

Design of Question Paper

Mathematics - Class X

Time : Three hours

Max. Marks : 80

Weightage and distribution of marks over different dimensions of the question paper shall be as follows:

A. Weightage to content units

S.No.	Content Units	Marks
1.	Number systems	04
2.	Algebra	20
3.	Trigonometry	12
4.	Coordinate Geometry	08
5.	Geometry	16
6.	Mensuration	10
7.	Statistics & Probability	10
Total		80

B. Weightage to forms of questions

S.No.	Forms of Questions	Marks of each question	No. of Questions	Total marks
1.	Very Short answer questions (VSA)	01	10	10
2.	Short answer questions-I (SAI)	02	05	10
3.	Short answer questions-II (SAII)	03	10	30
4.	Long answer questions (LA)	06	05	30
Total			30	80

C. Scheme of Options

All questions are compulsory. There is no overall choice in the question paper. However, internal choice has been provided in one question of two marks each, three questions of three marks each and two questions of six marks each.

D. Weightage to difficulty level of Questions

S.No.	Estimated difficulty level of questions	Percentage of marks
1.	Easy	15
2.	Average	70
3.	Difficult	15

Based on the above design, separate Sample papers along with their blue print and marking scheme have been included in this document for Board's examination. The design of the question paper will remain the same whereas the blue print based on this design may change.

Mathematics-X
Blue Print I

Unit	Form of Questions	VSA (1 Mark) each	SAI (2 Marks) each	SA II (3 Marks) each	LA (6 Marks) each	Total
Number systems		1(1)	—	3(1)	—	4(2)
Algebra		3(3)	2(1)	9(3)	6(1)	20(8)
Trigonometry		1(1)	2(1)	3(1)	6(1)	12(4)
Coordinate Geometry		—	2(1)	6(2)	—	8(3)
Geometry		2(2)	2(1)	6(2)	6(1)	16(6)
Mensuration		1(1)	—	3(1)	6(1)	10(3)
Statistic and Probability		2(2)	2(1)	—	6(1)	10(4)
Total		10(10)	10(5)	30(10)	30(5)	80(30)

Sample Question Paper - I

Mathematics - Class X

Time : Three hours

Max.Marks :80

General Instructions.

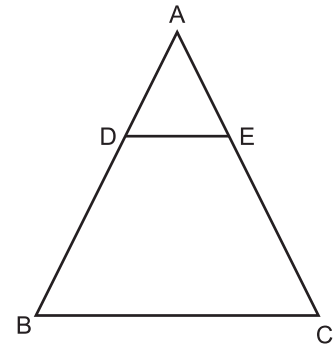
1. All Questions are compulsory.
2. The question paper consists of thirty questions divided into 4 sections A, B, C and D. Section A comprises of ten questions of 01 mark each, section B comprises of five questions of 02 marks each, section C comprises of ten questions of 03 marks each and section D comprises of five questions of 06 marks each.
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
4. There is no overall choice. However, internal choice has been provided in one question of 02 marks each, three questions of 03 marks each and two questions of 06 marks each. You have to attempt only one of the alternatives in all such questions.
5. In question on construction, drawings should be neat and exactly as per the given measurements.
6. Use of calculators is not permitted. However you may ask for mathematical tables.

Section A

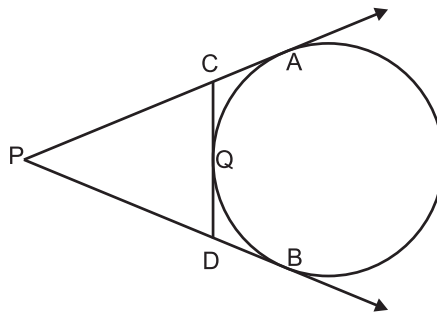
1. Write the condition to be satisfied by q so that a rational number $\frac{p}{q}$ has a terminating decimal expansion.
2. The sum and product of the zeroes of a quadratic polynomial are $-\frac{1}{2}$ and -3 respectively. What is the quadratic polynomial?
3. For what value of k the quadratic equation $x^2 - kx + 4 = 0$ has equal roots?
4. Given that $\tan\theta = \frac{1}{\sqrt{5}}$, what is the value of $\frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta}$
5. Which term of the sequence 114, 109, 104 is the first negative term ?

6. A cylinder, a cone and a hemisphere are of equal base and have the same height. What is the ratio in their volumes?

7. In the given figure, DE is parallel to BC and $AD = 1\text{cm}$, $BD = 2\text{cm}$. What is the ratio of the area of $\triangle ABC$ to the area of $\triangle ADE$?

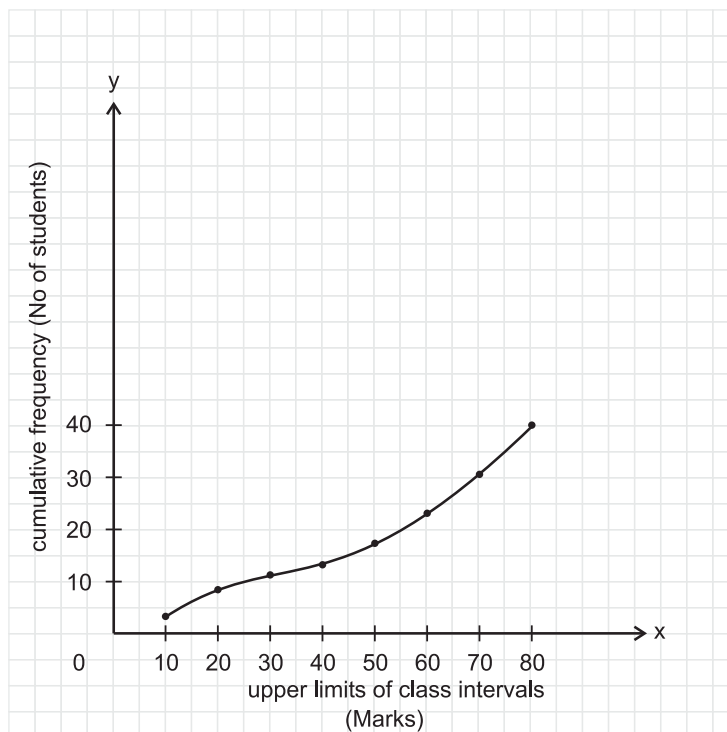


8. In the figure given below, PA and PB are tangents to the circle drawn from an external point P. CD is a third tangent touching the circle at Q. If $PB = 10\text{cm}$, and $CQ = 2\text{cm}$, what is the length of PC?



9. Cards each marked with one of the numbers 4,5,6....20 are placed in a box and mixed thoroughly. One card is drawn at random from the box. What is the probability of getting an even prime number ?

10. A student draws a cumulative frequency curve for the marks obtained by 40 students of a class, as shown below. Find the median marks obtained by the students of the class.



Section B

- 11 Without drawing the graphs, state whether the following pair of linear equations will represent intersecting lines, coincident lines or parallel lines :

$$6x - 3y + 10 = 0$$

$$2x - y + 9 = 0$$

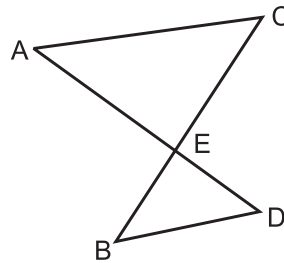
Justify your answer.

12. Without using trigonometric tables, find the value of $\frac{\cos 70^\circ}{\sin 20^\circ} + \cos 57^\circ \operatorname{cosec} 33^\circ - 2 \cos 60^\circ$

- 13 Find a point on the y-axis which is equidistant from the points A(6,5) and B (-4,3).

- 14 In the figure given below, AC is parallel to BD,

Is $\frac{AE}{CE} = \frac{DE}{BE}$? Justify your answer.



15. A bag contains 5 red, 8 green and 7 white balls. One ball is drawn at random from the bag, find the probability of getting
- a white ball or a green ball.
 - neither a green ball nor a red ball.

OR

One card is drawn from a well shuffled deck of 52 playing cards. Find the probability of getting

- a non-face card
- A black king or a red queen.

Section C

- 16 Using Euclid's division algorithm, find the HCF of 56, 96 and 404.

OR

Prove that $3 - \sqrt{5}$ is an irrational number

17. If two zeroes of the polynomial $x^4 + 3x^3 - 20x^2 - 6x + 36$ are $\sqrt{2}$ and $-\sqrt{2}$, find the other zeroes of the polynomial.
18. Draw the graph of the following pair of linear equations

$$x + 3y = 6$$

$$2x - 3y = 12$$

Hence find the area of the region bounded by the

$$x = 0, y = 0 \text{ and } 2x - 3y = 12$$

19. A contract on construction job specifies a penalty for delay of completion beyond a certain date as follows: Rs 200 for 1st day, Rs. 250 for second day, Rs. 300 for third day and so on. If the contractor pays Rs 27750 as penalty, find the number of days for which the construction work is delayed.

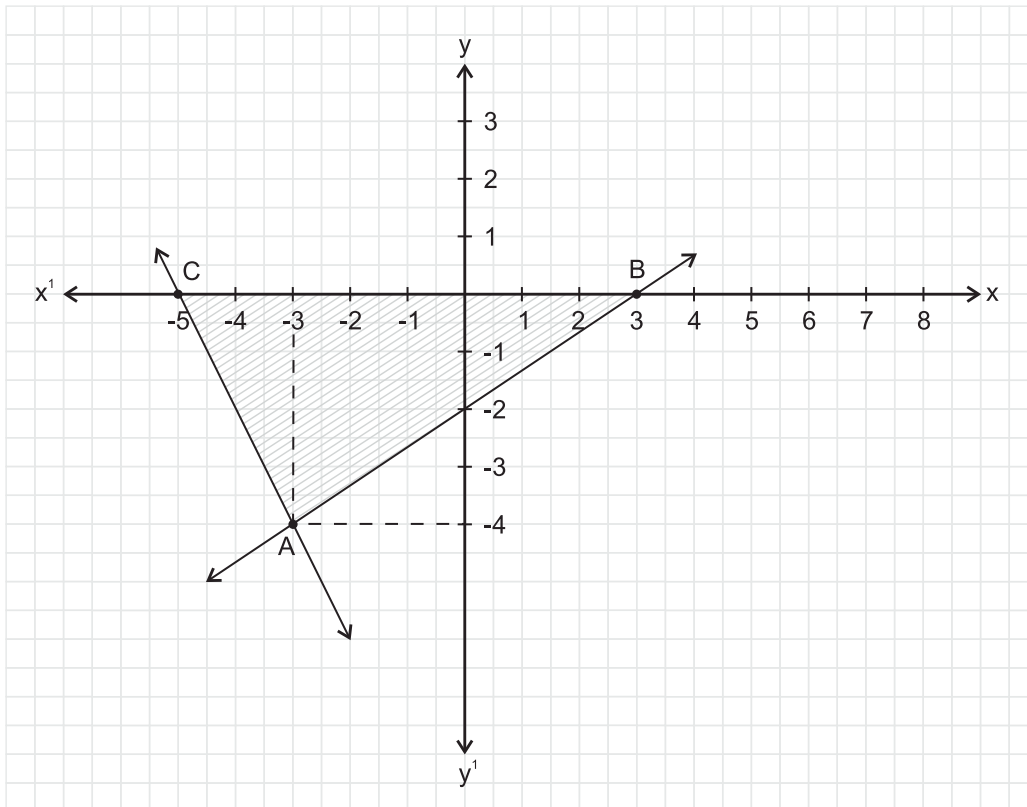
20. Prove that: $\frac{1 + \cos A}{\sin A} + \frac{\sin A}{1 + \cos A} = 2 \operatorname{cosec} A$

OR

Prove that:

$$\frac{\sin A + \cos A}{\sin A - \cos A} + \frac{\sin A - \cos A}{\sin A + \cos A} = \frac{2}{\sin^2 A - \cos^2 A}$$

21. Observe the graph given below and state whether triangle ABC is scalene, isosceles or equilateral. Justify your answer. Also find its area.



22. Find the area of the quadrilateral whose vertices taken in order are A (-5,-3) B(-4, -6), C(2,-1) and D (1,2).
23. Construct a ΔABC in which $CA = 6\text{cm}$, $AB = 5\text{cm}$ and $\angle BAC = 45^\circ$, then construct a triangle similar to the given triangle whose sides are $\frac{6}{5}$ of the corresponding sides of the ΔABC .
24. Prove that the intercept of a tangent between two parallel tangents to a circle subtends a right angle at the centre of the circle.
25. A square field and an equilateral triangular park have equal perimeters. If the cost of ploughing the field at rate of Rs 5/ m^2 is Rs 720, find the cost of maintaining the park at the rate of Rs 10/ m^2 .

OR

An iron solid sphere of radius 3cm is melted and recast into small spherical balls of radius 1cm each. Assuming that there is no wastage in the process, find the number of small spherical balls made from the given sphere.

Section D

26. Some students arranged a picnic. The budget for food was Rs 240. Because four students of the group failed to go, the cost of food to each student got increased by Rs 5. How many students went for the picnic?

OR

A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500km away in time, it had to increase the speed by 250 km/h from the usual speed. Find its usual speed.

27. From the top of a building 100 m high, the angles of depression of the top and bottom of a tower are observed to be 45° and 60° respectively. Find the height of the tower. Also find the distance between the foot of the building and bottom of the tower.

OR

The angle of elevation of the top a tower at a point on the level ground is 30° . After walking a distance of 100m towards the foot of the tower along the horizontal line through the foot of the tower on the same level ground, the angle of elevation of the top of the tower is 60° . Find the height of the tower.

28. Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Using the above, solve the following:

A ladder reaches a window which is 12m above the ground on one side of the street. Keeping its foot at the same point, the ladder is turned to the other side of the street to reach a window 9m high. Find the width of the street if the length of the ladder is 15m.

29. The interior of building is in the form of a right circular cylinder of radius 7m and height 6m, surmounted by a right circular cone of same radius and of vertical angle 60° . Find the cost of painting the building from inside at the rate of Rs 30/m²
- 30 The following table shows the marks obtained by 100 students of class X in a school during a particular academic session. Find the mode of this distribution.

Marks	No. of students
Less than 10	7
Less than 20	21
Less than 30	34
Less than 40	46
Less than 50	66
Less than 60	77
Less than 70	92
Less than 80	100

Mathematics-X
Blue Print II

Form of Questions Unit	VSA (1 Mark)	SA - I (2 Marks)	SA - II (3 Marks)	LA (6 Marks)	Total
Number systems	1(1)	--	3(1)	-	4(2)
Algebra	3(3)	2(1)	9(3)	6(1)	20(8)
Trigonometry	1(1)	2(1)	3(1)	6(1)	12(4)
Coordinate Geometry	-	2(1)	6(2)	-	8(3)
Geometry	2(2)	2(1)	6(2)	6(1)	16(6)
Mensuration	1(1)	-	3(1)	6(1)	10(3)
Statistics and Probability	2(2)	2(1)	-	6(1)	10(4)
Total	10(10)	10(5)	30(10)	30(5)	80(30)

Sample Question Paper - II

Mathematics - Class X

Time : Three hours

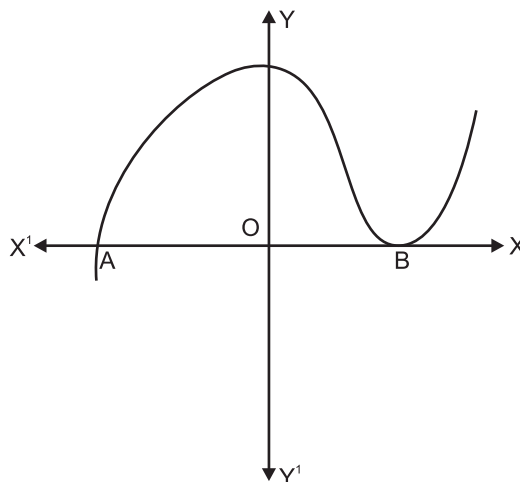
Max. Marks : 80

General Instructions :

1. All questions are compulsory.
2. The question paper consists of thirty questions divided into 4 Section A,B,C and D. Section A comprises of ten questions of 01marks each, section B comprises of five questions of 02 marks each, section C comprises of ten questions of 03 marks each and section D comprises of five questions of 06 marks each.
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
4. There is no overall choice. However, internal choice has been provided in one question of 02 marks each, three questions of 03 marks each and two questions of 06 marks each. You have to attempt only one of the alternatives in all such questions.
5. In question on construction, drawings should be neat and exactly as per the given measurements.
6. Use of calculator is not permitted. However, you may ask for mathematical tables.

Section A

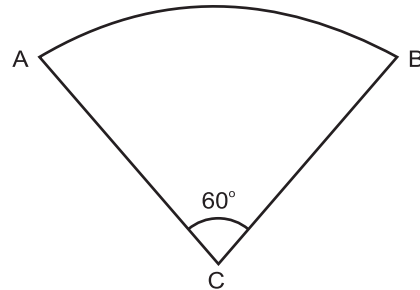
1. State the Fundamental Theorem of Arithmetic.
2. The graph of $y=f(x)$ is given below. Find the number of zeroes of $f(x)$.



3. Give an example of polynomials $f(x)$, $g(x)$, $q(x)$, and $r(x)$ satisfying $f(x) = g(x) \cdot q(x) + r(x)$ where $\deg r(x) = 0$.

4. What is the nature of roots of the quadratic equation $4x^2 - 12x - 9 = 0$?

5. If the adjoining figure is a sector of a circle of radius 10.5 cm,



find the perimeter of the sector. (Take $\pi = \frac{22}{7}$)

6. The length of tangent from a point A at a distance of 5 cm from the centre of the circle is 4 cm. What will be the radius of the circle?

7. Which measure of central tendency is given by the x-coordinate of the point of intersection of the 'more than' ogive and 'less than' ogive?

8. A bag contains 5 red and 4 black balls. A ball is drawn at random from the bag. What is the probability of getting a black ball?

9. What is the distance between two parallel tangents of a circle of the radius 4 cm?

10. The height of a tower is 10m. Calculate the height of its shadow when Sun's altitude is 45° .

Section B

11. From your pocket money, you save Rs.1 on day 1, Rs. 2 on day 2, Rs. 3 on day 3 and so on. How much money will you save in the month of March 2008 ?

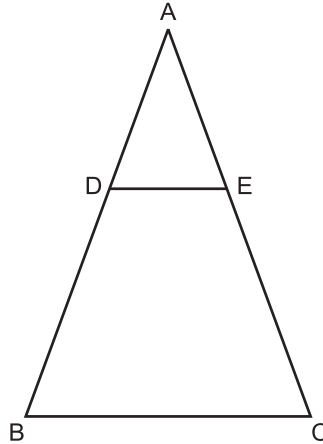
12. Express $\sin 67^\circ + \cos 75^\circ$ in terms of trigonometric ratios of angles between 0° and 45°

OR

If A,B,C are interior angles of a ΔABC , then show that

$$\cos\left(\frac{B+C}{2}\right) = \sin \frac{A}{2}$$

13. In the figure given below, $DE \parallel BC$. If $AD = 2.4$ cm, $DB = 3.6$ cm and $AC = 5$ cm Find AE .



14. Find the values of x for which the distance between the point $P (2,-3)$ and $Q (x,5)$ is 10 units.
15. All cards of ace, jack and queen are removed from a deck of playing cards. One card is drawn at random from the remaining cards. find the probability that the card drawn is
- a face card
 - not a face card

Section C

16. Find the zeroes of the quadratic polynomial $x^2 + 5x + 6$ and verify the relationship between the zeroes and the coefficients.
17. Prove that $5 + \sqrt{2}$ is irrational.
18. For what value or 'k' will the following pair of linear equations have infinitely many solutions

$$\begin{aligned} kx + 3y &= k-3 \\ 12x + ky &= k \end{aligned}$$

OR

Solve for x and y

$$\frac{5}{x} + \frac{1}{y} = 2$$

$$\frac{6}{x} - \frac{3}{y} = 1 \quad \left. \vphantom{\frac{6}{x} - \frac{3}{y} = 1} \right\} x \neq 0, y \neq 0$$

19. Determine an A.P. whose 3rd term is 16 and when 5th term is subtracted from 7th term, we get 12.

OR

Find the sum of all three digit numbers which leave the remainder 3 when divided by 5.

20. Prove that

$$\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{Cosec} A$$

21. Prove that the points A(-3,0), B(1,-3) and C(4,1) are the vertices of an isoscles right triangle.

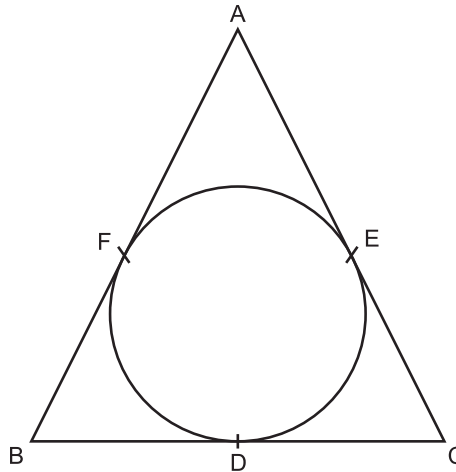
OR

For what value of 'K' the points A (1,5), B (K,1) and C (4,11) are collinear?

22. In what ratio does the point P(2,-5) divide the line segment joining A(-3,5) and B(4,-9)?

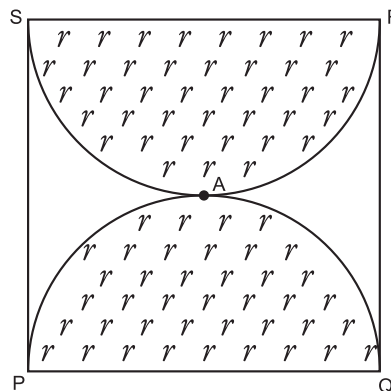
23. Construct a triangle similar to given ABC in which AB = 4 cm, BC = 6 cm and $\angle ABC = 60^\circ$, such that each side of the new triangle is $\frac{3}{4}$ of given ΔABC .

24. The incircle of ΔABC touches the sides BC, CA and AB at D,E, and F respectively. IF $AB = AC$, prove that $BD=CD$.



25. PQRS is a square land of side 28m. Two semicircular grass covered portions are to be made on two of its opposite sides as shown in the figure. How much area will be left

uncovered? (Take $\pi = \frac{22}{7}$)



Section D

26. Solve the following system of linear equations graphically:

$$3x + y - 12 = 0$$

$$x - 3y + 6 = 0$$

Shade the region bounded by these lines and the x-axis. Also find the ratio of areas of triangles formed by given lines with x-axis and the y-axis.

27. There are two poles, one each on either bank of a river, just opposite to each other. One pole is 60m high. From the top of this pole, the angles of depression of the top and the foot of the other pole are 30° and 60° respectively. Find the width of the river and the height of the other pole.

28. Prove that the ratio of areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

Use the above theorem, in the following.

The areas of two similar triangles are 81 cm^2 and 144 cm^2 . If the largest side of the smaller triangle is 27 cm, find the largest side of the larger triangle.

OR

Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Use the above theorem, in the following.

If $\triangle ABC$ is an equilateral triangle with $AD \perp BC$, then $AD^2 = 3 DC^2$.

29. An iron pillar has lower part in the form of a right circular cylinder and the upper part in the form of a right circular cone. The radius of the base of each of the cone and cylinder is 8 cm. The cylindrical part is 240 cm high and the conical part is 36 cm high. Find the weight

of the pillar if 1 cm^3 of iron weighs 7.5 grams. (Take $\pi = \frac{22}{7}$)

OR

A container (open at the top) made up of a metal sheet is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm respectively. Find

- (i) the cost of milk when it is completely filled with milk at the rate of Rs 15 per litre.
- (ii) the cost of metal sheet used, if it costs Rs 5 per 100 cm^2

(Take $\pi = 3.14$)

30. The median of the following data is 20.75. Find the missing frequencies x and y , if the total frequency is 100.

Class Interval	Frequency
0 - 5	7
5 - 10	10
10 - 15	x
15 - 20	13
20 - 25	y
25 - 30	10
30 - 35	14
35 - 40	9

Blue Print III
X - Mathematics

Unit \ Form of Questions	VSA (1 Mark) each	SA - I (2 Marks) each	SA - II (3 Marks) each	LA (6 Marks) each	Total
Number systems	1(1)	--	3(1)	-	4(2)
Algebra	3(3)	2(1)	9(3)	6(1)	20(8)
Trigonometry	1(1)	2(1)	3(1)	6(1)	12(4)
Coordinate Geometry	-	2(1)	6(2)	-	8(3)
Geometry	2(2)	2(1)	6(2)	6(1)	16(6)
Mensuration	1(1)	-	3(1)	6(1)	10(3)
Statistics and Probability	2(2)	2(1)	-	6(1)	10(4)
Total	10(10)	10(5)	30(10)	30(5)	80(30)

Sample Question Paper III
Mathematics - Class X

Time : Three hours

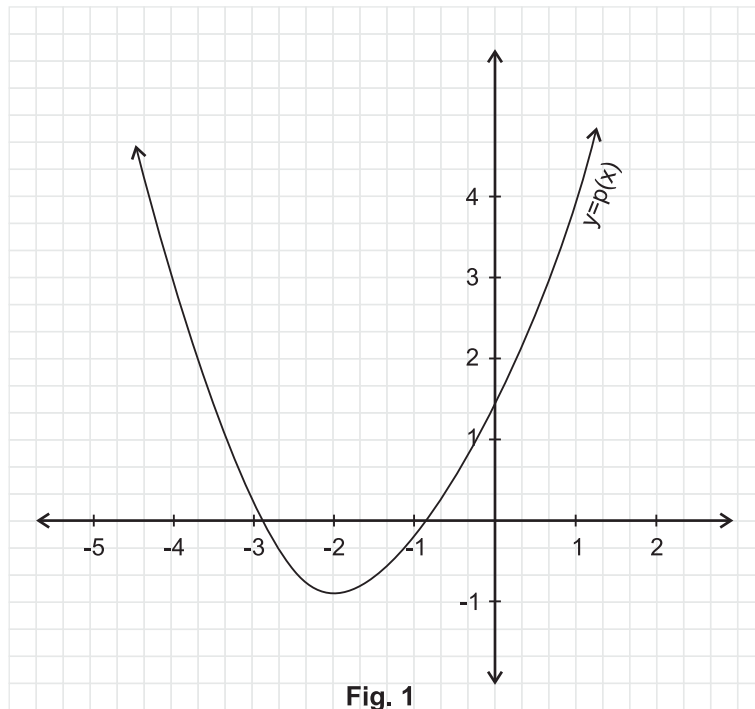
Max. Marks : 80

General Instructions :

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 3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
 4. There is no overall choice. However, internal choice has been provided in one question of 02 marks each, three questions of 03 marks each and two questions of 06 marks each. You have to attempt only one of the alternatives in all such questions.
 5. In question on construction, drawings should be neat and exactly as per the given measurements.
 6. Use of calculators is not permitted. However, you may ask for mathematical tables.
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SECTION-A

1. Write 98 as product of its prime factors.
2. In fig. 1 the graph of a polynomial $p(x)$ is given. Find the zeroes of the polynomial.



3. For what value of k , the following pair of linear equations has infinitely many solutions?

$$10x + 5y - (k-5) = 0$$

$$20x + 10y - k = 0$$
4. What is the maximum value of $\frac{1}{\sec \theta}$?
5. If $\tan A = \frac{3}{4}$ and $A+B = 90^\circ$, then what is the value of $\cot B$?
6. What is the ratio of the areas of a circle and an equilateral triangle whose diameter and a side are respectively equal ?
- 7.

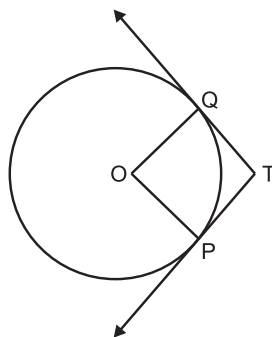


Fig. 2

Two tangents TP and TQ are drawn from an external point T to a circle with centre O, as shown in fig. 2. If they are inclined to each other at an angle of 100° then what is the value of $\angle POQ$?

8. In fig. 3 what are the angles of depression from the observing positions O_1 and O_2 of the object at A?

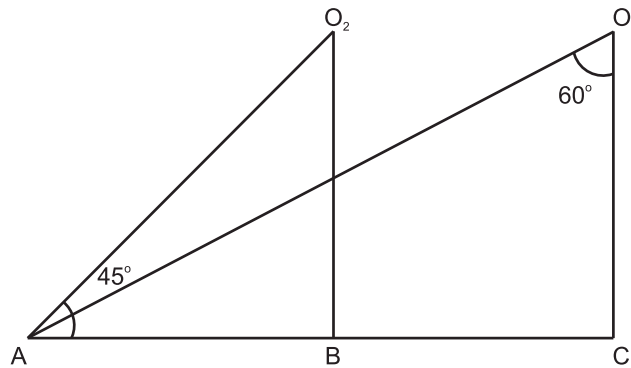


Fig. 3

9. A die is thrown once. what is the probability of getting a prime number?
10. What is the value of the median of the data using the graph in fig. 4, of less than ogive and more than ogive?

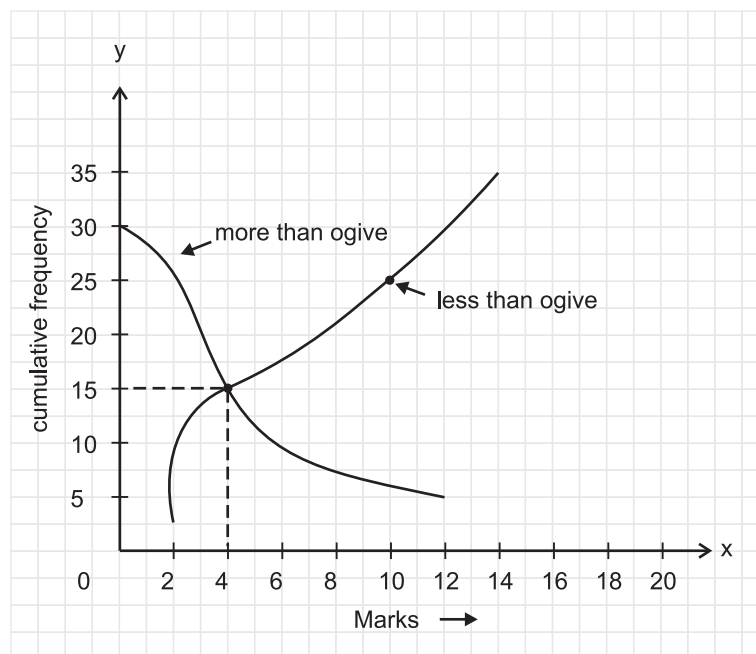


Fig. 4

SECTION : B

11. If the 10th term of an A.P. is 47 and its first term is 2, find the sum of its first 15 terms.
12. Justify the statement : "Tossing a coin is a fair way of deciding which team should get the batting first at the beginning of a cricket game."
13. Find the solution of the pair of equations:

$$\frac{3}{x} + \frac{8}{y} = -1, \quad \frac{1}{x} - \frac{2}{y} = 2, \quad x, y \neq 0$$

14. The coordinates of the vertices of ΔABC are $A(4, 1)$, $B(-3, 2)$ and $C(0, k)$. Given that the area of ABC is 12 unit^2 , find the value of k .
15. Write a quadratic polynomial, sum of whose zeroes is $2\sqrt{3}$ and their product is 2.

OR

What are the quotient and the remainder, when $3x^4 + 5x^3 - 7x^2 + 2x + 2$ is divided by $x^2 + 3x + 1$?

SECTION-C

16. If a student had walked 1 km/hr faster, he would have taken 15 minutes less to walk 3 km. Find the rate at which he was walking.
17. Show that $3+5\sqrt{2}$ is an irrational number.
18. Find the value of k so that the following quadratic equation has equal roots:
 $2x^2 - (k-2)x + 1 = 0$
19. Construct a circle whose radius is equal to 4 cm. Let P be a point whose distance from its centre is 6 cm. Construct two tangents to it from P .
20. Prove that

$$\frac{\sin \theta}{\cot \theta + \operatorname{cosec} \theta} = 2 + \frac{\sin \theta}{\cot \theta - \operatorname{cosec} \theta}$$

OR

Evaluate

$$\frac{\sec 29^\circ}{\operatorname{Cosec} 61^\circ} + 2 \cot 8^\circ \cot 17^\circ \cot 45^\circ \cot 73^\circ \cot 82^\circ - 3(\sin^2 38^\circ + \sin^2 52^\circ)$$

21. In fig. 5, $\frac{XP}{PY} = \frac{XQ}{QZ} = 3$, if the area of XYZ is 32 cm^2 , then find the area of the quadrilateral $PYZQ$.

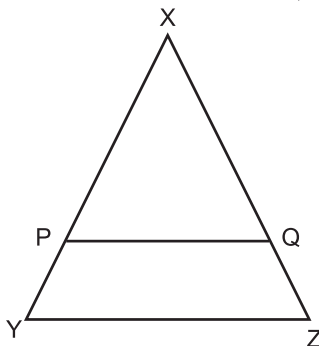


Fig. 5

OR

A circle touches the side BC of a ΔABC at a point P and touches AB and AC when produced at Q and R respectively. Show that

$$AQ = \frac{1}{2} (\text{Perimeter of } \Delta ABC)$$

22. Find the ratio in which the line segment joining the points A (3, -6) and B(5,3) is divided by x - axis. Also find the coordinates of the point of intersection.
23. Find a relation between x and y such that the point P(x,y) is equidistant from the points A(2, 5) and B(-3, 7)
24. If in fig. 6, ΔABC and ΔAMP are right angled at B and M respectively, prove that $CA \times MP = PA \times BC$

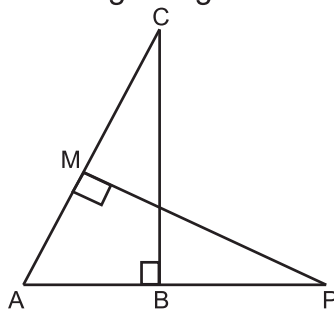


Fig. 6

25. In Fig. 7, OAPB is a sector of a circle of radius 3.5 cm with the centre at O and $\angle AOB = 120^\circ$. Find the length of OAPBO.

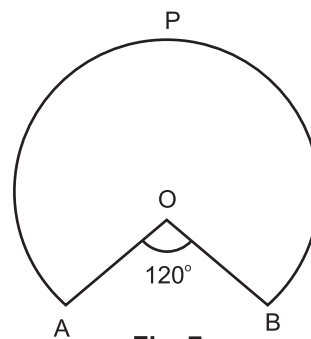


Fig. 7

OR

Find the area of the shaded region of fig. 8 if the diameter of the circle with centre O is

$$28 \text{ cm and } AQ = \frac{1}{4} AB.$$

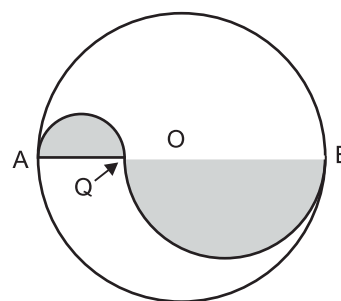


Fig. 8

SECTION-D

- [26] Prove that in a triangle, if the square of one side is equal to the sum of the squares of the other two sides the angle opposite to the first side is a right angle. Using the converse of above, determine the length of an altitude of an equilateral triangle of side 2 cm.
- [27] Form a pair of linear equations in two variables using the following information and solve it graphically.
Five years ago, Sagar was twice as old as Tiru. Ten year later Sagar's age will be ten years more than Tiru's age. Find their present ages. What was the age of Sagar when Tiru was born?
- [28] From the top and foot of a tower 40m high, the angle of elevation of the top of a light house is found to be 30° and 60° respectively. Find the height of the lighthouse. Also find the distance of the top of the lighthouse from the foot of the tower.
- [29] A solid is composed of a cylinder with hemispherical ends. If the whole length of the solid is 100cm and the diameter of the hemispherical ends is 28cm. find the cost of polishing the surface of the solid at the rate of 5 paise per sq.cm.

OR

An open container made up of a metal sheet is in the form of a frustum of a cone of height 8cm with radii of its lower and upper ends as 4 cm and 10 cm respectively. Find the cost of oil which can completely fill the container at the rate of Rs. 50 per litre. Also, find the cost of metal used, if it costs Rs. 5 per 100 cm^2 (Use $\pi = 3.14$)

- [30] The mean of the following frequency table is 53. But the frequencies f_1 and f_2 in the classes 20-40 and 60-80 are missing. Find the missing frequencies.

Age (in years)	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100	Total
Number of people	15	f_1	21	f_2	17	100

OR

Find the median of the following frequency distribution:

Marks	Frequency
0-100	2
100-200	5
200-300	9
300-400	12
400-500	17
500-600	20
600-700	15
700-800	9
800-900	7
900-1000	4