

Mathematics

Class: X Std.

Marks:80

General Instructions:

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

Part –A

1. *There are two sections Section –I and Section-II.*
2. *Section –I has 16 questions of 1 mark each and internal choices provided in 5 questions.*
3. *Section-II has four questions based on case study. Each question has 5 sub-questions. An examinee is to attend 4 out of 5subquestions.*

Part-B.

1. *Questions 21 to 26 carry 2 marks each. Internal choice is provided in two questions.*
2. *Questions 27to 33 carry 3 marks each and internal choice provided in 2 questions.*
3. *Questions 34 to 36 carry 5 marks each and internal choice is provided in one question.*
4. *Use of calculators prohibited.*

Part- A

Section- I

1. If a, b and c are three positive integers such that a is a multiple of b and c is a factor of b then what is L.C.M(a, b, c)?

OR

Can two positive integers have their H.C.F 12 and L.C.M. 100? Give reason.

2. In $\triangle ABC$ right angled at C, $CD \perp AB$. If $BC = 4$ cm, $BD = 3.2$ cm, find length of AB

OR

Diagonals AC and BD of trapezium ABCD in which $AB \parallel DC$ intersect at O. If $3AB = CD$ and $OB = 1.5$ cm find the length of diagonal BD.

3. Two dice are thrown together. What is the probability of getting scores such that their product is a prime number?
4. If $4\sin^2 A = 3$, find the measure of angle A.
5. At a certain time of the day the shadow of a vertical pole is $\sqrt{3}$ times its height. What is the altitude of the Sun?
6. A circular race track of width 3.5 m has inner radius 7 m. Find its area.

OR

Length of an arc of circle of radius 14 cm is 44 cm. Find the area of the corresponding minor sector.

7. For what value of 'k' the following system of equations will have unique solution?
 $2x - 3y = 7$; $kx - 4y = 10$.
8. Given $a_n = 17 - 3n$, which term is the first negative term?

OR

If a, b and c are three consecutive terms of an A.P. find a relation between a, b and c .

9. Find a quadratic polynomial whose zeroes are $\frac{1}{2}$ and $-\frac{1}{2}$.
10. Two cubes of edge 6 cm are joined end to end. Find the total surface area of the cuboid so formed.
11. Given $a = 5$, common difference = -5 , find an expression for the n^{th} term.
12. If the equation $x^2 + 2(k + 2) + 9k = 0$ has equal roots find value of 'k'.
13. If one root of the equation $ax^2 + bx + c = 0$ is negative of the other what is the value of b?

OR

If one zero of the polynomial $ax^3 + bx^2 + cx + d$ is zero, find the product of the other two zeroes.

14. The length of chord obtained by joining point of contact of a tangent with one of the ends of the diameter is $5\sqrt{2}$ cm. Find the radius of the circle.
15. Find the side of the largest square that can be inscribed in a right triangle whose sides making right angle measure 6 cm and 8 cm respectively.
16. In $\triangle ABC$, $DE \parallel BC$. If $AD = 1.2$ cm, $AB = 6$ cm, $AE = 3$ cm, find EC.

Section-II

17. **Case study I :** A team of students visited a village to study mortality rate during the past 5 years. The following data gives information about the occurrence of death at various ages.

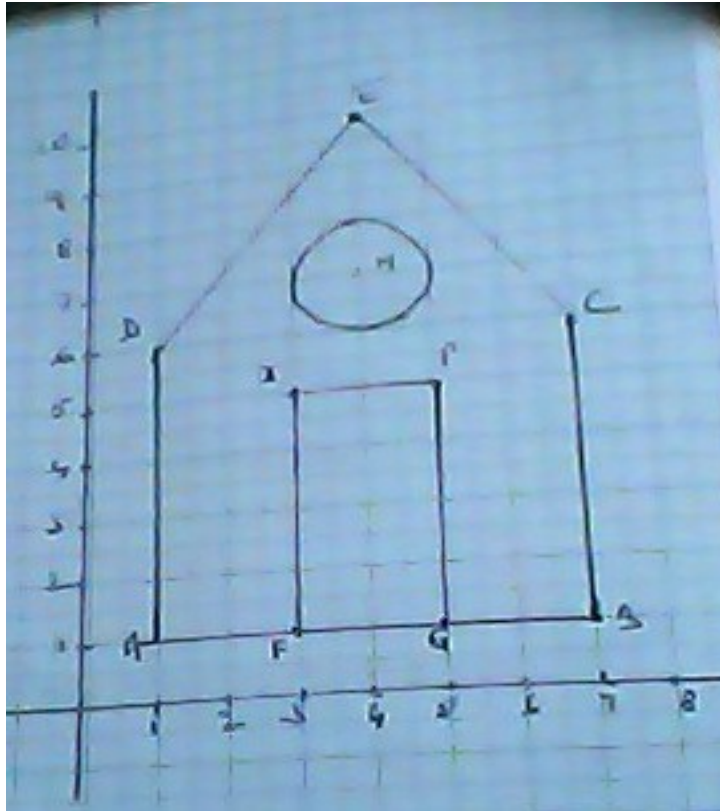
Age(years)	0 – 10	10-20	20 - 30	30- 40	40- 50	50-60	60- 70	70- 80
No. of deaths	6	15	20	25	35	45	44	15

- a) The percent of deaths in the age group 0 – 10 years with reference to the current sample of the population is
 - i) 6% ii) 3% iii) 5% iv) None of these.
 - b) The mode of the above data is ____
 - i) 61.1 ii) 61.3 iii) 61.2 iv) 61.4
 - c) The median class is ____
 - i) 50 – 60 ii) 60 – 70 iii) 40 – 50 iv) 50-60
 - d) Cumulative frequency of the median class is ____
 - i) 100 ii) 120 iii) 111 iv) 101
 - e) The mean of the above data is ____
 - i) 45 ii) 45.95 iii) 46.95 iv) 47.85
18. **Case Study II :** Equations of the type $ax^2 + bx + c = 0$ are called quadratic equations. When plotted on a graph they present a parabola similar to quadratic polynomials. The solutions to the equation are termed roots of the equation. A quadratic equation has two roots. Quadratic equations where the first degree term is missing are called pure quadratic equations and roots are always equal in magnitude but have opposite signs. The equations where first degree term is present are called affected quadratic equations and the nature of the roots depends on the value of the discriminant ($b^2 - 4ac$).
 - a) If the roots of the equation $ax^2 + bx + c = 0$ are both negative then_

- i) Both 'a' and 'b' are negative.
 - ii) Both 'b' and 'c' are positive
 - iii) a, b and c will have same sign
 - iv) 'a' will have sign opposite to that of 'b' and 'c'.
- b) One of the roots of a quadratic equation is $4 + 3\sqrt{2}$, hence the other root is
- i) $4 + 3\sqrt{2}$ ii) $4 - 3\sqrt{2}$ iii) $3\sqrt{2} - 4$ iv) None of these
- c) If a quadratic equation has equal roots then value of the Discriminant is
- i) Zero ii) less than zero iii) Greater than zero iv) none of these
- d) The roots of the equation $ax^2 + bx + c = 0$ are reciprocals of each other. Then _
- i) $a = -c$ ii) $a = c$ iii) $a > c$ iv) $a < c$
- e) The roots of a quadratic equation are $\sqrt{3}$ and $-\sqrt{3}$, the equation is _
- i) $x^2 + 9$ ii) $x^2 - 3$ iii) $x^2 + 3$ iv) $x^2 - 9$

19. Case Study III : It is said that relation between the sides of a right triangle was discovered accidentally while attending a banquet. Pythagoras theproponent of the theorem came to the conclusion while observing the ceiling of the banquet hall which contained a number of right triangles. Today Pythagoras theorem forms the basis for study of trigonometry and Analytical geometry. The Pythagoras theorem has given rise to finding a number of ways of finding such triplets-pythagorean triplets- where the square of largest number is equal to the sum of the squares of the other two numbers.Let's concentrate only Pythagoras theorem and right triangle.

- a) In a ΔABC , right angled at 'A', $AD \perp BC$. Then which of the following statements is incorrect.
- i) $AB^2 = BC \cdot BD$ ii) $AC^2 = BC \cdot CD$ iii) $AD^2 = BC + BD$
 - iv) $AD^2 = BD \cdot CD$
- b) If a, b and c are sides of a right triangle where c is hypotenuse then radius of the incircle of the triangle is given by _
- c) $\frac{a+b+c}{3}$ ii) $\frac{a+b-c}{3}$ iii) $\frac{a+b+c}{2}$ iv) $\frac{a+b-c}{2}$
- d) ΔABC is right angled at C and $CD \perp AB$. If $BC = a, AC = b, AB = c$ and $CD = p$ then which of the following is true?
- i) $p^2 - a^2 = b^2$ ii) $p^2 = a^2 - b^2$ iii) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$ iv) $\frac{1}{p^2} = \frac{1}{a^2} - \frac{1}{b^2}$
- e) If a, b and c are sides of a right triangle where c is the hypotenuse then the side of the largest square that can be inserted in the triangle is given by
- i) $\frac{a+b}{ab}$ ii) $\frac{a-b}{ab}$ iii) $\frac{ab}{a+b}$ iv) $\frac{ab}{a-b}$



20. Case Study IV : The above figure shows the front view of Sohan's house. Observe carefully and answer the following questions.

- a) The co-ordinates of F are ____
 i) (1,6) ii) (6,1) iii) (1,3) iv) (3,1)
- b) The midpoint of FB is ____
 i) (1,5) ii) (5,1) iii) (5,0) iv) None of these
- c) The distance between D and B is ____
 i) 4 units ii) $\sqrt{61}$ units iii) $2\sqrt{15}$ units iv) None of these
- d) Vertical height of the house is ____
 i) 9 units ii) 10 units iii) can not be determined iv) none of these
- e) Distance of point I from y-axis ____
 i) 5 units ii) 4 units iii) 3 units iv) none of these

Part- B

- 21.** Find the greatest number that divides 42, 69 and 122 leaving remainders 3, 4 and 5 respectively.
- 22.** For what value of 'k' the following system of equations will have unique solution:
 $3x - 4y + 7 = 0$; $kx + 3y - 5 = 0$

OR

For what values of a and b the following system of equations will have infinitely many solutions: $(a-1)x + 3y - 2 = 0$; $6x + (1-2b)y - 6 = 0$.

23. Two tangents BC and BD are drawn to a circle with centre 'O'. If $\angle CBD = 120^\circ$ prove $OB = 2BC$.
24. If three consecutive vertices of a parallelogram ABCD are A(1,2), B(1,0), C(4,0) find coordinates of the fourth vertex.

OR

Find the ratio in which the point $(-3, p)$ divides the line segment joining points $(-5, -4)$ and $(-2, 3)$. Also find value of p.

25. Prove : $(1 + \cot A - \operatorname{cosec} A)(1 + \tan A + \sec A) = 2$
26. Diagonals AC and BD of a quadrilateral ABCD intersect at O. Prove that ratio of area of $\triangle ABD$ to area of $\triangle BCD$ is $AO : OC$
27. Given $\sqrt{3}$ and $\sqrt{2}$ are irrational, prove $\sqrt{3} + \sqrt{2}$ is irrational

OR

On a morning walk three persons step together and their steps measure 40 cm, 42 cm and 45 cm respectively. What is the minimum distance each should walk so that each cover the same distance in complete steps.

28. Given $\sqrt{2}$ is a zero of the polynomial $6x^3 + \sqrt{2}x^2 - 10x - 4\sqrt{2}$ find the other two zeroes.

OR

For what value of 'k' is -4 will be a zero of the polynomial $x^2 - x - (2k + 2)$. Also find the other zero of the polynomial.

29. In $\triangle ABC$, E is the midpoint of AC and BC produced to D. DE produced meets AB at F such that $\angle AEF = \angle AFE$. Prove that $BD : CD = BF : CE$.
30. If $1 + \sin^2 A = 3\sin A$, Prove $\tan A = 1$ or $\frac{1}{2}$
31. A child's game has 8 triangle of which 3 are blue and rest are red, and 10 squares of which 6 are blue and rest are red. One piece is lost at random. Find the probability that it is i) a square ii) a blue triangle iii) a red square.
32. The table below shows salaries of 280 people. Calculate the median and mode of the data.

Salary (in thousands)	5- 10	10-15	15-20	20-25	25-30	30-35	35-40
No.of persons	49	133	63	15	7	8	5

33. A metallic rod of length is 39 cm and has conical endings on either side. If the length of the cylindrical part is 14 cm and the radius of the pole is 7 cm find its total surface area.

34. If $\sec A + \tan A = x$, show that $\sin A = \frac{x^2 - 1}{x^2 + 1}$

OR

A person atop a light house 100 m high observes the angle of depression of a boat coming towards the foot of the light house to be 30° . After 15 minutes the angle of depression changes to 60° . In what time from this point the boat would reach the light house.

35. A building is in the form of a cube of edge 14 m with a hemispherical dome. It has door measuring 2 m X 3 m and 8 windows each measuring 1 m X 1.5 m on its lateral walls. Find the cost of painting its outer surface at the cost of Rs. 25/ m²
36. A railway half ticket costs half of the full fare while reservation charge is same for both. A reserved first class ticket from Bangalore to Delhi costs Rs. 2850. Raju had to pay Rs. 8600 for 2 full and 2 half reserved tickets. Find the fare and reservation charges.