MATHEMATICS

Maximum Marks: 80

Time allowed: Three hours

1. *Answers to this Paper must be written on the paper provided separately.*

2. *You will **not** be allowed to write during first **15** minutes.*

3. *This time is to be spent in reading the question paper.*

4. ***The time given at the head of this Paper is the time allowed for writing the answers.***

5. *Attempt **all** questions from **Section A** and **any four** questions from **Section B**.*

6. ***All working, including rough work, must be clearly shown, and must be done on the same sheet as the rest of the answer.***

7. ***Omission of essential working will result in loss of marks.***

8. *The intended marks for questions or parts of questions are given in brackets [ ]*

9. ***Mathematical tables and graph papers are to be provided by the school.***

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

This paper consists of 15 printed pages and 1 blank page.

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

Question 1

Choose the correct answers to the questions from the given options. [15]

(Do not copy the questions, write the correct answers only.)

(i)   When polynomial $x^3 - 3x^2 - 6x + 8$ is divided by $(x + 2),$ the remainder is zero. The **probability** of $(x + 2)$ to be one of the factors of the given polynomial is:

        (a)   0

        (b) $\dfrac{1}{3}$

        (c) $\dfrac{2}{3}$

        (d)   1

(ii)   **Assertion (A):**   In $\triangle ABC$ and $\triangle PQR$, if $\angle BAC = \angle QPR$ and $\angle ABC = \angle PQR$, then $\triangle ABC \sim \triangle PQR$

        Reason (R): $\triangle ABC \sim \triangle PQR$ by **SSS** axiom

        (a)   (A) is true, (R) is false.

        (b)   (A) is false, (R) is true.

        (c)   Both (A) and (R) are true, and (R) is the correct reason for (A).

        (d)   Both (A) and (R) are true, and (R) is the incorrect reason for (A).

(iii)   The ratio of **diameters** of two right circular cones is **3 : 7** and that of their heights is **14 : 9**, then their **volumes** are in ratio:

(a)   3 : 7

(b)   2 : 7

(c)   3 : 2

(d)   9 : 49

(iv)   The value of p for which $(x - p)$ is a factor of $x^3 - px^2 + x + 5$ is:

(a) $- 5$

(b) $- 4$

(c)   5

(d) $p + 5$

(v)   The **GST** of an article is reduced from **12%** to **5%** and due to this, the price paid for the article is cut down by **₹14**. The original price of the article is:

(a)   ₹50

(b)   ₹98

(c)   ₹100

(d)   ₹200

(vi)   The mean of 1^2, 2^2, 3^3 and 4^4 is:

(a)   24

(b)   72

(c)   144

(d)   264

(vii)   If $2x - 15 > 4x + 9$, then:

(a) $x < -12$

(b) $x < 12$

(c) $x > -12$

(d) $x > 12$

(viii)   **Assertion(A):**   If the length of shadow of a person is equal to his height, then the angle of elevation of the sun is **45°**.

Reason(R):   For any right-angled triangle, $tan\,\theta = \frac{Perpendicular}{Base}$

(a)   (A) is true, (R) is false.

(b)   (A) is false, (R) is true.

(c)   Both (A) and (R) are true, and (R) is the correct reason for (A).

(d)   Both (A) and (R) are true, and (R) is the incorrect reason for (A).

(ix)   The roots of the quadratic equation $3x^2 = 6x$ is:

(a)   0

(b)   2

(c)   0 and 2

(d)   0 and 6

(x)   The **locus** of a toy bird fixed at the tip of one of the blades of a rotating ceiling fan is a:

(a)   straight line

(b)   circle

(c)   semi-circular arc

(d)   diameter of the circle so formed

(xi)   Percentage return on **₹100, 12%** share of a company bought at **4%** discount is:

(a)   10%

(b)   12%
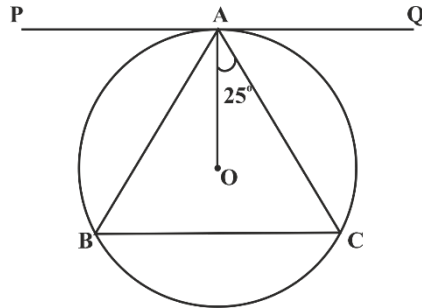
(c)   12.5%

(d)   16%

(xii)   If matrix **A** of order **2 × 1** and matrix **B** of order **2 × 2** are added, then the order of the matrix A + B is:

(a)   2 × 2

(b)   2 × 1

(c)   1 × 2

(d)   A + B is not possible

(xiii)   In the adjoining diagram, **PQ** is a tangent at **A** to the circle with centre **O**. If $\angle OAC = 25^\circ$, then $\angle ABC$ is:

(a)   20º

(b)   65º

(c)   70º

(d)   130º

(xiv)   The line segment joining **A(–7, 2)** and **B(3, –8)** is divided by the **x-axis** in the ratio:

(a)   1 : 4

(b)   3 : 7

(c)   4 : 1

(d)   7 : 3

(xv)   Mr. Rahul deposited **₹11,700** in a recurring deposit account for **$1\frac{1}{2}$** years.

The amount deposited by him per month is:
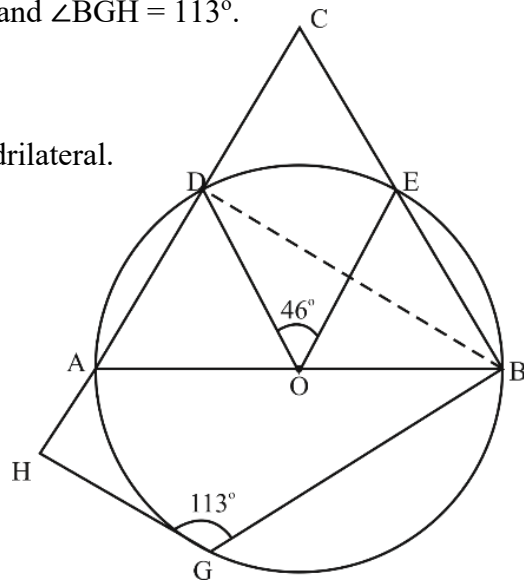
(a)   ₹650

(b)   ₹780

(c)   ₹6,500

(d)   ₹7,800

Question 2

(i)   A retailer purchased an air conditioner (A.C.) for **₹30,000**. He marked up its   [4]
price by **20%** and then allows a discount of **10%** on the marked price to a
customer. If the sale is intra-state and the rate of GST is **28%**, find the:

(a)   marked price of A.C.

(b)   total amount paid by the customer including GST.

(c)   tax collected by the central and the state governments respectively.

(ii)   In the adjoining diagram ∠DOE = 46° and ∠BGH = 113°.   [4]

(a)   Find ∠DBC and ∠DCE.

(b)   Prove that CBGH is a cyclic quadrilateral.

(iii) The table given below shows a record of the weight in kilogram of **200** [4] students of a school.

Weight (kg)	Number of students
40 – 45	8
45 – 50	19
50 – 55	24
55 – 60	45
60 – 65	51
65 – 70	31
70 – 75	22

Draw a histogram and find the **modal weight**.

[Take 2 cm = 5 kg along one axis and 2 cm = 5 students along the other axis]
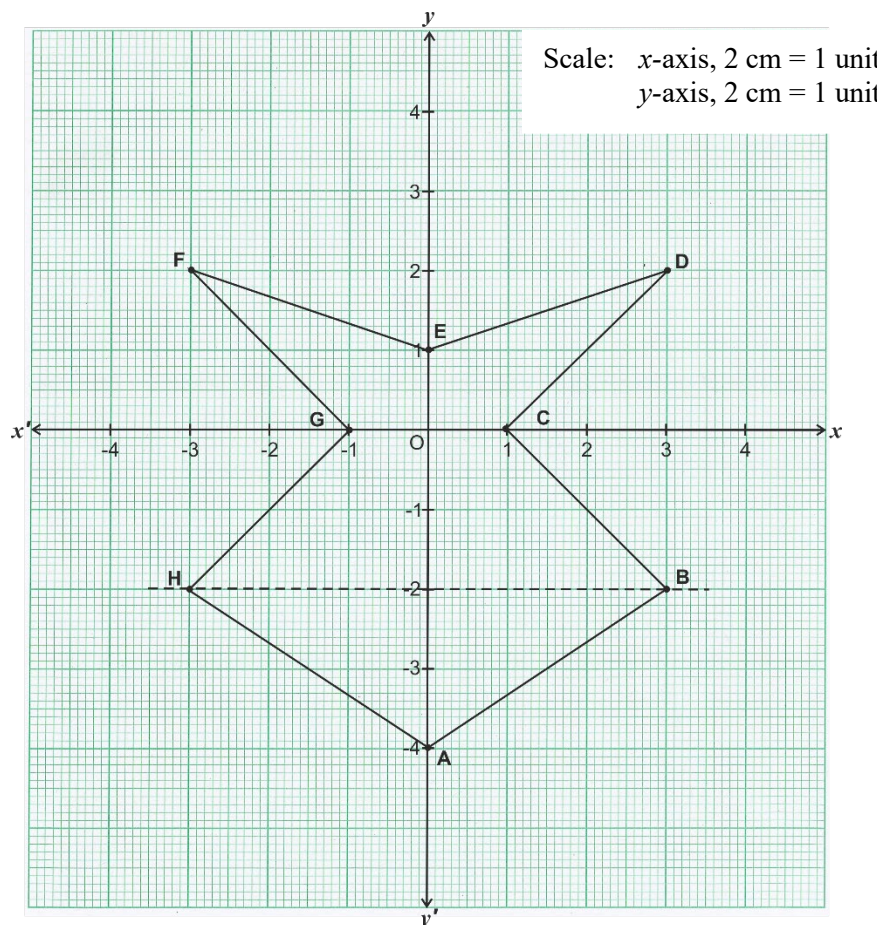
Question 3

(i) Prove that: [4]

$$\frac{(sinA - sin^3 A)}{(cos^3 A - cosA)} \times (secA - cosecA) = cosecA(cotA - 1)$$

(ii) If $2x^3 - 3x^2 - 3x + 2 = (2x - 1)(x^2 + ax + b)$: [4]

(a) using Remainder and Factor theorem, find the value of 'a' and 'b'.

(b) **hence**, factorise the polynomial $2x^3 - 3x^2 - 3x + 2$ completely.

Scale: x-axis, 2 cm = 1 unit
y-axis, 2 cm = 1 unit

[5]

Using the given graph, answer the following:

(a) Write down the coordinates of the points **A**, **B**, **C**, and **E**.

(b) Name and write down the coordinates of the image of **B** under reflection in **x-axis**.

(c) Name and write the coordinates of the image of **D** under reflection through the **origin**.

(d) Which point is the image of **A** under reflection on the line **BH?** Write its coordinates.

(e) Name the closed figure **ABCDEFGH.**

SECTION B (40 Marks)

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

Question 4

(i) The sum of two numbers is **2** and the sum of their reciprocals is **2.25**. Find the numbers. [3]

(ii) A right circular cone of radius **20 cm** has its volume **8800 cm³**. Find its: [3]

    (a) height

    (b) curved surface area

    Give your answer to the nearest whole number.

    [Use $\pi = \frac{22}{7}$]

(iii) Construct a regular hexagon of side **4.5 cm**. Hence, construct a circle circumscribing the regular hexagon. Use ruler and compass for the construction. Measure and write down the radius of the circle. [4]

Question 5

(i) **164, 160, 156, 152, ……** are in Arithmetic Progression (A.P.). Find: [3]

    (a) which term is equal to 0.

    (b) the sum of its first 20 terms.

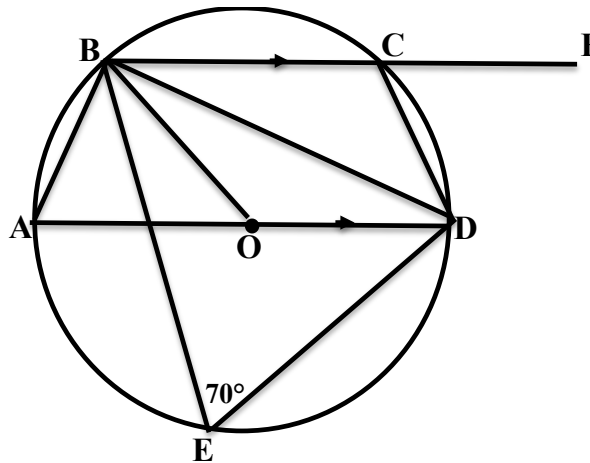(ii)   Solve the following quadratic equation: [3]

$$3x^2 + 6x - 4 = 0$$

Give your answer correct to two places of decimals

(Use Mathematical tables, if necessary)

(iii)   In the adjoining figure of a circle with centre **O** and diameter **AD**, ∠**BED** = **70°**   [4]
         and **BC** is parallel to **AD**. Find:

(a)   ∠BAD

(b)   ∠BOD

(c)   ∠DBC

(d)   ∠DCF

Question 6

(i)   Solve the inequation, write down the solution set and represent it on a real number   [3]
         line:

$$3x - 16 < \frac{2x}{5} - 3 \leq -\frac{3}{5} + 2x ; \quad x \in R$$

(ii) If the **6th** term of a series in Geometric Progression (G.P.) is **32** and the **9th** term   [3]
is **256**, find the:

(a) first term and the common ratio.

(b) sum of its first 10 terms.

(iii) An ice cream cone has a diameter of **7 cm** and its height is **9 cm**. It is filled with   [4]
a scoop of spherical shaped ice cream of radius **3.5 cm.**
Find: (Give all answers correct to the nearest whole number)

(a) on melting, is the ice cream sufficient to fill the cone completely without
any wastage?

(b) the volume of ice cream, if any, is in excess or less.

[Use $\pi = \frac{22}{7}$]

Question 7

(i)   There are some red, green and white marbles in a box. One marble is picked up   [3]
at random from this box. If the probability of picking up a red marble is $\frac{2}{9}$ and

that of picking up a green marble is $\frac{4}{9}$ then find the:

    (a)   probability of picking up a white marble.

    (b)   number of green marbles, if total number of marbles is **54**.

    (c)   probability of **not** picking up a red marble.

(ii)   Mr. Anil has a recurring deposit account. He deposits a certain amount of money   [3]
per month for **2** years. If he received an interest whose value is the double of the
deposit made per month, then find the rate of interest.

(iii)   If *a, b, c* and *d* are in continued proportion, prove that   [4]

$$ad(c^2 + d^2) = c^3(b + d)$$

Question 8

(i)   **₹100** shares of a company giving **10%** dividend are selling at **₹150**. Mr. Saha   [3]
invests **₹18000** to buy these shares. He sells **80%** of his shares after one year.
Find:

    (a)   the number of shares he purchased.

    (b)   the number of shares he sold.

    (c)   his annual income from the remaining **20%** shares he still holds.

(ii)   Equation of a line **AB** is $x + 2y + 6 = 0$. A perpendicular **PQ** is dropped on AB   [3]
from the point **P(3, –2)** meeting AB at **Q**. Find the:

(a)   equation of PQ.

(b)   coordinates of the point Q.

(iii)   Divide **20** into two parts such that the sum of their squares is **272**. The larger of   [4]
two parts is square of the other. Assuming the smaller part to be '**x**', form an
equation and solve it to find the two parts.

Question 9

(i)   Use a graph paper for this question: [5]

The Marks out of **80** obtained by **160** students in a Mathematics test were
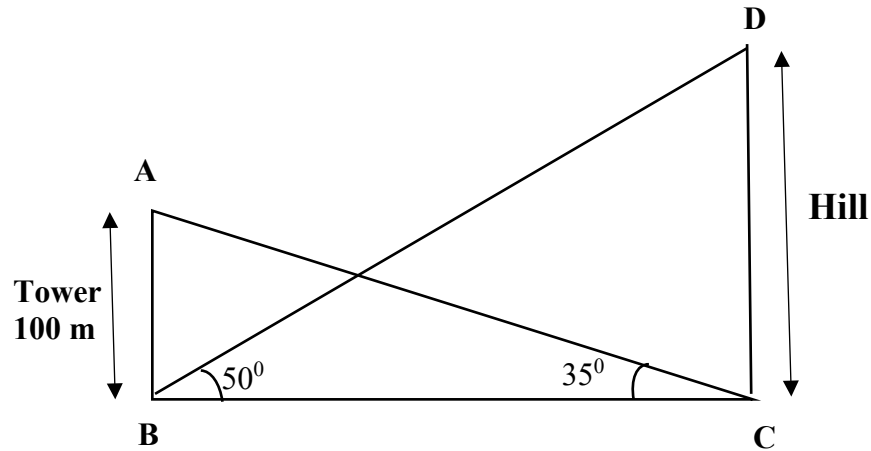recorded as given in the table:

Marks	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80
No. of Students	12	20	28	35	29	16	12	8

(Take 2 cm = 10 Marks on one axis and 2 cm = 20 students on the other axis).

Draw an Ogive and use it to find the following:

(a)   median marks

(b)   upper quartile marks

(c)   number of students who scored above 65 marks

(d)   the lowest marks scored by the top 30% students.

(ii)   The angle of elevation of the top of a hill from the foot of a tower at **B** is **50⁰.** The   [5]
angle of elevation of the top of the tower **100 m** high from the foot of the hill at
C is **35⁰**.

Find the:

(a)   horizontal distance **BC** between the Hill and the Tower.

(b)   height **CD** of the Hill. *(Take tan50° = 1.20)*

(c)   time taken by a cyclist to cover the distance **BC,** cycling at **20 m/sec**.

Question 10

(i)   Using Remainder and Factor theorem factorise the given polynomial completely.   [3]

$$6x^3 + x^2 - 4x + 1$$

(ii)   Using **short-cut** method, find Mean of the given frequency distribution: [3]

Class	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
Frequency	6	9	14	10	7	4

(iii)   Use ruler and compass for the following constructions: [4]

Construct:

(a)   an isosceles **ΔABC** in which **AB = AC = 7 cm** and **BC = 6 cm**.

(b)   the locus of points which moves such that it is **2.5 cm** from the point **A**.

(c)   the locus of points equidistant from **B** and **C**. Mark point **P** which satisfies both the conditions mentioned in **(b)** and **(c)**.

(d)   a circle passing through **P**, **B** and **C**.