CBSE Board Class X Mathematics Sample Paper 1 (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.
- Section II has 4 questions on case study. Each case study has 5 case-based subparts. 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

Part A

Section I Section I has 16 questions of 1 mark each.

(Internal choice is provided in 5 questions)

1. What is the LCM of $(2^3 \times 3 \times 5)$ and $(2^4 \times 5 \times 7)$?

OR

What is the largest number that divides each one of 1152 and 1664 exactly?

2. If $\frac{2x}{3} - \frac{y}{2} + \frac{1}{6} = 0$ and $\frac{x}{2} + \frac{2y}{3} = 3$ then

- **3.** What is the value of $\tan 5^\circ \tan 25^\circ \tan 30^\circ \tan 65^\circ \tan 85^\circ = ?$
- **4.** Find the value of cos 1° cos 2° cos 3° cos 180°.
- **5.** Find the distance of the point (-3, 4) from x-axis.
- 6. The area of a square field is 6050 m², then what will be the length of its diagonal?
- 7. If one zero of $3x^2 + 8x + k$ be the reciprocal of the other then find the value of k?
- **8.** The shadow of a 5 m long stick is 2 m long. At the same time what will be the length of the shadow of a 12.5 m high tree (in m)?
- **9.** Find the common difference of the AP, if the sum of first n terms of an AP is $(3n^2 + 6n)$.

OR

Which term of the AP 21, 18, 15, ... is -81?

10. In a circle of radius 7 cm, tangent PT is drawn from a point P such that PT = 24 cm. If O is the center of the circle, then what is the length of OP?



OR

The chord of a circle of radius 10 cm subtends a right angle at its center. Find the length of the chord (in cm)?

11. If the probability of occurrence of an event is p then find the probability of non-happening of this event.

OR

A digit is chosen at random from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 then find the probability that it is odd.

- **12.** What are the Zeroes of $p(x) = x^2 2x 3$?
- **13.** Is the pair of equations y = 0 and y = -5 has solutions?
- **14.** Determine the values of p for which the quadratic equation $2x^2 + px + 8 = 0$ has real and equal roots.

If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 + 2x + 1$, find the value value of $\frac{1}{\alpha} + \frac{1}{\beta}$.

- **15.** The HCF of two numbers is 27 and their LCM is 162. If one of the numbers is 81, find the other.
- **16.** If $\triangle ABC \sim \triangle DEF$ such that 2AB = DE and BC = 6 cm, find EF.

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 Front View

Find the mid-point of the segment joining the points J (6, 17) and I (9, 16).

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

(b) Refer to Front View

The distance of the point P from the y-axis is (i) 4 (ii) 15 (iii) 19 (iv) 25

(c) Refer to Front View The distance between the points A and S 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 1:3 internally. (i) (8.5, 2.0) (ii) (2.0, 9.5) (iii) (3.0, 7.5) (iv) (2.0, 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.

Scale factor = <u>length in image</u> 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 1:4. The model is 120cm long. The full size of the boat has a width of 60cm. What is the width of the scale model?
 - (i) 20cm
 - (ii) 25cm
 - (iii) 15cm
 - (iv) 240cm



- (b) What will affect 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 a²: b²
- (d) The shadow of a stick 5m long is 2m. At the same time the shadow of a tree 12.5m high is



- (i) 3m (ii) 3.5m (iii) 4.5m (iv) 5m
- (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, EFGHKLMN. 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

Vertex



- (a) If the highway overpass is represented by x²-2x -8. Then its zeroes are
 (i) (2, -4) (ii) (4, -2) (iii) (-2, -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 sum of the zeroes is 0, is
 - (i) $x^2 6x + 2$ (ii) $x^2 - 36$ (iii) $x^2 - 6$ (iv) $x^2 - 3$
- (e) The number of zeroes that polynomial $f(x) = (x 2)^2 + 4$ 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 upper 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 lower limits of median class and modal class is

- (i) 60
- (ii) 100
- (iii) 80
- (iv) 140

(e) How many students finished the race within 1 minute?

- (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.** Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segments joining the points of contact at the centre.
- **22.** A ladder 15 m long just reaches the top of a vertical wall. If the ladder makes an angle of 60° with the wall then find the height of the wall.

OR

Find the value of $\frac{2\sin^2 63^{\circ} + 1 + 2\sin^2 27^{\circ}}{3\cos^2 17^{\circ} - 2 + 3\cos^2 73^{\circ}}$.

23. Find the coordinates of the point on x-axis which is equidistant from points A(-1, 0) and B(5, 0).

OR

If R(5, 6) is the midpoint of the line segment AB joining the points A(x, 5) and B(4, y) then find the values of x and y.

- **24.** If one zero of the quadratic polynomial $(k 1)x^2 + kx + 1$ is -4, then find the value of k
- **25.** Find:
 - i. If a, a 2, 3a are in A.P. then a = ____
 - ii. If a = 8, $T_n = 62$ and $S_n = 210$ then n =_____
- **26.** Draw a pair of tangents to a circle of radius 5 cm which are inclined to each other at an angle of 60°.

Section IV

(Q 27 to Q 33 carry 3 marks each)

27. In a trapezium ABCD, it is given that AB \parallel CD and AB = 2CD. Its diagonals AC and BD intersect at the point O such that ar(Δ AOB) = 84 cm². Find ar(Δ COD).

OR

Two triangle ABC and PQR are such that AB = 3 cm, AC = 6 cm, $\angle A$ = 70°, PR = 9 cm, $\angle P$ = 70° and PQ = 4.5 cm. Show that $\triangle ABC \sim \triangle PQR$ and state the similarity criterion.

- **28.** Find the number of solid spheres, each of diameter 6 cm that could be molded to form a solid metallic cylinder of height 45 cm and diameter 4 cm.
- **29.** Prove that $\frac{2}{\sqrt{7}}$ is irrational.
- **30.** The arithmetic mean of the following frequency distribution is 25.

Class	0-10	10-20	20-30	30-40	40-50
Frequency	16	р	30	32	14

Find the value of p.

31. Bridge across a river makes an angle of 45° with the river bank as shown in the figure. If the length of the bridge across the river is 150 m, what is the width of the river?



32. Find the mean of following distribution by the step deviation method.

Daily Expenditure:	100-150	150-200	200-250	250-300	300-350
No. of householders:	4	5	12	2	2

33. Solve: 23x + 29y = 98, 29x + 23y = 110

OR

Solve: 6x + 3y = 7xy and 3x + 9y = 11xy

Section V (Q 34 to Q 36 carry 5 marks each)

- **34.** A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank which is 10 m in diameter and 2 m deep. If the water flows through the pipe at the rate of 4 km/hr, in how much time will the tank be filled completely?
- **35.** An electrician has to repair an electric fault on a pole of height 4 metres. He needs to reach a point 1 metre below the top of the pole to undertake the repair work. What should be the length of the ladder that he should use, which when inclined at an angle of 60° to the horizontal would enable him to reach the required position?

Take $\sqrt{3} = 1.732$

A straight highway leads to foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30° , which is approaching the foot of the tower with a uniform speed. Six seconds later the angle of depression of the car is found to be 60° . Find the time taken by the car to reach the foot of the tower from this point.

36. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 12 days, find the time taken by B to finish the work.