ICSE SEMESTER 2 EXAMINATION
SPECIMEN QUESTION PAPER
MATHEMATICS
(PAPER 1)

Maximum Marks: 40
Time allowed: One and a half hours
Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during the first 10 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 three questions from Section B.

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

SECTION A (10 Marks)
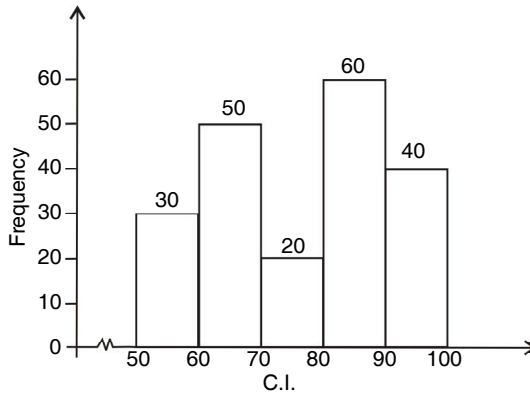### (Attempt all the questions from this section)

Question 1

Choose the correct answers to the questions from the given options. (Do not copy the question. Write the correct answer only).

(i)   The point (3, 5) under the reflection in the line $y = 3$ is :

    (a) (3, 2)   (b) (5, 3)   (c) (3, –5)   (d) (3, 1)

(ii) In the given figure, PQ is the diameter. Chord RS is parallel to QP. If angle PQR is 62°, then the angle x (angle PTS) is :

    (a) 28°

    (b) 162°

    (c) 152°

    (d) 62°
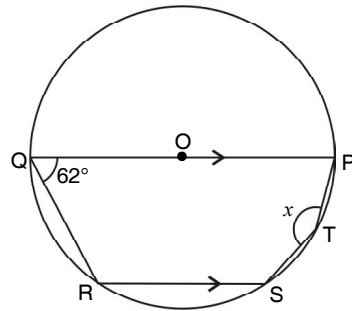
(iii) The diameter of a closed cylinder is 14 cm and its height is 21 cm. The total surface area of the cylinder is :

    (a) 2464 cm^2 (b) 616 cm^2 (c) 1232 cm^2 (d) 6160 cm^2

(iv) The slope and the y-intercept of the line $x – 2y + 4 = 0$ are :

    (a) slope = 2 and y-intercept = – 4   (b) slope = –4 and y-intercept = 2

    (c) slope = $\dfrac{1}{2}$ and y-intercept = 2   (d) slope = 2 and y-intercept = $\dfrac{1}{2}$

(v) $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$ is equal to :

    (a) $\sin\theta - \cos\theta$ (b) $\sin\theta + \cos\theta$

    (c) $\tan\theta$ (d) $\cot\theta$

(vi) The median of 9 numbers is 15. If each number is decreased by 4, the resulting median will be :

    (a) 19   (b) 13   (c) 5   (d) 11

(vii) The inclination of a line is 45° and its y-intercept is –5; the equation of the line is :

    (a) $x + y = 5$ (b) $y = x + 5$ (c) $x - 5y = 5$ (d) $x - y - 5 = 0$

(viii) The volume of a cylinder is $9x$ cm³. The volume of the cone having the same radius and same height as that of the given cylinder is :

    (a) x cm³   (b) $3x$ cm³   (c) $1 \cdot 5x$ cm³   (d) $4 \cdot 5x$ cm³

(ix) In the given graph, the modal class is the class with frequency :

    (a) 30

    (b) 50

    (c) 60

    (d) 40

(x) A bag contains 5 red and 8 blue balls, all identical in shape and size. If one ball is drawn from the bag, the probability that the ball drawn is a black ball is :

   (a) 5   (b) 8   (c) 0   (d) 1

SECTION B (30 marks)
(Attempt any three questions from this Section.)

Question 2

(i) Find the co-ordinates of the point which divides the line segment joining the points $(3, -3)$ and $(-7, 2)$ internally in the ratio 2 : 3.   [2]

(ii) Rohit and Dinesh both were born in the year 1992. What is probability that they were born on the :   [2]

    (a) same day ?   (b) different days ?

(iii) In the given figure, PM is a tangent to the circle and PA = AM. Show that : [3]

    (a) ΔPMB is isosceles   (b) $BM^2 = PA \times PB$
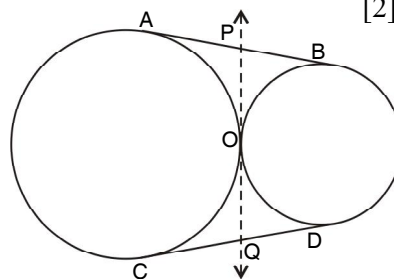

2
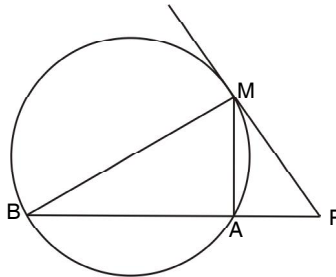
(iv) In the given figure, angles x and y are complimentary to each other. Show that
PA^2 = AB × AC [3]
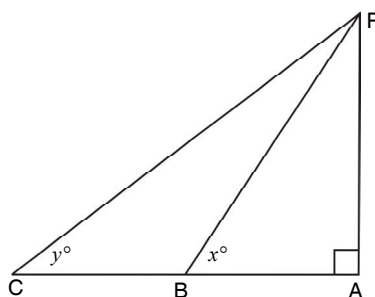
Question 3

(i) In the given figure, two circles touch each other externally at point O. AB and CD are tangents to the two circles. The common tangent at point O cuts tangents AB and CD at points P and Q respectively. Find : [2]

(a) QD, if CD = 12 cm

(b) AP, if AB = 15 cm

(ii) Prove that : [2]

$$\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} = \sin A + \cos A$$

(iii) A cylindrical road roller is 2·5 m in length and 0·875 m in radius. How many revolutions will it make to cover an area of 5500 m^2 ? [3]

(iv) The mean of the following numbers is 73. Find the value of x and the median. [3]
50, 57, 65, x, 74, 75, 31, 86 and 99.

Question 4

(i) A straight line passes through the points A(2, −5) and B(4, 3). Find the equation of the line AB. Also, find the value of m if line AB passes through the point (m − 1, m + 4). [2]

(ii) Find the mean of the following frequency distribution. [2]

Variable	5	6	7	8	9	10	11	12
Frequency	20	17	16	10	8	6	7	6

(iii) R and r respectively are the external and internal radii of a hollow cylinder of length h. Find the expression for the total surface area of this hollow cylinder. [3]

(iv) In each of the following cases, find the values of m and n if : [3]

(a) (4, −3) on reflection in x-axis gives (−m, n)

(b) (m, 5) on reflection in y-axis gives (−5, n − 2)

(c) (−6, n + 2) on reflection in origin gives (m + 3, −4)

Question 5

(i) The given figure shows a triangle ABC circumscribing a circle with centre O and radius = 3 cm. Given - angle BAC = 90° and the length of segments BD and DC is 6 cm and 9 cm respectively; find the lengths of sides AB and AC. [2]

(ii) Prove that : [2]

$(\tan \theta + \cot \theta)(\sin \theta + \cos \theta) = \sec \theta + \csc \theta$.
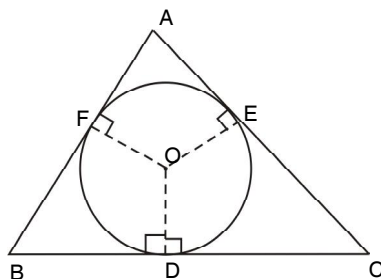
(iii) A line segment AB cuts x-axis at point A and y-axis at point B. If AB is bisected at point P(–4, 7), find : [3]

    (a) co-ordinates of points A and B

    (b) slope of AB   (c) equation of AB

(iv) Draw a histogram for the following frequency distribution to estimate mode. [3]

Class-interval	20-25	25-30	30-35	35-40	40-45	45-50
Frequency	2	7	18	10	8	5

Question 6

(i) Two dice are thrown simultaneously. Find the probability that the product of the two numbers on the top faces of the dice is : [2]

    (a) 6   (b) a perfect square.

(ii) $x + ky + 8 = 0$ is the median of a triangle with vertices A(–1, 3), B(0, 4) and C(–5, 2); find the value of k if this median passes through the vertex B. [2]

(iii) In the given figure, from the top of a building AB with height 60 m, the angles of depression of the top and bottom of a vertical lamp post CD are 30° and 60° respectively. Find : [3]

    (a) the horizontal distance between AB and CD

    (b) the height of the lamp post.
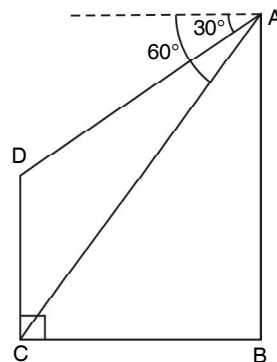
(iv) The mean of the following distribution is 100. If the sum of frequencies is 120, find the values of a and b. [3]

Variable	20	60	100	140	180
Frequency	17	28	a	24	b

ICSE SEMESTER 2 EXAMINATION
SPECIMEN QUESTION PAPER
MATHEMATICS
(PAPER 2)

Maximum Marks: 40
Time allowed: One and a half hours
Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during the first 10 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 three questions from Section B.

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

SECTION A (10 marks)
(Attempt all the questions from this section)

Question 1

Choose the correct answers to the questions from the given options. (Do not copy the question. Write the correct answer only).

(i)   The reflection of the point (6, –3) in the line $y + 2 = 0$ is :

(a) (1, 6)   (b) (6, 3)   (c) (6, –1)   (d) (3, –6)

(ii)   In the given figure, PQRS is a cyclic quadrilateral in which PQ = QR and RS is produced to point T. If angle QPR = 50°, angle x (∠PSR) is equal to :

(a)   100°

(b)   80°

(c)   130°

(d)   150°
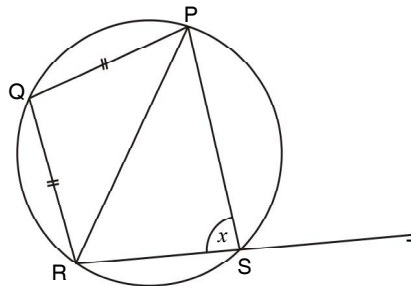
(iii)   The diameters of two circular cylinders are in the ratio 5 : 7 and their heights are in the ratio 21 : 25. The ratio of their curved surfaces is :

(a) 3 : 5   (b) 5 : 3   (c) 125 : 175   (d) 35 : 25

(iv)   If the vertices of a triangle are (5, 7), (3, 4) and (–8, –11), the co-ordinates of its centroid are :

(a) (2, 0)   (b) (–5, 0)   (c) (8, 0)   (d) (0, 0)

(v) $\dfrac{\sin\theta}{1+\cos\theta}+\dfrac{1+\cos\theta}{\sin\theta}$ is equal to :

(a) cosec θ   (b) 2 cosec θ   (c) cos θ   (d) sin θ

(vi)   The median of 10 numbers, written in ascending order, is 23. If the first and the last numbers are removed, the resulting median will be :

(a) 23   (b) 21   (c) 25   (d) 11·5

(vii) If $3y = 2x + 5$ and $mx + 6y + 7 = 0$ are parallel to each other, the value of m is :

    (a) –4   (b) 4   (c) 1   (d) –2

(viii) The lateral surface area of a cone of slant height 21 cm and radius of the base 12 cm is :

    (a) 792 cm   (b) 792 cm^2 (c) 396 cm^2 (d) 1584 cm^2

(ix) The mode of the following numbers is :

29, 20, 22, 28, 25, 23, 25, 24, 21 and 25

    (a) 25   (b) 24   (c) 21   (d) 28

(x) A die is tossed once. The probability of getting a multiple of 3 is :

    (a) $\dfrac{1}{2}$ (b) 2   (c) $\dfrac{1}{3}$ (d) 1

SECTION B (marks 30)
### *(Attempt any three questions from this Section.)*

Question 2

(i) Points A(5, 2), B(2, –1) and C(x, y) are collinear. If AB : BC = 3 : 4, find the values of x and y.   [2]

(ii) If 55% of the students in a school have black eyes, 28% have brown eyes and the remaining have blue eyes, what is the probability that a student chosen at random from this school has neither blue nor brown eyes ?   [2]

(iii) In the given figure, AQ, AR and BC are tangents at points Q, R and P respectively. If the distance between centre O of the circle and point A is 13 cm and the radius of the circle is 5 cm, show that the perimeter of the triangle ABC = 24 cm.   [3]

(iv) Use the information given in the following figure to find the length of PA.   [3]
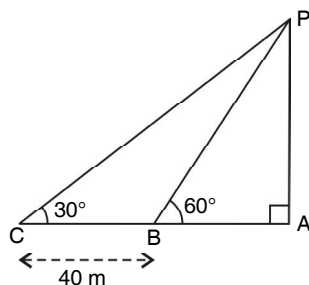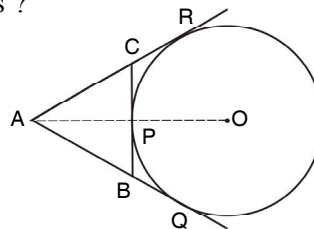
Question 3

(i) In the given figure, $\angle x = \angle y$. Show that : PA = PC.   [2]
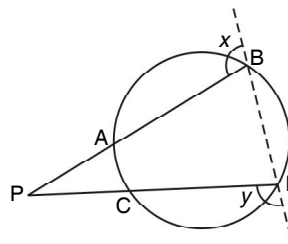
(ii) Prove that :   [2]

$$(\operatorname{cosec} \theta - \cot \theta)^2 = \frac{1 - \cos \theta}{1 + \cos \theta}$$

(iii) How many square metres of canvas is required to make a conical tent with height 3·5 m and radius of the base 12 m ?   [3]

(iv) The daily wages of 80 workers in a project are given below :   [3]

| Wages (in ₹)	400-450	450-500	500-550	550-600	600-650	650-700	700-750
No. of workers	2	6	12	18	24	13	5

Use a graph paper to draw an ogive for the above distribution, taking 2 cm = ₹ 50 on x-axis and 2 cm = 10 workers on y-axis. Use the ogive drawn to estimate the median.

Question 4

(i) Find the equation of a straight line that passes through the point (0, –2) and the point of intersection of the lines $4x + 3y = 1$ and $3x – y + 9 = 0$.   [2]

(ii) Find the mean of the following frequency distribution by short-cut method : [2]

| Class-interval	64-70	70-76	76-82	82-88	88-94
Frequency	8	12	15	10	5

(iii) Find the expression for the total surface area of the given hemispherical shell.   [3]
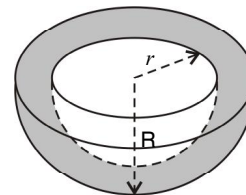
(iv) Use a graph paper for this question. (Take two divisions = 1 unit on both the axes)

Plot the points P(3, 2) and Q(–3, –2). From P and Q, draw perpendiculars PM and QN on the x-axis.   [3]

(a) Write the co-ordinates of points M and N.

(b) Assign the special name to the geometrical figure PMQN and find its area.

Question 5

(i) The given figure shows a circle with centre O, tangent AB at point B of the circle and angle BDC = 65°. Find the angle BAO.   [2]
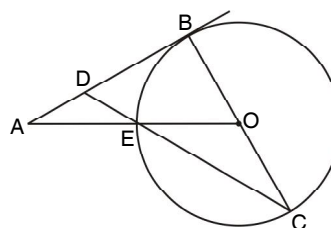
(ii) Prove that :

$(1 + \cot \theta – \operatorname{cosec} \theta) (1 + \tan \theta + \sec \theta) = 2$.   [2]

(iii) Find the equation of the perpendicular bisector of a line segment AB, where A = (5, – 6) and B = (3, – 4).   [3]

(iv) Find the mode of the following frequency distribution by drawing a histogram.   [3]

Class	11-16	17-22	23-28	29-34	35-40	41-46
Frequency	6	12	20	15	9	4

Question 6

(i) Two dice are thrown simultaneously. Find the probability that the sum of numbers appearing on the top face of the dice is : [2]

   (a) 8   (b) at least 10.

(ii) Three consecutive vertices of a parallelogram ABCD are A(12, –4), B(4, –4) and C(–2, 0). Find the fourth vertex D. [2]

(iii) The length of the shadow of a tower standing on a level plane is found to be $2y$ metres longer when sun's altitude is 30° than when it is 45°. Prove that the height of the tower is $y\left(\sqrt{3}+1\right)$ metres. [3]

(iv) The total number of observations in the following distribution table is 120 and their mean is 25. Find the values of f_1 and f_2. [3]

Class-interval	0-10	10-20	20-30	30-40	40-50
Frequency	17	f_1	32	f_2	19

ICSE SEMESTER 2 EXAMINATION
SPECIMEN QUESTION PAPER
MATHEMATICS
(PAPER 3)

Maximum Marks: 40
Time allowed: One and a half hours
Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during the first 10 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 three questions from Section B.

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

SECTION A (10 marks)
(Attempt all the questions from this section)

Question 1

Choose the correct answers to the questions from the given options. (Do not copy the question. Write the correct answer only).

(i) The point (2, –3) is invariant under the reflection in the lines :

(a) $x = 2$ and $y = 3$ 　　　　　　(b) $x = 2$ and $y + 3 = 0$

(c) $x + 2 = 0$ and $y – 3 = 0$ 　　(d) $x – 2 = 0$ and $y = 2$

(ii) In the given figure, O is the centre of the circle and angle OAD = 60°. The values of angles x and y will be :

(a) $x = 60°, y = 120°$

(b) $x = 120°, y = 60°$

(c) $x = 120°, y = 120°$

(d) $x = 60°, y = 60°$
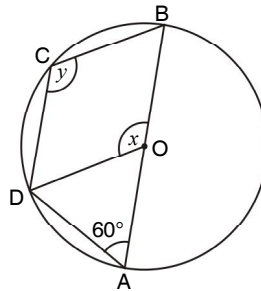
(iii) The diameter of a closed cylindrical tank is 6·3 m and its height is 3 m. Its lateral surface area is :

(a) 90·585 m^2 　　(b) 59·4 m^2 　　(c) 121·77 m^2 　　(d) 148·5 m^2

(iv) The vertices of a triangle are (3, –2), (x, y) and (4, 0). If its centroid is (0, 0), the values of x and y are :

(a) $x = –7$ and $y = 2$ 　　　　　　(b) $x = 7$ and $y = –2$

(c) $x = –7$ and $y = –2$ 　　　　　(d) $x = 7$ and $y = 2$

(v) $\dfrac{\cos^2 \theta + \tan^2 \theta - 1}{sin^2 \theta}$ is equal to :

(a) $\tan^2 \theta$ 　　(b) $\cot^2 \theta$ 　　(c) $\tan \theta$ 　　(d) $\cot \theta$

(vi) n different numbers are written in descending order. If n is an odd number, then the median is :

(a) $\left(\dfrac{n}{2}\right)^{\text{th}}$ term

(b) $\left(\dfrac{n+1}{2}\right)^{\text{th}}$ term

(c) $\dfrac{1}{2}\left[\left(\dfrac{n}{2}\right)^{\text{th}}\text{term} + \left(\dfrac{n+1}{2}\right)^{\text{th}}\text{term}\right]$

(d) $\dfrac{1}{2}\left[\left(\dfrac{n}{2}\right)^{\text{th}}\text{term} + \left(\dfrac{n}{2}+1\right)^{\text{th}}\text{term}\right]$

(vii) The lines $2x + 3y = 7$ and $ax - 4y + 12 = 0$ are perpendicular to each other; the value of a is :

    (a) −6   (b) −12   (c) 12   (d) 6

(viii) A few identical solid cones are melted and recasted into a single solid cylinder with the same height and radius as that of each cone. How many cones are melted :

    (a) 4   (b) 2   (c) 3   (d) 6

(ix) The modal class for the following frequency distribution is :

Class-interval	50-70	70-90	90-110	110-130	130-150
Frequency	27	85	93	82	14

    (a) 130-150   (b) 70-90   (c) 90-110   (d) 110-130

(x) A die is tossed once. The probability of getting an even number or a multiple of 3 is :

    (a) $\dfrac{1}{3}$ (b) $\dfrac{2}{3}$ (c) $\dfrac{4}{5}$ (d) $\dfrac{5}{6}$

SECTION B (30 marks)
(Attempt any three questions from this Section.)
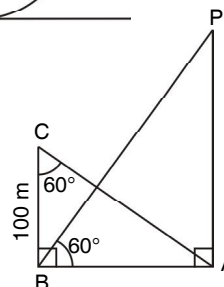
Question 2

(i) Points A, B and C divide the line segment P(8, 2) and Q(−2, 2) into four equal parts. Find the co-ordinates of point C.   [2]

(ii) Three-digit numbers are made using the digits 3, 6 and 9 (without repetition). Out of these numbers, a number is selected at random. What is the probability that the number selected is divisible by 9 ?   [2]

(iii) The given figure shows a circle with centre O, chord AB, radius OQ and tangent TA. If angle OQT = 149°, find the angle ATQ.   [3]
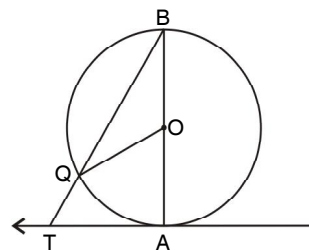
(iv) Use the information given in the adjoining figure to find the length of PA.   [3]

10

Question 3

(i) In the given figure, a circle is inscribed in a triangle ABC. If BC = 8 cm, AC = 10 cm and AB = 12 cm, find the lengths of : [2]

    (a) AD   (b) BE   (c) CF

(ii) Prove that : [2]

$$\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} = 1 + \tan A + \cot A$$

(iii) How many solid right circular cylinders each of diameter 8 cm and height 5 cm can be made from melting a solid right circular cylinder of radius 12 cm and height 25 cm ? [3]

(iv) The daily wages of 160 workers in a building project are given below : [3]

Wages (in ₹)	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120-130
No. of workers	12	20	30	38	24	16	12	8

Using a graph paper, draw an ogive for the above distribution. Use your ogive to estimate the median wage of the workers.
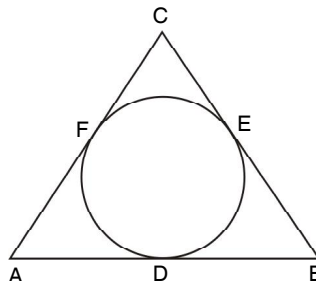
Question 4

(i) The vertices of a triangle ABC are A = (3, 4), B = (7, –2) and C = (–2, –1). Find the equation of the median of this triangle that passes through vertex C. [2]

(ii) Find the values of mean and median for the following distribution : [2]

Variable	5	7	9	11	13	15	20
Frequency	4	4	4	7	3	2	1

(iii) The given figure shows a cone OAB with height 40 cm. A small cone OCD is cut off at the top by a plane parallel to its base. If volume of cone OAB : volume of cone OCD = 64 : 1, find MN. [3]
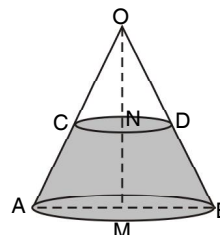
(iv) Taking 2 cm = 1 unit along both x-axis and y-axis on a graph paper : [3]

    (a) Plot the points A(4, 3) and B(2, 0). Reflect point B on the y-axis to point B′. Write the co-ordinates of B′.

    (b) Reflect point A on the line BB′ to point A′. Write the co-ordinates of A′.

   (c) Write the angle between AA′ and BB′.

Question 5

(i) The given figure shows a circle with centre O. AB and AD are bisectors of angle CAQ and angle PAC respectively. If angle QAB = 30°, show that BD is the diameter of the given circle. [2]

11
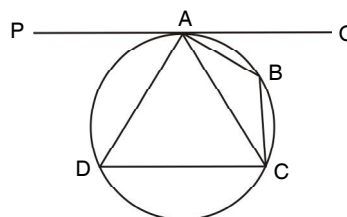
(ii) Prove that : [2]

$$\frac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1} = \frac{1 + \sin \theta}{\cos \theta}.$$

(iii) In the given figure, the equation of line segment PA is $y = \sqrt{3}\,x + 3$ and the equation of line segment QB is $\sqrt{3}\,y = x + 6$. PA and QB intersect at point R on y-axis. Find angle $\theta(\angle PRQ)$. [3]
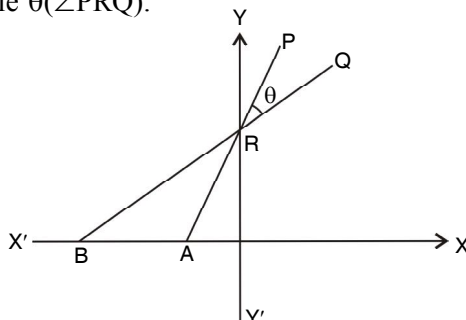

(iv) Calculate the mean, median and mode of the following distribution : [3]

Variable	0	4	8	12	16	20
Frequency	8	16	28	24	32	12

Question 6

(i) Three coins are tossed simultaneously. Find the probability of getting : [2]

    (a) at least one head.   (b) at least two heads.

(ii) Calculate the ratio in which the line joining A(–4, 2) and B(3, 6) is divided internally by point P(x, 3). Also find : [2]

    (a) the value of x.   (b) the length of AP.

(iii) A pole BC of length 6 m is fixed on the top of a tower. The angle of elevation of the top of the pole as observed from a point P on the ground is 60° and the angle of depression of point P from the top of the tower is 45°. Find the height of the tower. [3]
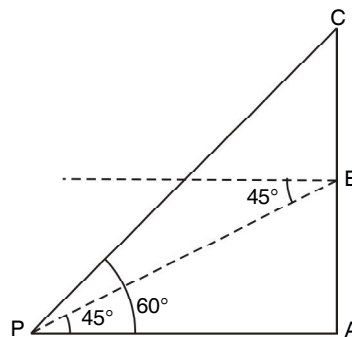
(iv) The mean of the following distribution is $21\frac{1}{7}$. Find the value of f. [3]

Class	0-10	10-20	20-30	30-40	40-50
Frequency	16	44	62	2f	4

ICSE SEMESTER 2 EXAMINATION
SPECIMEN QUESTION PAPER
MATHEMATICS
(PAPER 4)

Maximum Marks: 40
Time allowed: One and a half hours
Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during the first 10 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 three questions from Section B.

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

SECTION A (10 marks)
(Attempt all the questions from this section)

Question 1

Choose the correct answers to the questions from the given options. (Do not copy the question. Write the correct answer only).
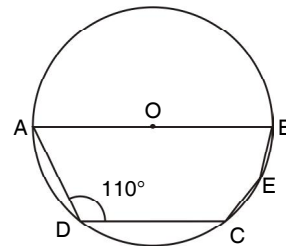
(i) The point (0, –5) is invariant under reflection in the line :

(a) $x = 0$ (b) $y – 5 = 0$ (c) $y = 0$ (d) $x = –5$

(ii) In the given figure, AB is the diameter of the circle.
If angle ADC = 110°, angle CAB is equal to :

(a) 30°

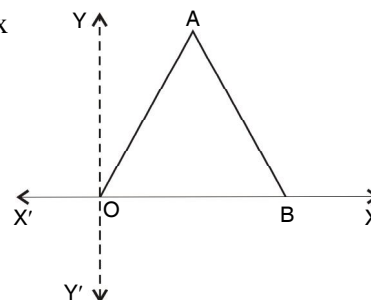(b) 70°

(c) 20°

(d) 50°

(iii) The curved surface area of a cylinder is 1100 cm^2 and the circumference of its base is 22 cm. The height of the cylinder is :

(a) 55 cm   (b) 100 cm   (c) 25 cm   (d) 50 cm

(iv) The given figure shows an equilateral triangle OAB. If AB = 2a units, the co-ordinates of vertex A are :

(a) $(a, 0)$ (b) $(0, a)$

(c) $\left(a\sqrt{3}, a\right)$ (d) $\left(a, a\sqrt{3}\right)$

(v) $1 + \dfrac{\tan^2 \theta}{1 + \sec \theta}$ is equal to :

(a) $\tan \theta$ (b) $\tan \theta + 1$ (c) $\sec \theta – 1$ (d) $\sec \theta$

13

(vi) The median class for the given distribution is :

Class-interval	6-10	11-15	16-20	21-25	26-30
Cumulative frequency	5	9	14	20	25

    (a) 11 - 15   (b) 16 - 20   (c) 15·5 - 20·5   (d) 20·5 - 25·5

(vii) The slope of a line parallel to the line $3x + ay - 8 = 0$ is $-\dfrac{3}{2}$, the value of a is :

    (a) –4   (b) 4   (c) 2   (d) –2

(viii) The radius of the base of a cone is 3·5 cm and its height is 12 cm. The slant height of the cone is :

    (a) 15 cm   (b) 12·5 cm   (c) 25 cm   (d) 37·5 cm

(ix) For the following frequency distribution, the modal class is :

Class interval	51-56	57-62	63-68	69-74
Frequency	12	24	40	30

    (a) 57 - 62   (b) 63 - 68   (c) 69 - 74   (d) 62·5 - 68·5

(x) A die is tossed once. The probability of getting an even number and a multiple of 3 is :

   (a) $\dfrac{2}{3}$ (b) $\dfrac{1}{6}$ (c) $\dfrac{1}{2}$ (d) $\dfrac{5}{6}$

SECTION B (30 marks)
(Attempt any three questions from this Section.)

Question 2

(i) In what ratio does the point (–5, 2) divide the line joining the points (5, –3) and (–9, 4) internally ?   [2]

(ii) What is the probability of having 53 Sundays in :   [2]
    (a) a leap year ?   (b) a non-leap year ?

(iii) In the given figure, O is the centre of the circle. TP is tangent to the circle at point P. PR and PQ are chords. If angle TPQ = 50°, find angle PRQ.   [3]
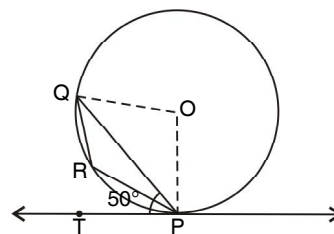
(iv) The given figure shows two positions P and Q of an aeroplane flying horizontally at a constant height of $1500\sqrt{3}$ metres. If for reaching from P to Q, the aeroplane takes 15 seconds, find (in km per hour) the speed of it.   [3]
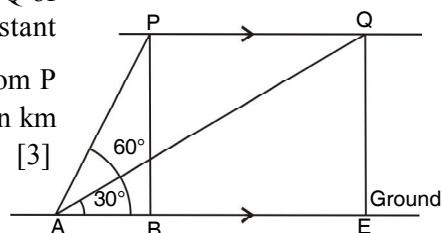
Question 3

(i) The given figure shows a parallelogram ABCD circumscribing a circle with centre O. State, true or false : [2]

(a) ABCD is a square.

(b) ABCD is a rectangle.

(c) ABCD is a rhombus.
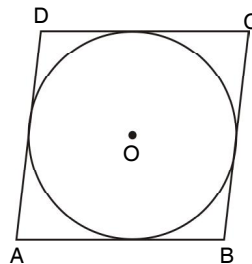
(ii) Prove that : [2]

$$\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \text{ cosec A.}$$

(iii) The total surface area of a solid cylinder is 462 cm². If its curved surface area is one-third of its total surface area, find the volume of the cylinder. [3]

(iv) The marks obtained by 200 students in an examination are given below : [3]

| Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	5	10	11	20	27	38	40	29	14	6

Taking 2 cm = 10 marks on one axis and 2 cm = 20 students on the other axis, draw an ogive on a graph paper. Using the ogive drawn, estimate the median.
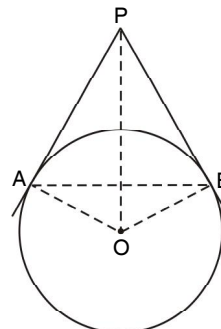
Question 4

(i) Find the equation of a line which passes through the point (–5, 1) and is parallel to the line passing through the points (0, 3) and (7, –1). [2]

(ii) Find the mean correct to two decimal places : [2]

Class interval :	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Frequency :	3	7	15	24	16	8	5	2

(iii) From a solid cylinder of length 28 cm, two cavities, one hemispherical and one conical, are made. Use the given information to find the volume of the remaining solid. [3]
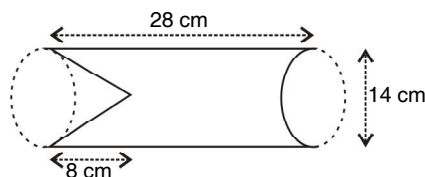
(iv) The point P(6, 4) is reflected in the origin to get the image P′. [3]

(a) Write the co-ordinates of image P′.

(b) PM and P′N are perpendiculars to x-axis. Write down the co-ordinates of points M and N.

(c) Name the figure PMP′N and find its area.

Question 5

(i) The given figure shows a circle with centre O. PA and PB are tangents to this circle from an exterior point P. If length of OP is twice the length of OA, find angle OBA. [2]

15

(ii) Prove that : [2]

$\tan^2 \theta + \cot^2 \theta + 2 = \sec^2 \theta \cdot \text{cosec}^2 \theta$

(iii) A line AB meets x-axis at point A and y-axis at point B. P(2, 3) is a point in line segment AB so that 2PA = 3PB. Find the equation of the line that passes through the point P and is perpendicular to line AB. [3]

(iv) Taking 1 cm = 5 units along x-axis representing class-interval and 1 cm = 2 units along y-axis representing frequency, draw a suitable histogram for the following frequency distribution and then find the mode. [3]

Class interval	30-35	35-40	40-45	45-50	50-55	55-60
Frequency	2	7	18	10	8	5

Question 6

(i) All the red face cards are removed from a pack of 52 cards. The remaining cards are reshuffled and from these cards, one card is drawn at random. Find the probability that the card drawn is : [2]

(a) an ace   (b) a red card

(ii) Find a point which is equidistant from the pionts (–5, 4) and (–1, 6). How many such points are there ? [2]

(iii) From the point P, 500 m above point C, the angles of depression of points A and B are 30° and 45° respectively. If A, B and C are on the same level ground, find the length of AB. [3]
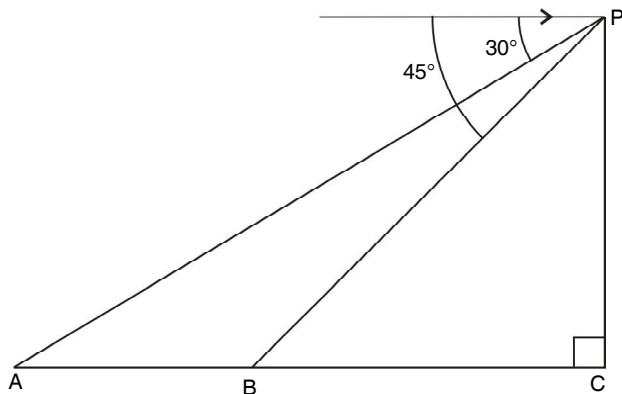
(iv) For the following distribution, mean is 108. Find the value of *m*. [3]

Class	0-40	40-80	80-120	120-160	160-200
Frequency	7	*m*	10	9	13

ICSE SEMESTER 2 EXAMINATION
SPECIMEN QUESTION PAPER
MATHEMATICS
(PAPER 5)

Maximum Marks: 40
Time allowed: One and a half hours
Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during the first 10 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 three questions from Section B.

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

SECTION A (10 marks)
(Attempt all the questions from this section)

Question 1

Choose the correct answers to the questions from the given options. (Do not copy the question. Write the correct answer only).

(i) The point P(5, –4) is reflected in y-axis as point P′. The point P′ is further reflected to point P″(5, 4). The point P′ is reflected to point P″ in :

    (a) x-axis   (b) y-axis

    (c) both x-axis and y-axis   (d) the origin

(ii) In the given figure, O is the centre of the circle. If angle BAD = 70° and BC = CD, the measure of angle BOC will be :

    (a) 55°

    (b) 140°

    (c) 40°

    (d) 70°

(iii) 40 circular plates, each of diameter 28 cm and thickness 1 cm are placed one above the other to form a cylindrical solid. The volume of the cylinder so formed is :

    (a) 12320 cm^3 (b) 24640 cm^3 (c) 49280 cm^3 (d) 6160 cm^3

(iv) The equation of a line with slope = –3 and y-intercept = –1 is :

    (a) $3x + y + 1 = 0$ (b) $3x - y + 1 = 0$

    (c) $3x + y - 1 = 0$ (d) $3x - y - 1 = 0$

(v) $\dfrac{\sin \theta}{1 - \cos \theta}$ is equal to :

    (a) $\sin \theta$ (b) $\sec \theta$ (c) $\csc \theta$ (d) none
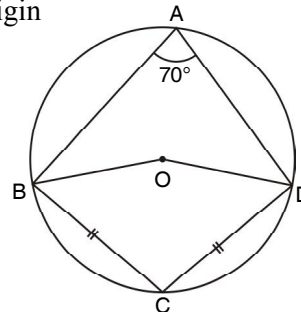
(vi) The median class for the following distribution is :

Class interval	40-50	50-60	60-70	70-80	80-90
Frequency	23	47	82	35	48

    (a) 60-70   (b) 80-90   (c) 50-60   (d) none

(vii) The slope of a line perpendicular to the line $ax + 4y = 8$ is $1\frac{1}{3}$; the value of a is :

    (a) −4   (b) 3   (c) −3   (d) 4

(viii) The area of the base of a solid cone is x m^2 and its height is $3x$ cm. The volume of the cone is :

    (a) $100\ x^2$ cm^3 (b) $\dfrac{x^2}{100}$ m^3 (c) $100\ x^2$ m^3 (d) $\dfrac{100}{x^2}$ cm^3

(ix) For the given graph, the mode is :
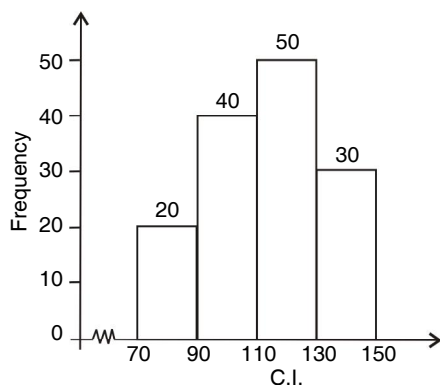

    (a) between 110 and 130   (b) between 50 and 30
    (c) between 40 and 50   (d) 120

(x) If the probability of losing a game is 0·68, then the probability of winning the same game will be :

    (a) 0·42   (b) 1   (c) 0·32   (d) 0

SECTION B (30 marks)
*(Attempt any three questions from this Section.)*

Question 2

(i) Find the value of k so that the line segment joining the points (2, −2) and (3, 7) is divided internally by the line $2x + y = 4$ in the ratio $k : 1$.   [2]

(ii) A box contains 250 identical balls. Some of these balls are black and the remaining are red. If one ball is drawn from the box at random and the probability of it to be red is 0·36, find the number of black balls in the box.   [2]

(iii) Radii of two concentric circles are 6 cm and 10 cm respectively. Find the length of the chord of the bigger circle which touches the smaller circle.   [3]

(iv) In the given figure, point C is the reflection of point A in a lake and point D is 50 m above the lake surface. If $\angle ADF = 30°$, $\angle CDF = 60°$ and $DF \perp AC$, find the distance between A and C. [3]
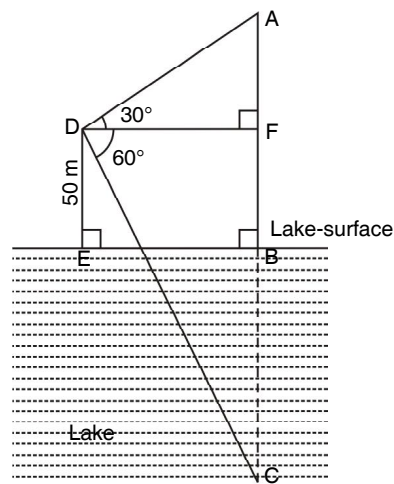
Question 3

(i) In the given figure, AB is tangent to the circle at point A. Chord DC is produced to meet tangent AB at point B. DE bisects angle ADC and is perpendicular to AC. If BC = 9 cm and AD = 7 cm, find : [2]
   (a) DC   (b) AB
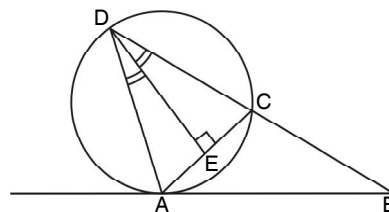
(ii) Prove that $\dfrac{\cos A}{1 + \sin A} + \tan A = \sec A$ [2]

(iii) A solid right circular cylinder of height 10 cm and base radius 6 cm is melted and recasted into identical solid cones of height 4 cm and diameter 3 cm. Find the number of cones obtained. [3]

(iv) Draw an ogive with the following frequency distribution and use the ogive drawn to estimate the median. [3]

Class interval	20-30	30-40	40-50	50-60	60-70
Frequency	11	20	27	38	40

Question 4

(i) Find the equation of the line which passes through the point (–1, –2) and is perpendicular to $3x + 4y = 12$. [2]

(ii) Find the mean of the following frequency distribution using step-deviation method : [2]

| Class interval	35-45	45-55	55-65	65-75	75-85	85-95
Frequency	10	6	8	12	5	9

(iii) The given figure shows a hollow cylinder mounted on a hollow hemisphere. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel. [3]
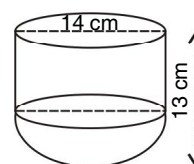
(iv) Points (5, 0) and (–2, 0) are invariant points under reflection in the line L_1. Points (0, –4) and (0, 2) are invariant points on reflection in the line L_2. [3]

   (a) Write the equations of the lines L_1 and L_2.

   (b) Point P(3, 4) on reflection in line L_1 gives point P′. What are the co-ordinates of point P′ ?

   (c) Write down the image of P on reflection in L_2.

Question 5

(i) The given figure shows a circle with tangent PT, diameter AB and chord CD all intersecting at point P.

   If CD = 7·8 cm, PD = 5 cm and PB = 4 cm, find the lengths of AB and PT. [2]

(ii) Prove that : [2]

   $\sin^6 \theta + \cos^6 \theta + 3 \sin^2 \theta \cos^2 \theta = 1$.

(iii) Two lines $4x + 3y = 1$ and $y = 3(x + 3)$ intersect at point P and passes through point A(0, –2). Find : [3]

   (a) the co-ordinates of point R.

   (b) the equation of the line through points P and A.

(iv) Taking 2 cm equal to 10 marks along x-axis and 2 cm equal to 2 students along y-axis, draw a histogram for the following frequency distribution and find the mode. [3]
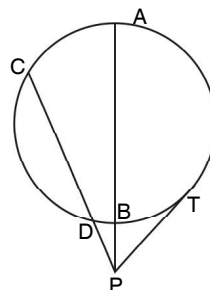
Marks	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	4	7	9	11	6	2

Question 6

(i) A box contains some red balls, some blue balls and the remaining balls are orange. If a ball is drawn at random from the box, the probability of it to be red is $\frac{1}{4}$ and the probability of it to be blue is $\frac{1}{3}$. If the bag contains 10 orange balls, find the total number of balls in the box. [2]

(ii) (a, b) is the mid-point of a line segment joining the points A(k, 4) and B(10, –6). Given - a – 2b = 18; find the value of k and the length of AB. [2]

(iii) An observer P on the top of a cliff 400 m above the sea-level, observes the angles of depression of the ships A and B as 45° and 60° respectively. Find the distance between the ships, if the ships are : [3]

   (a) on the same side of the cliff.   (b) on the opposite sides of the cliff.

(iv) The mean of following distribution is 2·4. Find the value of m. [3]

Class	1·5	2	2·4	3	3·2	3·4
Frequency	4	5	m	5	2	1

20