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 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) Find the value of 'k' if $4x^3 - 2x^2 + kx + 5$ leaves remainder -10 when divided by $2x + 1$. [3]

(b) Amit deposits ₹ 1600 per month in a bank for 18 months in a recurring deposit account. If he gets ₹ 31,080 at the time of maturity, what is the rate of interest per annum? [3]

(c) The price of an article is ₹ 9350 which includes VAT at 10%. Find how much less a customer pays for the article, if the VAT on the article decreases by 3%. [4]

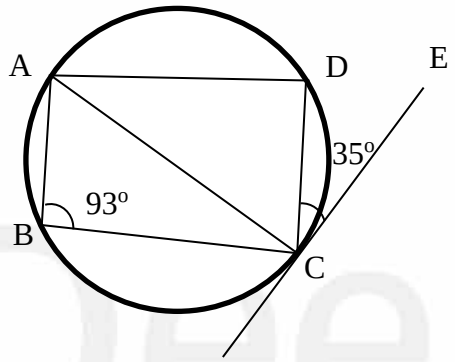
Question 2

(a) Solve the following inequation and represent your solution on the real number line:

$-5\frac{1}{2} - x \leq \frac{1}{2} - 3x \leq 3\frac{1}{2} - x,\ x \in R$ [3]

(b) Find the 16th term of the A.P. 7, 11, 15, 19…. Find the sum of the first 6 terms. [3]

(c) In the given figure CE is a tangent to the circle at point C. ABCD is a cyclic quadrilateral. If ∠ABC = 93° and ∠DCE = 35°.



Find:

(i) ∠ADC

(ii) ∠CAD

(ii) ∠ACD [4]

Question 3

(a) Prove the following identity

$\frac{\sec A}{\sec A - 1} + \frac{\sec A}{\sec A + 1} = 2\text{cosec}^2\text{A}$ [3]

(b) Find x and y if :

$3\begin{bmatrix} 5 & -6 \\ 4 & x \end{bmatrix} - \begin{bmatrix} 6 & y \\ 0 & 6 \end{bmatrix} = 3\begin{bmatrix} 3 & -2 \\ 4 & 0 \end{bmatrix}$ [3]

(c) For what value of 'k' will the following quadratic equation:

$(k+1)x^2 - 4kx + 9 = 0$ have real and equal roots? Solve the equations. [4]

Question 4

(a) A box consists of 4 red, 5 black and 6 white balls. One ball is drawn out at random. Find the probability that the ball drawn is:

(i) black

(ii) red or white [3]

(b) Calculate the median and mode for the following distribution:

Weight (in kg)	35	47	52	56	60
No. of students	4	3	5	3	2

[3]

(c) A solid cylinder of radius 7 cm and height 14 cm is melted and recast into solid spheres each of radius 3.5 cm. Find the number of spheres formed. [4]

SECTION B (40 Marks)

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

Question 5

(a) The 2^{nd} and 45^{th} term of an arithmetic progression are 10 and 96 respectively. Find the first term and the common difference and hence find the sum of the first 15 terms. [3]

(b) If $A = \begin{bmatrix} 3 & -1 \\ 0 & 2 \end{bmatrix}$, find matrix B such that $A^2 - 2B = 3A + 5I$ where I is a 2 x 2 identity matrix. [3]

(c) With the help of a graph paper, taking 1cm=1unit along both x and y axis:

(i) Plot points A (0, 3), B (2, 3), C (3, 0), D (2, -3), E (0, -3)

(ii) Reflect points B, C and D on the y axis and name them as B', C' and D' respectively.

(iii) Write the co-ordinates of B', C' and D'.

(iv) Write the equation of line B' D'.

(v) Name the figure BCDD'C'B'B [4]

Question 6

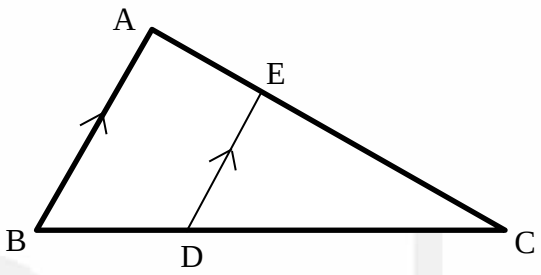
(a) In Δ ABC and ΔEDC, AB is parallel to ED. BD = $\frac{1}{3}$BC and AB = 12.3 cm.

(i) Prove that ΔABC ~ΔEDC.

(ii) Find DE

(iii) Find:

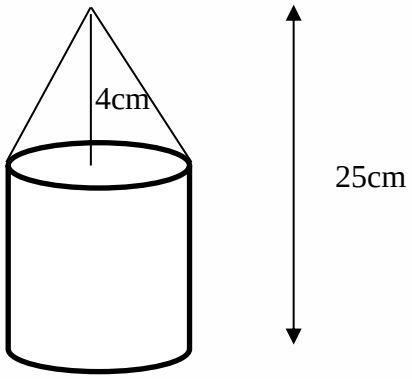
$$\frac{area\ of\ \Delta EDC}{area\ of\ \Delta ABC}$$



[3]

(b) Find the ratio in which the line joining (-2, 5) and (-5, -6) is divided by the line y = -3. Hence find the point of intersection. [3]

(c) The given solid figure is a cylinder surmounted by a cone. The diameter of the base of the cylinder is 6 cm. The height of the cone is 4 cm and the total height of the solid is 25 cm. Take $\pi = \frac{22}{7}$.



Find the:

(i) Volume of the solid

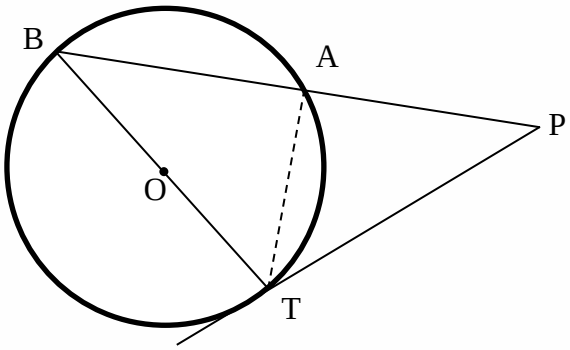
(ii) Curved surface area of the solid

Give your answers correct to the nearest whole number. [4]

Question 7

(a) In the given figure, PAB is a secant and PT a tangent to the circle with centre O.

If ∠ATP = 40°, PA = 9 cm and AB = 7 cm.



Find:

(i) ∠APT

(ii) length of PT [3]

(b) The 1st and the 8th term of a GP are 4 and 512 respectively. Find:

(i) the common ratio

(ii) the sum of its first 5 terms. [3]

(c) The mean of the following distribution is 49. Find the missing frequency *'a'*.

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	15	20	30	*a*	10

[4]

Question 8

(a) Prove the following identity

$(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 5 + \sec^2 A \cdot \operatorname{cosec}^2 A$ [3]

(b) Find the equation of the perpendicular bisector of line segment joining A(4, 2) and B(-3, -5) [3]

(c) Using properties of proportion, find $x : y$ if

$$\frac{x^3 + 12x}{6x^2 + 8} = \frac{y^3 + 27y}{9y^2 + 27}$$

[4]

Question 9

(a) The difference of the squares of two natural numbers is 84. The square of the larger number is 25 times the smaller number. Find the numbers. [4]

(b) The following table shows the distribution of marks in Mathematics:

Marks (less than)	No. of students
10	7
20	28
30	54
40	71
50	84
60	105
70	147
80	180

With the help of a graph paper, taking 2 cm = 10 units along one axis and 2 cm = 20 units along the other axis, plot an ogive for the above distribution and use it to find the:

(i) median.

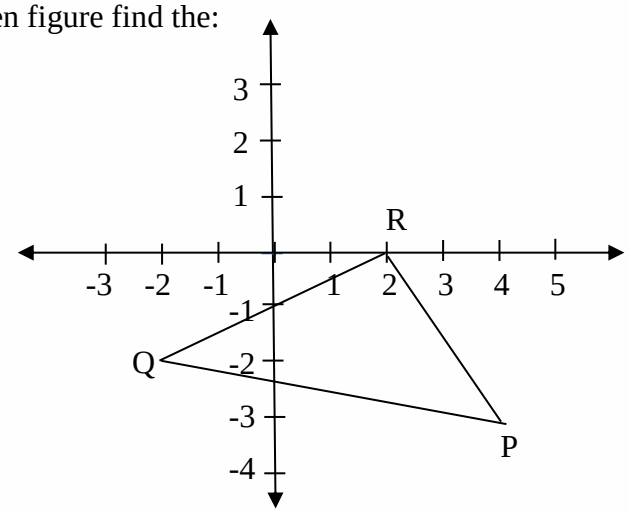
(ii) number of students who scored distinction marks (75% and above)

(iii) number of students, who passed the examination if pass marks is 35%. [6]

Question 10

(a) Prove that two tangents drawn from an external point to a circle are of equal length. [3]

(b) From the given figure find the:



(i) Coordinates of points P, Q, R.

(ii) Equation of the line through P and parallel to QR. [3]

(c) A manufacturer sells an article to a wholesaler with marked price ₹ 2000 at a discount of 20% on the marked price. The wholesaler sells it to a retailer at a discount of 12% on the marked price. The retailer sells the article at the marked price. If the VAT paid by the wholesaler is ₹ 11.20, find the:

(i) Rate of VAT

(ii) VAT paid by the retailer. [4]

Question 11

(a) Mr. Sharma receives an annual income of ₹ 900 in buying ₹ 50 shares selling at ₹ 80. If the dividend declared is 20%, find the:

(i) Amount invested by Mr. Sharma.

(ii) Percentage return on his investment. [3]

(b) Two poles AB and PQ are standing opposite each other on either side of a road 200 m wide. From a point R between them on the road, the angles of elevation of the top of the poles AB and PQ are 45^o and 40^o respectively. If height of AB = 80 m, find the height of PQ correct to the nearest metre. [3]

(c) Construct a triangle PQR, given RQ = 10 cm, $\angle PRQ = 75^o$ and base RP = 8 cm. Find by construction:

(i) The locus of points which are equidistant from QR and QP.

(ii) The locus of points which are equidistant from P and Q.

(iii) Mark the point O which satisfies conditions (i) and (ii). [4]