perfect square?   [3]

(b) Without using trigonometric tables evaluate

$$\frac{\sin 35° \cos 55° + \cos 35° \sin 55°}{\operatorname{cosec}^2 10° - \tan^2 80°}$$ [3]

(c) (*Use graph paper for this question*)

   A(0, 3), B(3, -2) and O(0, 0) are the vertices of triangle ABO.

   (i)   Plot the triangle on a graph sheet taking 2 cm = 1 unit on both the axes.

   (ii)   Plot D the reflection of B in the Y axis, and write its co-ordinates.

   (iii)   Give the geometrical name of the figure ABOD.

   (iv)   Write the equation of the line of symmetry of the figure ABOD.   [4]

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Question 4

(a) When divided by x-3 the polynomials $x^3 - px^2 + x + 6$ and $2x^3 - x^2 - (p+3)x - 6$ leave the same remainder. Find the value of 'p'. [3]

(b) In the figure given below AB and CD are two parallel chords and O is the centre. If the radius of the circle is 15 cm, find the distance MN between the two chords of length 24 cm and 18 cm respectively. [3]
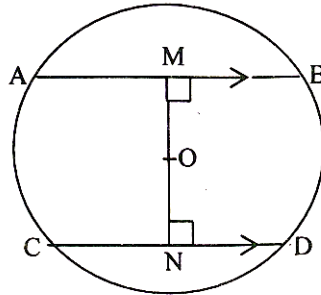
(c) The distribution given below shows the marks obtained by 25 students in an aptitude test. Find the mean, median and mode of the distribution. [4]

Marks obtained	5	6	7	8	9	10
No. of students	3	9	6	4	2	1

SECTION B (40 Marks)

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

Question 5

(a) Without solving the following quadratic equation, find the value of '*p*' for which the roots are equal.

$$px^2 - 4x + 3 = 0.$$ [3]

(b) Rohit borrows Rs.86,000 from Arun for two years at 5% per annum simple interest. He immediately lends out this money to Akshay at 5% compound interest compounded annually for the same period. Calculate Rohit's profit in the transaction at the end of two years. [3]

(c)   Mrs. Kapoor opened a Savings Bank Account in State Bank of India on 9th January 2008. Her pass book entries for the year 2008 are given below:

Date	Particulars	Withdrawals (in Rs.)	Deposits (in Rs.)	Balance (in Rs.)
Jan 9, 2008	By Cash	-	10,000	10,000
Feb 12, 2008	By Cash	-	15,500	25,500
April 6, 2008	To Cheque	3500	-	22,000
April 30, 2008	To Self	2000	-	20,000
July 16, 2008	By Cheque	-	6500	26,500
Aug 4, 2008	To Self	5500	-	21,000
Aug 20, 2008	To Cheque	1200	-	19,800
Dec 12, 2008	By Cash	-	1700	21500

Mrs. Kapoor closes the account on 31st December, 2008. If the bank pays interest at 4% per annum, find the interest Mrs. Kapoor receives on closing the account. Give your answer correct to the nearest rupee.   [4]

Question 6

(a)   A manufacturer marks an article for Rs.5000. He sells it to a wholesaler at a discount of 25% on the marked price and the wholesaler sells it to a retailer at a discount of 15% on the marked price. The retailer sells it to a consumer at the marked price and at each stage the VAT is 8%. Calculate the amount of VAT received by the Government from:

(i)   the wholesaler

(ii)   the retailer   [3]

(b)   In the following figure O is the centre of the circle and AB is a tangent to it at point B. $\angle BDC = 65°$. Find $\angle BAO$.   [3]

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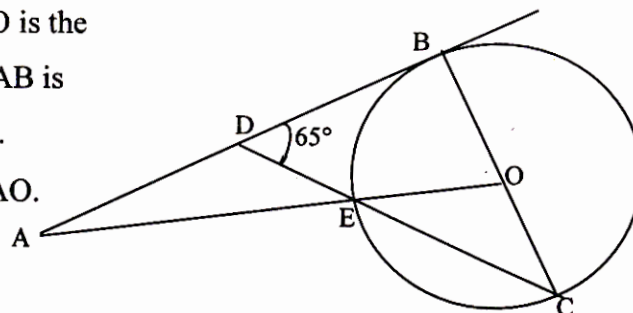
(c) A doorway is decorated as shown in the figure. There are four semi-circles. BC, the diameter of the larger semi circle is of length 84 cm. Centres of the three equal semi-circles lie on BC. ABC is an isosceles triangle with AB = AC. If BO = OC, find the area of the shaded region. (Take $\pi = \frac{22}{7}$)
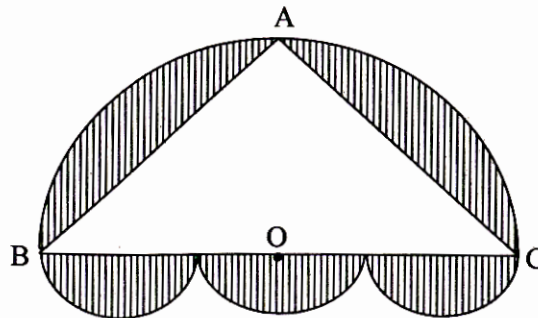
[4]

Question 7

(a) *Use ruler and compasses only for this question*

   (i) Construct ΔABC, where AB = 3.5 cm, BC=6 cm and ∠ABC = 60°.

   (ii) Construct the locus of points inside the triangle which are equidistant from BA and BC.

   (iii) Construct the locus of points inside the triangle which are equidistant from B and C.

   (iv) Mark the point P which is equidistant from AB, BC and also equidistant from B and C. Measure and record the length of PB. [3]

(b) The equation of a line is 3x + 4y – 7 = 0. Find

   (i) the slope of the line.

   (ii) the equation of a line perpendicular to the given line and passing through the intersection of the lines x – y + 2 = 0 and 3x + y – 10 = 0. [3]

(c) The mean of the following distribution is 52 and the frequency of class interval 30-40 is '*f*'. Find '*f*'.

| Class Interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	5	3	*f*	7	2	6	13

[4]

Question 8

(a)   Use the Remainder Theorem to factorise the following expression:

$$2x^3 + x^2 - 13x + 6$$ [3]

(b)   If x, y, z are in continued proportion, prove that $\dfrac{(x+y)^2}{(y+z)^2} = \dfrac{x}{z}$.   [3]

(c)   From the top of a light house 100 m high the angles of depression of two ships on opposite sides of it are 48° and 36° respectively. Find the distance between the two ships to the nearest metre.
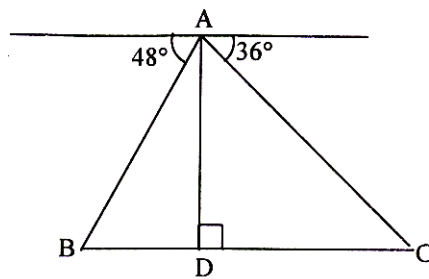
[4]

Question 9

(a)   Evaluate
$$\begin{bmatrix} 4\sin 30° & 2\cos 60° \\ \sin 90° & 2\cos 0° \end{bmatrix} \begin{bmatrix} 4 & 5 \\ 5 & 4 \end{bmatrix}$$ [3]

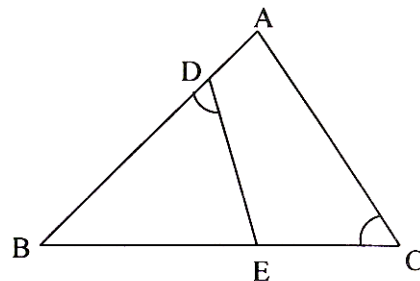(b)   In the give figure ABC is a triangle with ∠EDB = ∠ACB.

Prove that ΔABC ~ ΔEBD.

If BE = 6 cm, EC = 4 cm, BD = 5 cm

and area of ΔBED = 9 cm². Calculate the

(i)   length of AB

(ii)   area of ΔABC

[3]

(c)   Vivek invests Rs.4500 in 8%, Rs.10 shares at Rs.15. He sells the shares when the price rises to Rs.30, and invests the proceeds in 12% Rs.100 shares at Rs.125. Calculate

(i)   the sale proceeds

(ii)   the number of Rs.125 shares he buys.

(iii)   the change in his annual income from dividend.   [4]

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Question 10

(a) A positive number is divided into two parts such that the sum of the squares of the two parts is 208. The square of the larger part is 8 times the smaller part. Taking x as the smaller part of the two parts, find the number. [4]

(b) The monthly income of a group of 320 employees in a company is given below:

Monthly Income	No. of Employees
6000 - 7000	20
7000 - 8000	45
8000 - 9000	65
9000 - 10000	95
10000 - 11000	60
11000 - 12000	30
12000 - 13000	5

Draw an ogive of the given distribution on a graph sheet taking 2 cm = Rs.1000 on one axis and 2 cm = 50 employees on the other axis. From the graph determine

(i) the median wage

(ii) the number of employees whose income is below Rs.8500.

(iii) If the salary of a senior employee is above Rs.11,500, find the number of senior employees in the company.

(iv) the upper quartile. [6]

Question 11

(a) Construct a regular hexagon of side 4 cm. Construct a circle circumscribing the hexagon. [3]

(b) A hemispherical bowl of *diameter* 7.2 cm is filled completely with chocolate sauce. This sauce is poured into an inverted cone of radius 4.8 cm. Find the height of the cone. [3]

(c) Given $x = \dfrac{\sqrt{a^2+b^2} + \sqrt{a^2-b^2}}{\sqrt{a^2+b^2} - \sqrt{a^2-b^2}}$

Use componendo and dividendo to prove that $b^2 = \dfrac{2a^2 x}{x^2 + 1}$. [4]

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