

CBSE Board
Class X Mathematics
Sample Paper 2 (Standard)

Time: 3 hrs

Total Marks: 80

General Instructions:

1. This question paper contains **two parts** A and B.
2. Both **Part A** and **Part B** have internal choices.

Part – A:

1. It consists **two sections** - I and II.
2. **Section I** has **16 questions** of **1 mark** each. Internal choice is provided in **5 questions**.
3. **Section II** has **4 questions** on **case study**. Each case study has **5 case-based sub-parts**. An examinee is to attempt any **4 out of 5 sub-parts**. Each subpart carries **1 mark**.

Part – B:

1. It consists **three sections** – III, IV and V
 2. **Section III: Question No 21 to 26** are **Very short answer** Type questions of **2 marks** each.
 3. **Section IV: Question No 27 to 33** are **Short Answer Type** questions of **3 marks** each.
 4. **Section V: Question No 34 to 36** are **Long Answer Type** questions of **5 marks** each.
 5. Internal choice is provided in **2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks**
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Part A

Section I

Section I has 16 questions of 1 mark each.

(Internal choice is provided in 5 questions)

1. Express a decimal number $0.\overline{8}$ in its simplest form.

OR

Without actually performing the long division, state whether $\frac{17}{8}$ is a terminating decimal expansion or a non-terminating repeating decimal expansion.

2. Find the value(s) of m , for which the lines represented by the following pair of linear equations $3x + 6y - 15 = 0$ and $9x + 18y - m = 0$ be coincident.

- In ΔABC , right angled at B, $AB = 12$ cm and $BC = 5$ cm then what will be the value of $\sin A$.
- Given that $\sin 2x = 1$ and $\cos y = \frac{\sqrt{3}}{2}$, then find the value of $x - y$.
- What are the coordinates of a point which divides the line segment joining the points $A(-3, 6)$ and $B(5, 2)$ in the ratio $1 : 3$?

OR

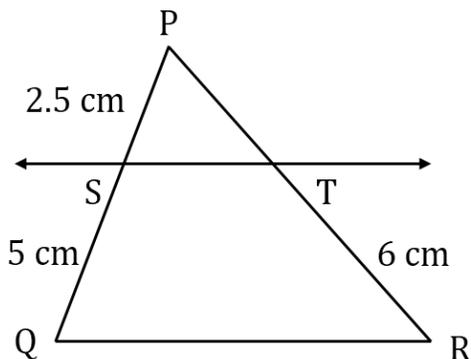
Find the distance of a point $(-24, 7)$ from the origin (in units).

- A number x is chosen from the numbers $-3, -2, -1, 0, 1, 2, 3$. Then find the probability that $|x| < 2$.

OR

What is the probability for a student to get pass marks in an examination?

- If the polynomial $p(x) = 3x^2 + 7x - 3$ is divided by another polynomial $x^2 - 2$ then find the remainder.
- 2 cubes each with side 4 cm are joined to form a cuboid. Find the surface area of the resulting cuboid.
- In the figure, ST is drawn parallel to the side QR .



Then, what is the length of PT ?

- Find the roots of the equation $x^2 - 3\sqrt{3}x + 6 = 0$.

OR

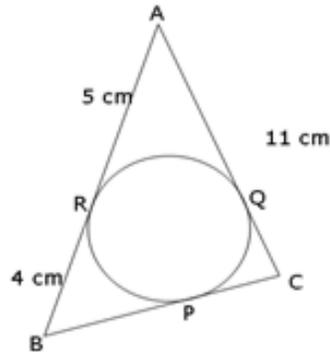
Find discriminant for the equation $x^2 - 2x + 1 = 0$.

- If $\frac{4}{5}$, a and 2 are three consecutive terms of an AP then find the value of a .

OR

The first and last terms of an A.P. are 1 and 11 . If the sum of all its terms is 36 , then find the number of terms in the A.P.

12. In the given figure, $AR = 5$ cm, $BR = 4$ cm and $AC = 11$ cm. What is the length of BC ?



13. If the system of equations $2x + 3y = 5$, $4x + ky = 10$ has infinitely many solutions, then find the value of k .
14. The distribution below gives the weights of 30 students of a class.

Weight (in kg)	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65	65 – 70	70 – 75
Number of students	2	3	8	6	6	3	2

In the given data what is the lower limit of the median class in the given data?

15. Find the area of a triangle (in sq. units) whose vertices are $(7, -2)$, $(5, 1)$ and $(3, 2)$.
16. If r , h and l denote respectively the radius of base, height and slant height of a right circular cone, then what is the formula of total surface area?

Section II

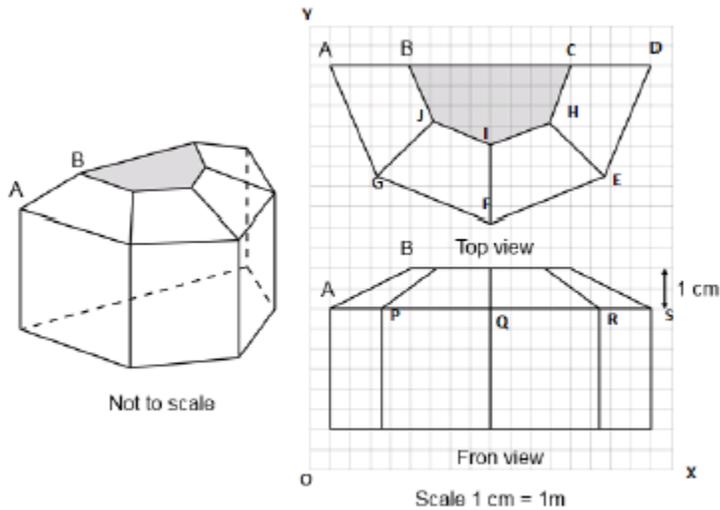
(Q 17 to Q 20 carry 4 marks each)

Case study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

17. **Case Study based-1**
SUN ROOM

The diagrams show the plans for a sun room. It will be built onto the wall of a house. The four walls of the sunroom are square clear glass panels. The roof is made using

- Four clear glass panels, trapezium in shape, all the same size
- One tinted glass panel, half a regular octagon in shape



(a) Refer to Top View

Find the mid-point of the segment joining the points I (9, 16) and H (12, 15).

- (i) $(33/2, 15/2)$
- (ii) $(3/2, 1/2)$
- (iii) $(21/2, 31/2)$
- (iv) $(1/2, 3/2)$

(b) Refer to Front View

The distance of the point Q from the x-axis is

- (i) 4 (ii) 6 (iii) 19 (iv) 25

(c) Refer to Top View

The distance between the points A and D is

- (i) 4 (ii) 8 (iii) 16 (iv) 20

(d) Refer to Front View

Find the co-ordinates of the point which divides the line segment joining the points A and B in the ratio 3:1 internally.

- (i) (8.5, 2.0) (ii) (4.0, 9.5) (iii) (3.0, 7.5) (iv) (4.0, 8.5)

(e) Refer to Front View

If a point (x,y) is equidistant from the Q(9,8) and S(17,8), then

- (i) $x+y=13$ (ii) $x-13=0$ (iii) $y-13=0$ (iv) $x-y=13$

18. Case Study Based- 2

SCALE FACTOR AND SIMILARITY

SCALE FACTOR

A scale drawing of an object is the same shape as the object but a different size.

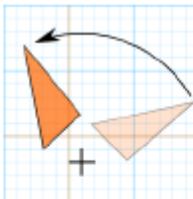
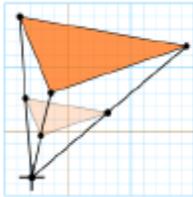
The scale of a drawing is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio.

SIMILAR FIGURES

The ratio of two corresponding sides in similar figures is called the scale factor.

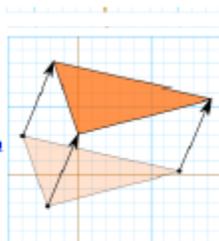
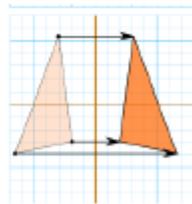
$$\text{Scale factor} = \frac{\text{length in image}}{\text{corresponding length in object}}$$

If one shape can become another using Resizing then the shapes are Similar



Rotation or Turn

Reflection or Flip



Translation or Slide

Hence, two shapes are Similar when one can become the other after a resize, flip, slide or turn.

(a) A model of a boat is made on the scale of 1:5. The model is 150cm long. The full size of the boat has a width of 60cm. What is the width of the scale model?

- (i) 20cm
- (ii) 12cm
- (iii) 15cm
- (iv) 240cm



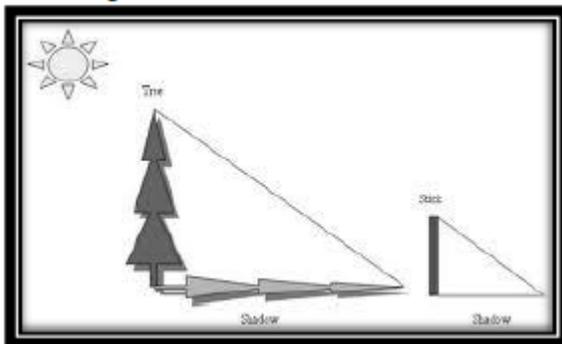
(b) What will effect the similarity of any two polygons?

- (i) They are flipped horizontally
- (ii) They are dilated by a scale factor
- (iii) They are translated down
- (iv) They are not the mirror image of one another

(c) If two similar triangles have a scale factor of $a : b$. Which statement regarding the two triangles is true?

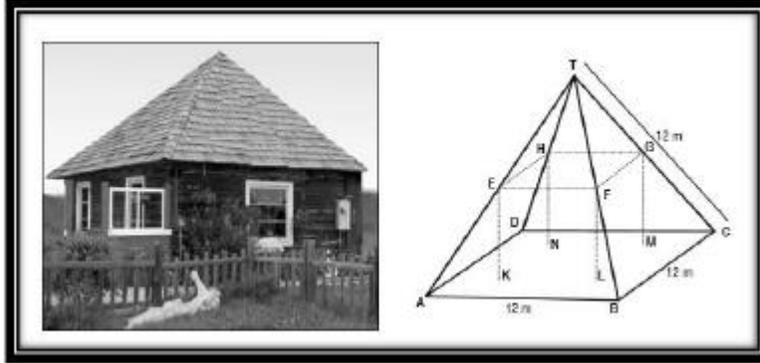
- (i) The ratio of their perimeters is $3a : b$
- (ii) Their altitudes have a ratio $a : b$
- (iii) Their medians have a ratio $a/2 : b$
- (iv) Their angle bisectors have a ratio $a^2 : b^2$

(d) The shadow of a stick 10m long is 4m. At the same time the shadow of a tree 22.5m high is



- (i) 3m
- (ii) 3.5m
- (iii) 5m
- (iv) 9m

(e) Below you see a student's mathematical model of a farmhouse roof with measurements. The attic floor, ABCD in the model, is a square. The beams that support the roof are the edges of a rectangular prism, EFGHLMN. E is the middle of AT, F is the middle of BT, G is the middle of CT, and H is the middle of DT. All the edges of the pyramid in the model have length of 12 m.



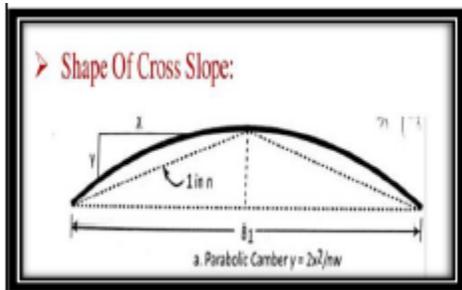
What is the length of EF, where EF is one of the horizontal edges of the block?

- (i) 24m
- (ii) 3m
- (iii) 6m
- (iv) 10m

19. Case Study Based- 3

Applications of Parabolas-Highway Overpasses/Underpasses

A highway underpass is parabolic in shape.

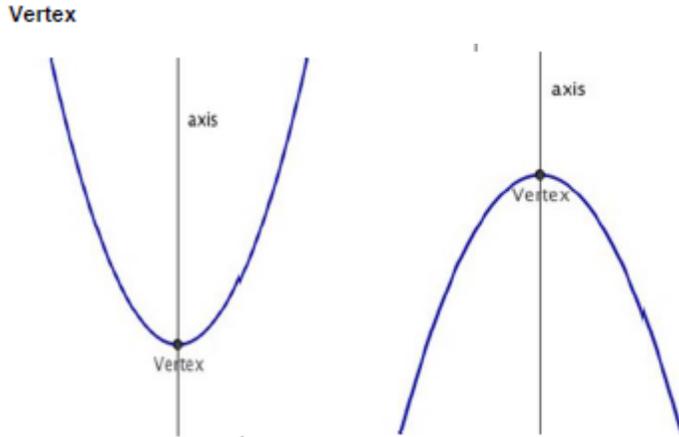


Parabola

A parabola is the graph that results from $p(x)=ax^2 + bx + c$

Parabolas are symmetric about a vertical line known as the Axis of Symmetry.

The Axis of Symmetry runs through the maximum or minimum point of the parabola which is called the

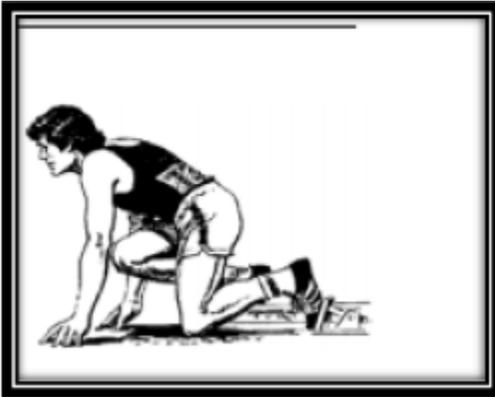


- (a) If the highway overpass is represented by $x^2 - 10x + 16$. Then its zeroes are
 (i) (2, -4) (ii) (8, 2) (iii) (-8, 2) (iv) (-4, -4)
- (b) The highway overpass is represented graphically.
 Zeroes of a polynomial can be expressed graphically. Number of zeroes of polynomial is equal to number of points where the graph of polynomial
 (i) Intersects x-axis
 (ii) Intersects y-axis
 (iii) Intersects y-axis or x-axis
 (iv) None of the above
- (c) Graph of a quadratic polynomial is a
 (i) straight line
 (ii) circle
 (iii) parabola
 (iv) ellipse
- (d) The representation of Highway Underpass whose one zero is 6 and product of the zeroes is 0, is
 (i) $x^2 - 6x + 2$
 (ii) $x^2 - 12x + 36$
 (iii) $x^2 - 36$
 (iv) $x^2 - 3$
- (e) The number of zeroes that polynomial $f(x) = (x - 3)^2 + 4$ can have is:
 (i) 1
 (ii) 2
 (iii) 0
 (iv) 3

20. Case Study Based- 4

100m RACE

A stopwatch was used to find the time that it took a group of students to run 100m.



Time(in sec)	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100
No. of students	8	10	13	6	3

- (a) Estimate the mean time taken by a student to finish the race.
- (i) 54
 - (ii) 63
 - (iii) 43
 - (iv) 50
- (b) What will be the lower limit of the modal class?
- (i) 20
 - (ii) 40
 - (iii) 60
 - (iv) 80
- (c) The construction of cumulative frequency table is useful in determining the
- (i) Mean
 - (ii) Median
 - (iii) Mode
 - (iv) All of the above
- (d) The sum of upper limits of median class and modal class is
- (i) 60
 - (ii) 120
 - (iii) 80
 - (iv) 140
- (e) How many students finished the race within 80 seconds?
- (i) 18
 - (ii) 37
 - (iii) 31
 - (iv) 8

Part B

All questions are compulsory. In case of internal choices, attempt any one.

Section III

(Q 21 to Q 26 carry 2 marks each)

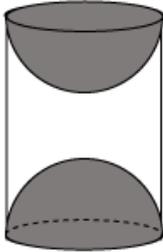
21. Show that the tangents at the end points of a diameter of a circle are parallel.
22. The radii of two circles are 19 cm and 9 cm respectively. Find the radius of the circle which has its circumference equal to the sum of the circumferences of the two circles.

OR

Two circular pieces of equal radii and maximum area, touching each other are cut out from a rectangular card board of dimensions 14 cm \times 7 cm. Find the area of the

remaining card board. (Use $\pi = \frac{22}{7}$)

23. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in the given figure. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article.



24. An electrician has to repair an electric fault on a pole of height 4 m. He needs to reach a point 1.3 m below the top of the pole to undertake the repair work. What should be the length of the ladder which makes an angle of 60° with the road to help him reach the required position?

OR

Find the angular elevation of the sun when the shadow of a 10 m long pole is $10\sqrt{3}$ m.

25. Write the next term of the AP $\sqrt{2}, \sqrt{8}, \sqrt{18}, \dots$
26. A die is thrown at once. What is the probability of getting a prime number?

Section IV

(Q 27 to Q 23 carry 3 marks each)

27. Determine the ratio in which the line $3x + y - 9 = 0$ divides the segment joining the points (1, 3) and (2, 7).

OR

The point P divides the join of (2, 1) and (-3, 6) in the ratio 2: 3. Does P lie on the line $x - 5y + 15 = 0$?

28. Draw a line segment of length 7.6 cm and divide it in the ratio 5:8. Measure the two parts.

29. The table shows the ages of the patients admitted in a hospital during a year. Find the mode and the mean of the data given above. Compare and interpret the two measures of central tendency.

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
Number of patients	6	11	21	23	14	5

OR

Find the mode for the following data which gives the literacy rate (in %) in 40 cities of India.

Literacy rate (%)	45-55	55-65	65-75	75-85	85-95
No. of cities	4	11	12	9	4

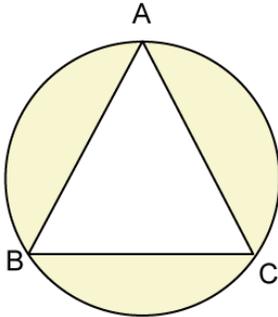
30. Explain why $\overline{3.1416}$ is a rational number.
31. On dividing $x^3 - 3x^2 + x + 2$ by a polynomial $g(x)$, the quotient and remainder were $x - 2$ and $-2x + 4$, respectively. Find $g(x)$.
32. The sum of the numerator and denominator of a fraction is 8. If 3 is added to both the numerator and the denominator, the fraction becomes $\frac{3}{4}$. Find the fraction
33. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre.
Find:
a. The length of the arc
b. Area of the sector formed by the arc
c. Area of the segment formed by the corresponding chord.

OR

On a circular table cover of radius 42 cm, a design is formed by a girl leaving an

equilateral triangle ABC in the middle, as shown in the figure. Find the covered area of the design.

$$\left[\text{Use } \sqrt{3} = 1.73 \text{ and } \pi = \frac{22}{7} \right]$$



Section V

(Q 34 to Q 36 carry 5 marks each)

34. On a window of a house in a street, h metres above the ground, the angles of elevation and depression of the top and the foot of another house on the opposite side of the street are α and β respectively. Show that the height of the opposite house is $h(1 + \tan \alpha \cdot \cot \beta)$ metres.

OR

From the top of a light house 200m high, the angles of depression of two ships on opposite sides of it are 45° and 30° respectively. Find the distance between two ships to the nearest metre.

35. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides. Formatting and numbering issue.
36. A copper wire of 4 mm diameter is evenly wound around a cylinder whose length is 24 cm and diameter 20 cm so as to cover the whole surface. Find the length and weight of the wire assuming the density to be 8.68 gm/cm^3 .