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 5ubquestions.***

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. Product of two numbers is 1728. If their HCF is 48 find their LCM

   OR

   If $1296 = 2^m \times 3^n$ find values of 'm' and 'n'.
2. Given $3x - 2y = 8$, write another equation such that the system of equations will have infinitely many solutions.
3. If -3 is a zero of the polynomial $3x^2 + kx + 24$, find 'k'.

   OR

   Write a polynomial whose sum and product of zeroes are -4 and -5 respectively.
4. Given $a_n = 2n - 3$, find the difference between 13^{th} and 3^{rd} terms.
5. Sides of two similar triangles are in the ratio 2 : 3. What is the ratio between their areas?

   OR

   Find the length of a tangent drawn to a circle of radius 3 cm from a point 5 cm away from the centre.
6. Find the sum of first ten natural multiples of 3.

   OR

   An A.P consists of 15 terms. If the first and last terms are 3 and -25 respectively find their sum.
7. If $\sin\beta = \cos\beta$ find the value of $(\tan\beta + \cot\beta)^2$
8. Express $\sec 67^o + \sin 73^o$ as t-ratios between 0^o and 45^o
9. Two concentric circles have radii 3.5 cm and 7 cm respectively. Find the area between the circles.

10. Ten cards are numbered 1 to 10.One card is drawn at random. What is the probability that it bears a perfect square number?

OR

Two coins are tossed together. What is the probability of getting utmost two heads.?

11. Circumference of a base of a 1.5 m high pillar is 60 cm. Find the cost of painting its surface at Rs.10/m^2.
12. The value of discriminant of a quadratic equation is 49. What can you say about the nature of its roots?
13. In a ΔABC, DE $\|$ BC. If AD = 1.5 cm, AB = 6cm, EC = 2.7 cm find the length of AC.
14. Internal diameter of a hemispherical cup is 7 cm. Find its inner surface area.
15. ΔABC is right angled at A and AD $\perp$ BC, divides BC such that $AD^2 = BD.CD$. If AD= 4 cm and BD =2 cm, Find BC.
16. Sum of the digits of a two digited number is 11. The numbe obtained by reversing the digits is 9 less than the original number. Forma pair of lineraequations in two variables to represent this fact.

Section-II

17. .**Case Study I**: In a survey to study obesity among students at undergraduate level , the following data gives the information collected. Based on it answer the questions that follow:

Wt(Kg)	*40-45*	*45-50*	*50-55*	*55-60*	*60-65*	*65-70*	*70-75*
No.of Students	4	11	6	15	12	9	3

a) Mean of the above data is
(i) 55 (ii) 57.35 (iii) 57.42 (iv) 58

b) Upper limit of the median class is
(i) 50 (ii) 55 (iii) 60 (iv) 65

c) If 60 Kg and above are considered obese, the number of obese students is
(i) 12 (ii) 24 (iii) 15 (iv) 25

d) If '**more than"** cumulative frequency is written then cumulative frequency of the class 55-60 is
(i) 15 (ii) 27 (iii) 39 (iv) 36

e) The mode of the above data is
(i) 55 (ii) 60.25 (iii) 55.75 (iv) 58.75

18. **Case Study II :** Similar triangles are those which are similar in shape. The geometrical polygons which are equiangular are invariably similar. However, similar figures can also be obtained by rotation, reflection, shadows etc.The corresponding sides of two similar polygons are ialways proportional.

a) Perimeters of two similar triangles are 24 cm and 36 cm respectively. If the longest side of the bigger triangle measures 15 cm, the length of the corresponding side of the smaller triangle is
(i) 8cm (ii) 10 cm (iii) 6 cm (iv) 12 cm.

b) Length of the shadow of a 6 cm long pencil during particular time of the day is found to be 9 cm, then the length of an electric pole whose shadow at the same time of the day measures 30 m is

(i) 20 m (ii) 18 m (iii) 15 m (iv) 25m

c) Sides of two similar triangles are in the ratio 2 : 5. If the area of the smaller triangle is 100 cm^2, area of the larger triangle is –

i) 125 cm^2 (ii) 225 cm^2 (iii) 600 cm^2 (iv) 625 cm^2

d) Sides of two similar triangles are in the ratio 2 : 3. If the length of a median of smaller triangle is 15 cm, thelength of the corresponding median of the bigger triangle is __

i) 45 cm. (ii) 22.5 cm (iii) 21 cm (iv) 24.5 cm

e) If ΔPQR is similar to ΔABC, which of the flowing is incorrect.?

i)$\frac{PQ}{QR} = \frac{AB}{BC}$ (ii) $\frac{PQ}{QR} = \frac{AB}{AC}$ (iii) $\frac{PR}{PQ} = \frac{AC}{AB}$ (iv)∟Q = ∟B

19. **Case Study III** : A group of students were discussing the various concepts of the co-ordinate geometry in Class X. They also learnt the centriod of a triangle divide median in the ratio 2 : 1. To understand the concepts of midpoint, distance between the points etc. they posed each other question some of which are given below.

a) Distance of a point (4, 6) from the origin is __

i) 5 units (ii) $7\sqrt{3}$ units (iii) $2\sqrt{13}$ units (iv) $4\sqrt{13}$ units

b) The distance between the points (0, −3) and (0,8) is ___

i) 5 units (ii) 11 units (iii) − 11 units (iv) none of these

c) Three consecutive vertices of a parallelogram are (3,4), (6, 9) and (7, 12). The co-ordinates of fourth vertex are__

i) (3, 8) (ii) (4, 7) (iii) (5, 10) (iv) (5, 9)

d) AB is a line segment. A point equidistant from points A and B means,

Statement I : It is only midpoint of the line segment AB

Statement II : It is any point on the perpendicular bisector of AB.

i) Only Statement one is true.

ii) Only Statemen II is true.

iii) Statement II is true but includes statement I in it.

iv) Can not say.

e) If $(\frac{a}{3}, -3)$ is the midpoint of the line joining points (2, 10) and (4, − 4) then value of 'a' is

i) 3 (ii) 6 (iii) 9 (iv) – 3

20. **Case study IV :** Linear polynomial present a straight line when plotted on a graph while quadratic and polynomials of hiher degree present curves. A curve represented by a quadratic polynomial is called parabola. If the curve opens downwards then it is called hyperbola.We find numerous examples of parabola in nature viz: railway underpasses. Dams temples etc

a) The zeroes of a quadratic polynomial is given by the __

i) Points where parabola intersects the x-axis

ii) Points whre the parabola intersects the y-axis

iii) Either points of intersection on x-axis or y-axis

iv) None of these

b) Zeroes of a quadratic polynomial are -4 and $-\frac{1}{2}$, the polynomial is

i) $X^2 + .\frac{9}{2}x + 2$ (ii) $2x^2 + 9x - 4$ (iii) $2x^2 - 7x - 4$

(iv) none of these

c) Age of a father is equal to square of the age of his son. A year ago he was 8 times the age of his son. His present age is—

i) 49 years (ii) 64 years (iii) 36 years (iv) 25 years

d) Graph of a highway over a railway underpass is represented by the polynomial $x^2 - 17x - 84$. The zeroes are__

i) (14,6) (ii) ($-$ 12,7) (iii) ($-$21,4) (iv) (21,$-$4)

e) The product of zeroes of a polynomial $ax^2 + bx + c$ is equal to 1, then

i) a>b (ii) a <b (iii) a = c (iv) a= $-$ c

PART- B

21. A and B walk together round a circular park of perimeter 360m ith a speed of 24m/minute and 18m/minute respectively. If they walk in the same direction after what interval of time will they meet at the starting point?

OR

Find the smallest number which when increased by 3, is divisible by 12, 15 and 18.

22. Find the zeroes of the polynomial $x^3 - 12x^2 + 39x - 28$ if the zeroes are in A.P.
23. If sinA + cosA = √3, show that tanA + cotA = 1

OR

If $\sin(30^o + A) = \cos A$, find A where 30^o=A and A are acute angles.

24. Find a point on x-axis which is equidistant from points (2, $-$5) and ($-$2,9)
25. Diagonals AC and BDof a trapezium intersect at O.If AB ∥ DC and OA= 2x+ 4, OC= x +1, OB = 4x $-$2 and OD = 4 units find 'x'.
26. ΔABC is right angled at A. Prove that the perpendicular AD from A on BC divides the ΔABC into two triangles similar to each other and to ΔABC
27. For what value of 'k' the following system of equations will have infinitely many solutions. 2x + 3y = 4 ; (k+2)x + 6y = 3k +2

OR

Find the zeroes of the polynomial $\sqrt{5}x^2 - 7x - 6\sqrt{5}$ and verify the relationship with the coefficients.

28. Prove that √5 is irrational.
29. ΔABC is right angled at B. Using the shorter side as the radius a quadrant is drawn and using hypotenuse as diameter a semicircle is drawn. Find the area enclosed between quadrant and semicircle.
30. ΔABC is right anled at B. D is the foot of perpendicular from B on AC and DM ⊥BC and DN ⊥ AB. Prove that (i) DM^2 = DN.MC and (ii) DN^2 = DM. AN

OR

In a ΔABC the perpendicular from A meets BC at D such that BD = 3 CD. Prove that $2AB^2 = 2AC^2 + BC^2$

31. Prove that $\tan^2 A + \cot^2 A = \sec^2 A \operatorname{cosec}^2 A - 2$

32. Find the median of the following data.

Marks	Below 10	Below20	Below30	Below 40	Below 50	Below60
Students	3	12	27	47	58	65

33. If the mean of the following data is 50 find the missing frequencies.

Class Int	0-20	20-40	40-60	60-80	80-100	Total
Freq	17	x	32	y	19	120

34. Two stations A and B are 100 kms apart on a highway. Two cars start simultaneously from these stations. If they travel in the same direction they meet in 5 hours, however if they travel in opposite direction they meet in 50 minutes. Find the speeds of the cars

OR

A piece of cloth costs ₹ 400.Had the cloth been 4m longer and rate /m been ₹5 less the cost would have remained same. Find the length of the cloth.

35. The angle of elevation of a plane- flying horizontally at an altitutde of $3000\sqrt{3}$ m- from a point on the ground was found to be 60^o. After a flight of 30 seconds the angle of elevation changes to 30^o. Find the speed of the plane.

36. Water flows through a pipe of internal diameter 7 cm at the rate of 15 km/h into a rectangular tank 50 m long and 44 m wide. In what time the level in the tank will rise by 21 cm?.