CBSE Board

Class X Mathematics

Sample Paper 5 (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:

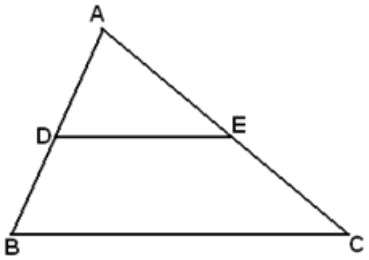
1. It consists **three sections** – III, IV and V
2. **Section III: Question No 21 to 26** are **Very short answer** Type questions of **2 marks** each.
3. **Section IV: Question No 27 to 33** are **Short Answer Type** questions of **3 marks** each.
4. **Section V: Question No 34 to 36** are **Long Answer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

Part A

Section I

Section I has 16 questions of 1 mark each.
(Internal choice is provided in 5 questions)

1. In $\triangle ABC$, D and E are points on the sides AB and AC respectively such that $DE \| BC$. If $\frac{AD}{DB} = \frac{2}{3}$ and EC = 4 cm, then find AE.



OR

If the areas of two similar triangles are in the ratio 25: 64, find the ratio of their corresponding sides.

2. If the LCM of a and 18 is 36 and the HCF of a and 18 is 2, then a =?

OR

Find the number of decimal places after which the decimal expansion of the rational number $\frac{23}{2^2 \times 5}$ will terminate.

3. Find: $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$

OR

If $x = a \sec\theta$ and $y = b \tan\theta$, then find $b^2x^2 - a^2y^2$.

4. If ΔABC is a right angled at C, then find the value of cos (A + B).

5. What is the distance of A (5, –12) from the origin?

OR

What is the perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0)?

6. Given $\Delta ABC \sim \Delta PQR$, if $\frac{AB}{PQ} = \frac{4}{9}$ then $\frac{ar\Delta ABC}{ar\Delta PQR} =$ $\square$

7. What is the sum of the first n natural numbers?

8. Find the probability of getting at most one head when two coins are tossed simultaneously.

9. Which term of the AP 3, 8, 13, 18, … is 88?

OR

Find the 11^{th} term of the AP (5a – x), 6a, (7a + x),…

10. If the arithmetic mean of x, x + 3, x + 6, x + 9 and x + 12 is 10, the find the value of x.

11. What is the name of the quadrilateral, if its diagonals divides each other proportionally?

12. What is the distance between the points (a cos θ + b sin θ, 0) and (0, a sin θ – b cos θ)?

13. Find the length of the hypotenuse of an isosceles right triangle whose one side is $4\sqrt{2}$ cm.

14. Find the sum of the exponents of the prime factors in the prime factorization of 196.

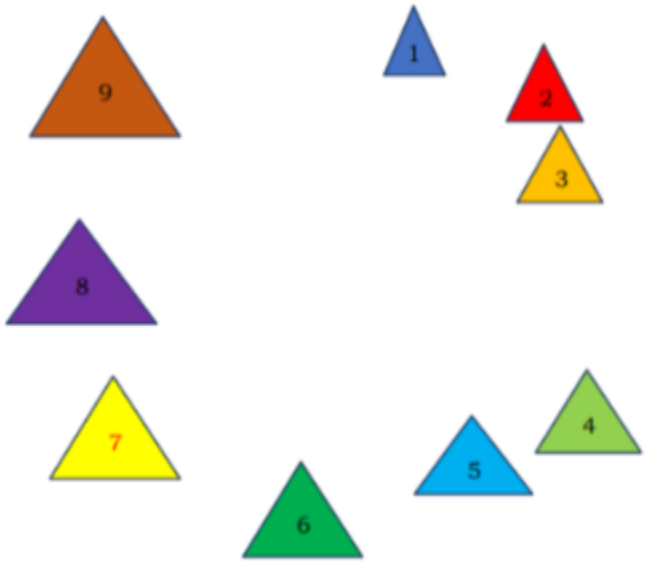
15. Which of the following is a pair of co-primes?
(14, 35), (18, 25), (31, 93), (32, 62)

16. A point P divides the join of A(5, –2) & B(9, 6) in the ratio 3:1. Find the coordinates of P.

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
Numbers and Equilateral Triangles.



Rahul and Sunil were feeling bored during the lockdown. They both created a number game. Sunil prepared nine equilateral triangles and numbered them from 1 to 9. The numbers written on the triangles also represent length of each side of the triangle (in cm).
Sunil arranged them in the form of a circle. He asked Rahul to remove alternate triangles starting from number 1, going clockwise, until only one triangle remained.

(a) The triangle which Rahul removed in the first round are in order, numbered 1, 3, 5, 7, 9. If Rahul continues in the same manner, which numbered triangle will be left in the last?

(i) 4
(ii) 2
(iii) 8
(iv) 6

(b) In the second round, Sunil started counting with triangle numbered 1 and eliminated every third triangle, until only one triangle remained. Which of the following triangle will be left in the end?

Triangle number:

(i) 1
(ii) 3
(iii) 7
(iv) 6

(c) Rahul added two more triangles in the circle and numbered these as triangle 10 and triangle 11. In this round, Rahul started counting with triangle numbered 1, but anticlockwise, and eiminated every fifth triangle, until only one triangle remained. Which triangle will be left in the end?

Triangle number:

(i) 2
(ii) 4
(iii) 5
(iv) 8

(d) If there are 9 triangles, will the perimeters of the triangles follow any pattern? If so, write the pattern?

(i) They are multiple of 3.
(ii) They are multiple of 6.
(iii) They are multiple of 2.
(iv) They are multiple of 4.

(e) Are the areas of the triangles numbered 3, 4 and 6, 8 in proportion? If yes then write down the ratio.

(i) 9: 16
(ii) 3: 4
(iii) 7: 8
(iv) 16: 9

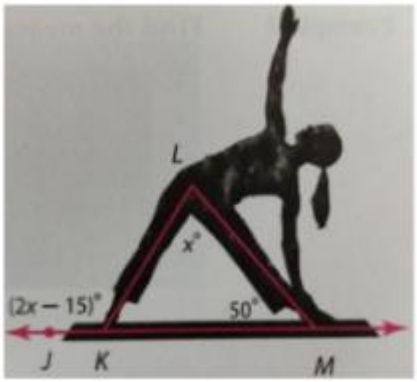
18. Case Study based-2

Types of angles and angle sum property of a triangle

It is 7:00 am!

Shikha rolls out her yoga mat and starts her warm up session with stretching and bending. Anaya her daughter is sitting nearby, observing her mother's daily ritual.

Anaya takes a picture of her mother while she was in a yoga posture and label it as shown.



(a) Angles ∠LKM and ∠JKL are called as?
- (i) Linear Pair of angles
- (ii) Vertically opposite angles
- (iii) Complementary angles
- (iv) Corresponding angles

(b) Find m∠LKM.
- (i) 195° – x
- (ii) 185° – 2x
- (iii) 195° – 2x
- (iv) 185° – x

(c) Find m∠KLM.
- (i) 115°
- (ii) 65°
- (iii) 50°
- (iv) 180°

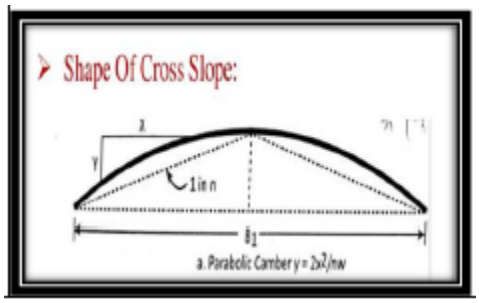
(d) Which of the following is true for △LKM?
- (i) △LKM is an equilateral triangle.
- (ii) △LKM is an isosceles triangle.
- (iii) △LKM is a right angle triangle.
- (iv) All of the above

(e) What is the measurement of the ∠LKJ?
- (i) 115°
- (ii) 65°
- (iii) 50°
- (iv) 180°

19. Case Study Based- 3

Applications of Parabolas-Highway Overpasses/Underpasses

A highway underpass is parabolic in shape.



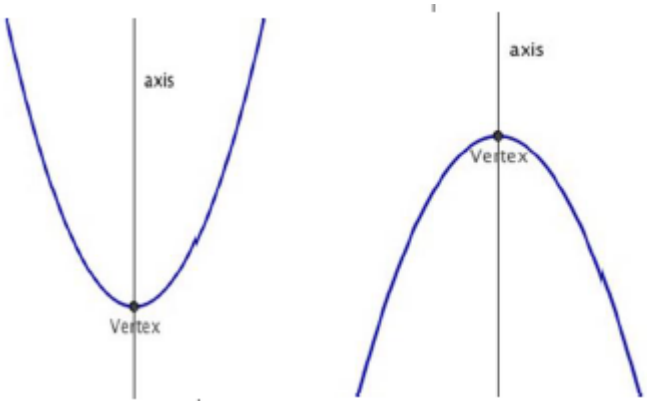
Parabola

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 $x^2 + 4x + k = 0$ has real and distinct roots then find the condition on k.

(i) $k > 4$

(ii) $k < 4$

(iii) $k \leq 4$

(iv) $k \geq 4$

(b) The quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively: $\frac{1}{4}$ and -1

(i) $k(4x^2 - x - 4)$
(ii) $k(x^2 - 12x + 36)$
(iii) $k(x^2 + 18x + 9)$
(iv) $k(x^2 - 3x + 6)$

(c) Determine the set of values of p for which the quadratic equation $px^2 + 6x + 1 = 0$ has real roots.

(i) $p < 9$
(ii) $p > 9$
(iii) $p \leq 9$
(iv) $p \geq 9$

(d) The representation of Highway Underpass whose zeroes are 9 and –2 is

(i) $x^2 - 9x + 18$
(ii) $x^2 - 12x + 36$
(iii) $x^2 + 18x + 9$
(iv) $x^2 - 7x - 18$

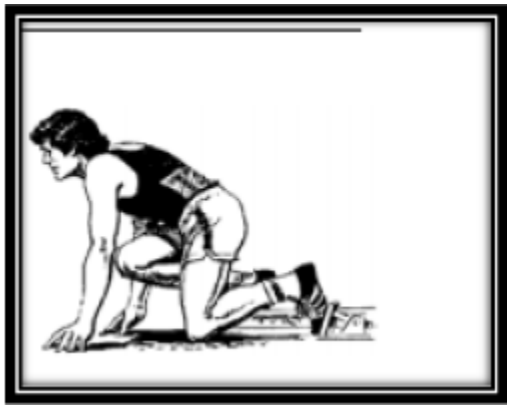
(e) The number of zeroes that polynomial $f(x) = x^2 - 1$ can have is:

(i)1
(ii) 2
(iii) 0
(iv) 3

20. Case Study Based- 4

110m RACE

A stopwatch was used to find the time that it took a group of students to run 110m.



Time(in sec)	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
No. of students	7	10	15	5	3

(a) Estimate the mean time taken by a student to finish the race.
(i) 54.6
(ii) 63.5
(iii) 43.5
(iv) 50.5

(b) What will be the lower limit of the modal class?
(i) 20
(ii) 40
(iii) 60
(iv) 80

(c) Which of the following are measures of Central Tendency?
(i) Mean
(ii) Median
(iii) Mode
(iv) All of the above

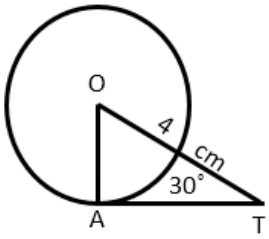
(d) The sum of upper limits of median class and modal class is
(i) 60
(ii) 120
(iii) 80
(iv) 160

(e) How many students finished the race within 1 min?
(i) 18
(ii) 37
(iii) 17
(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. In the given figure, AT is a tangent to the circle with centre O. Find the length of AT.



OR

Show that the tangents at the end points of a diameter of a circle are parallel.

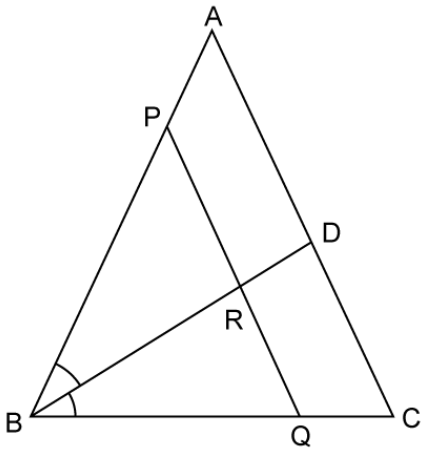
22. Find the zeroes of the quadratic polynomial $x^2 + 7x + 12$ and verify the relationship between the zeroes and its coefficients.

23. A point P is 25 cm away from the centre of a circle, and the length of the tangent drawn from P to the circle is 24 cm. Find the radius of the circle.

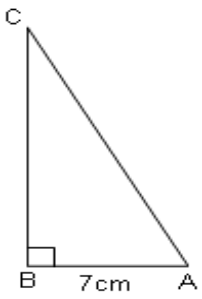
24. The perimeters of two similar triangles ABC and PQR are 32 cm and 24 cm, respectively. If PQ = 12 cm, then find AB.

OR

In ΔABC, the bisector of $\angle B$ meets AC at D. A line PQ || AC meets AB, BC and BD at P, Q and R, respectively. Show that $PR \times BQ = QR \times BP$.



25. In ΔABC, $m\angle B = 90°$, AB = 7 cm and AC – BC = 1 cm. Determine the values of sin C and cos C.



26. A bag contains 4 white and some red balls. If the probability of drawing a red ball is double that of drawing a white ball, find the number of red balls in the bag.

OR

Cards bearing numbers 1, 3, 5, …, 35 are kept in a bag. A card is drawn at random from the bag. Find the probability of getting a card bearing

(i) A prime number less than 15

(ii) A number divisible by 3 and 5

Section IV

(Q 27 to Q 33 carry 3 marks each)

27. In a seminar, the number of participants in Hindi, English and Mathematics are 60, 84 and 108, respectively. Find the minimum number of rooms required, if in each room the same number of participants are to be seated and all of them being in the same subject.

28. The 4^{th} term of an AP is zero. Prove that its 25^{th} term is triple its 11^{th} term.

29. If in a rectangle, the length is increased and breadth is reduced each by 2 metres, then the area is reduced by 28 sq metres. If the length is reduced by 1 metre and breadth is increased by 2 metres, then the area is increased by 33 sq metres. Find the length and breadth of the rectangle.

OR

If three times larger of the two numbers is divided by the smaller one, we get 4 as quotient and 3 as remainder. Also, if seven times the smaller number is divided by the larger one, we get 5 as quotient and 1 as remainder. Find the numbers.

30. If the zeros of the polynomial $f(x) = x^3 - 3x^2 + x + 1$ are $a - b$, a, $a + b$, find a and b.

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

OR

Show that a quadrilateral with vertices (0, 0), (5, 0), (8, 4) and (3, 4) is a rhombus. Also find its area.

32. If $\tan\theta = \frac{1}{\sqrt{7}}$, show that $\frac{\left(\operatorname{cosec}^2\theta - \sec^2\theta\right)}{\left(\operatorname{cosec}^2\theta + \sec^2\theta\right)} = \frac{3}{4}$

33. The cost of fencing a circular field at the rate of Rs. 24 per metre is Rs. 5280. The field is to be ploughed at the rate of Rs. 0.50 per m^2. Find the cost of ploughing the field. $\left(\text{Take } \pi = \frac{22}{7}\right)$

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

34. Draw a line segment AB of length 7 cm. Taking A as the centre, draw a circle of radius 3 cm, and taking B as a centre, draw another circle of radius 2.5 cm. Construct tangents to each circle from the centre of the other circle.

35. A rectangular field is 16 m long and 10 m wide. There is a path of uniform width all around it with an area of 120 m^2. Find the width of the path.

OR

Two pipes running together can fill a cistern in $3\frac{1}{13}$ minutes. If one pipe takes 3 minutes more than the other to fill it, then find the time in which each pipe would fill the cistern.

36. Find the mean, mode and median of the following data:

Class	Frequency
0–10	5
10–20	10
20–30	18
30–40	30
40–50	20
50–60	12
60–70	5