

Class- X Exam - 2022-23

Mathematics - Basic

Time Allowed: 3 Hours

Maximum Marks : 80

General Instructions :

1. This Question Paper has 5 Sections A-E.
 2. Section A has 20 MCQs carrying 1 mark each
 3. Section B has 5 questions carrying 02 marks each.
 4. Section C has 6 questions carrying 03 marks each.
 5. Section D has 4 questions carrying 05 marks each.
 6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
 7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
 8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.
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Section - A

Section A consists of 20 questions of 1 mark each.

1. If $4 \tan \theta = 3$, then $\left(\frac{4 \sin \theta - \cos \theta}{4 \sin \theta + \cos \theta}\right)$ is equal to
 - (a) $\frac{2}{3}$
 - (b) $\frac{1}{3}$
 - (c) $\frac{1}{2}$
 - (d) $\frac{3}{4}$
2. The value of the polynomial $x^8 - x^5 + x^2 - x + 1$ is
 - (a) positive for all the real numbers
 - (b) negative for all the real numbers
 - (c) 0
 - (d) depends on value of x
3. The total number of factors of prime number is
 - (a) 1
 - (b) 0
 - (c) 2
 - (d) 3
4. If one of the zeroes of a quadratic polynomial of the form $x^2 + ax + b$ is the negative of the other, then it
 - (a) has no linear term and the constant term is negative.
 - (b) has no linear term and the constant term is positive.
 - (c) can have a linear term but the constant term is negative.
 - (d) can have a linear term but the constant term is positive.

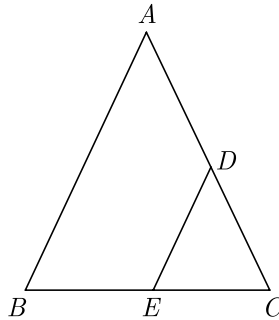
5. If a pair of linear equations is consistent, then the lines will be
 (a) parallel (b) always coincident
 (c) intersecting or coincident (d) always intersecting
6. Ratio of volumes of two cylinders with equal height is
 (a) $H : h$ (b) $R : r$
 (c) $R^2 : r^2$ (d) None of these
7. Aruna has only ₹ 1 and ₹ 2 coins with her. If the total number of coins that she has is 50 and the amount of money with her is ₹ 75, then the number of ₹ 1 and ₹ 2 coins are, respectively
 (a) 35 and 15 (b) 35 and 20
 (c) 15 and 35 (d) 25 and 25
8. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, then how many tickets has she bought?
 (a) 40 (b) 240
 (c) 480 (d) 750
9. The sum and product of the zeroes of a quadratic polynomial are 3 and -10 respectively. The quadratic polynomial is
 (a) $x^2 - 3x + 10$ (b) $x^2 + 3x - 10$
 (c) $x^2 - 3x - 10$ (d) $x^2 + 3x + 10$
10. Value(s) of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is/are
 (a) 0 (b) 4
 (c) 8 (d) 0, 8
11. The 11th term of an AP $-5, \frac{-5}{2}, 0, \frac{5}{2}, \dots$, is
 (a) -20 (b) 20
 (c) -30 (d) 30
12. The point which divides the line segment joining the points $(8, -9)$ and $(2, 3)$ in the ratio 1 : 2 internally lies in the
 (a) I quadrant (b) II quadrant
 (c) III quadrant (d) IV quadrant
13. If the first term of an AP is -5 and the common difference is 2, then the sum of the first 6 terms is
 (a) 0 (b) 5
 (c) 6 (d) 15
14. From an external point Q , the length of tangent to a circle is 12 cm and the distance of Q from the centre of circle is 13 cm. The radius of circle (in cm) is
 (a) 10 (b) 5
 (c) 12 (d) 7

15. The sum of the areas of two circles, which touch each other externally, is 153π . If the sum of their radii is 15, then the ratio of the larger to the smaller radius is
- (a) 4:1 (b) 2:1
(c) 3:1 (d) None of these
16. If the mean of the numbers $27 + x$, $31 + x$, $89 + x$, $107 + x$, $156 + x$ is 82, then the mean of $130 + x$, $126 + x$, $68 + x$, $50 + x$, and $1 + x$ is
- (a) 75 (b) 157
(c) 82 (d) 80
17. If the point $P(k, 0)$ divides the line segment joining the points $A(2, -2)$ and $B(-7, 4)$ in the ratio 1 : 2, then the value of k is
- (a) 1
(b) 2
(c) -2
(d) -1
18. The co-ordinates of the point which is reflection of point $(-3, 5)$ in x -axis are
- (a) $(3, 5)$
(b) $(3, -5)$
(c) $(-3, -5)$
(d) $(-3, 5)$
19. **Assertion :** In the $\triangle ABC$, $AB = 24$ cm, $BC = 10$ cm and $AC = 26$ cm, then $\triangle ABC$ is a right angle triangle.
Reason : If in two triangles, their corresponding angles are equal, then the triangles are similar.
- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.
20. **Assertion :** In a circle of radius 6 cm, the angle of a sector 60° . Then the area of the sector is $18\frac{6}{7}$ cm².
Reason : Area of the circle with radius r is πr^2 .
- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

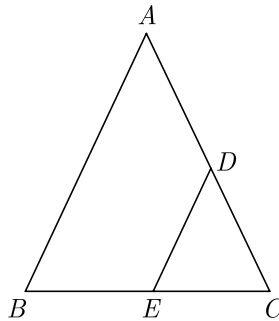
Section B consists of 5 questions of 2 marks each.

21. In the figure of $\triangle ABC$, the points D and E are on the sides CA, CB respectively such that $DE \parallel AB$, $AD = 2x, DC = x + 3, BE = 2x - 1$ and $CE = x$. Then, find x .

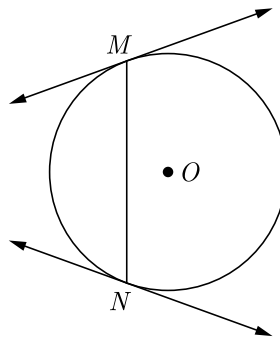


OR

In the figure of $\triangle ABC$, $DE \parallel AB$. If $AD = 2x, DC = x + 3, BE = 2x - 1$ and $CE = x$, then find the value of x .



22. Prove that tangents drawn at the ends of a chord of a circle make equal angles with the chord.



23. Show that : $\frac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta)\tan(30^\circ - \theta)} = 1$

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24. Find the mean of the following distribution :

Class interval	0-6	6-12	12-18	18-24	24-30
Frequency	5	4	1	6	4

OR

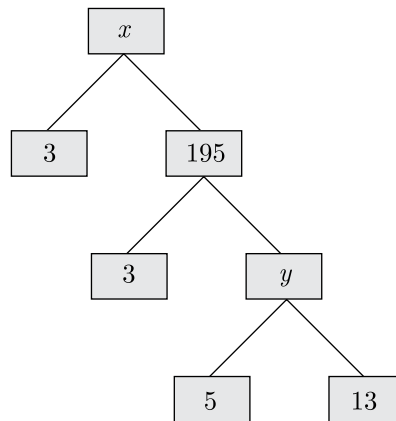
Find the sum of the lower limit of the median class and the upper limit of the modal class :

Classes	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	1	3	5	9	7	3

25. Find the smallest natural number by which 1200 should be multiplied so that the square root of the product is a rational number.

OR

Complete the following factor tree and find the composite number x .



Section - C

Section C consists of 6 questions of 3 marks each.

26. The 17th term of an AP is 5 more than twice its 8th term. If 11th term of AP is 43, then find its n^{th} term.
27. Prove that : $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1 = 0$
28. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find the area of sector formed by the arc.

OR

A road which is 7 m wide surrounds a circular park whose circumference is 88 m. Find the area of the road.

29. The weekly expenditure of 500 families is tabulated below :

Weekly Expenditure(Rs.)	Number of families
0-1000	150
1000-2000	200
2000-3000	75
3000-4000	60
4000-5000	15

Find the median expenditure.

30. The co-ordinates of the vertices of ΔABC are $A(7, 2)$, $B(9, 10)$ and $C(1, 4)$. If E and F are the mid-points of AB and AC respectively, prove that $EF = \frac{1}{2}BC$.

OR

Find the ratio in which the line $2x + 3y - 5 = 0$ divides the line segment joining the points $(8, -9)$ and $(2, 1)$. Also find the co-ordinates of the point of division.

31. The length, breadth and height of a room are 8 m 50 cm, 6 m 25 cm and 4 m 75 cm respectively. Find the length of the longest rod that can measure the dimensions of the room exactly.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Solve graphically the pair of linear equations :
 $3x - 4y + 3 = 0$ and $3x + 4y - 21 = 0$
 Find the co-ordinates of the vertices of the triangular region formed by these lines and x -axis. Also, calculate the area of this triangle.

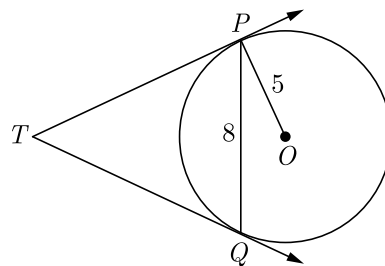
OR

Solve the following pair of equations graphically:

$$2x + 3y = 12, x - y - 1 = 0.$$

Shade the region between the two lines represented by the above equations and the X -axis.

33. In Figure, PQ is a chord of length 8 cm of a circle of radius 5 cm and centre O . The tangents at P and Q intersect at point T . Find the length of TP .



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34. Two poles of equal heights are standing opposite to each other on either side of the road which is 80 m wide. From a point P between them on the road, the angle of elevation of the top of a pole is 60° and the angle of depression from the top of the other pole of point P is 30° . Find the heights of the poles and the distance of the point P from the poles.

OR

Two post are k metre apart and the height of one is double that of the other. If from the mid-point of the line segment joining their feet, an observer finds the angles of elevation of their tops to be complementary, then find the height of the shorter post.

35. A toy is in the form of a cylinder of diameter $2\sqrt{2}$ m and height 3.5 m surmounted by a cone whose vertical angle is 90° . Find total surface area of the toy.

Section - E

Case study based questions are compulsory.

36. **Optimal Pricing Strategy :** The director of the National School of Drama must decide what to charge for a ticket to the comedy drama. If the price is set too low, the theatre will lose money; and if the price is too high, people won't come. From past experience she estimates that the profit P from sales (in hundreds) can be approximated by $P(x) = -x^2 + 22x - 40$ where x is the cost of a ticket and $0 \leq x \leq 25$ hundred rupees.



- (i) What is the lowest and highest cost of a ticket that would allow the theatre to break even?
(ii) If theatre charge Rs 4 hundred for each ticket, what is the profit/loss ?

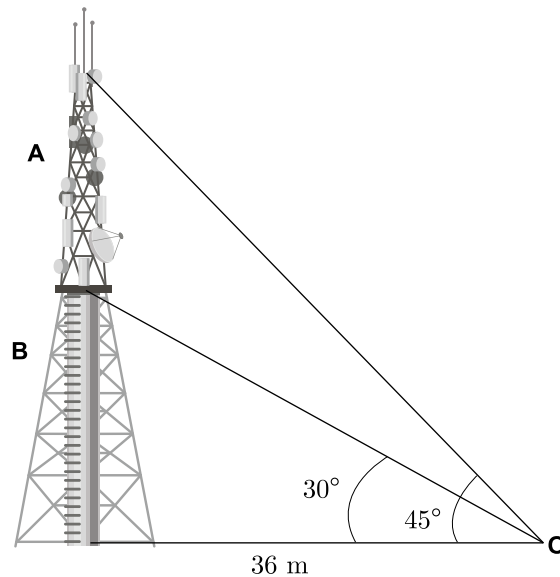
OR

- If theatre charge Rs 25 hundred for each ticket, what is the profit/loss ?
(iii) What is the maximum profit which can be earned by theatre ?

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37. Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure, including microwave dishes. They are among the tallest human-made structures. There are 2 main types: guyed and self-supporting structures.

On a similar concept, a radio station tower was built in two sections A and B . Tower is supported by wires from a point O . Distance between the base of the tower and point O is 36 m. From point O , the angle of elevation of the top of section B is 30° and the angle of elevation of the top of section A is 45° .



- (i) What is the height of the section B ?
- (ii) What is the height of the section A ?
- (iii) What is the length of the wire structure from the point O to the top of section A ?

OR

What is the length of the wire structure from the point O to the top of section B ?

38. Hospital Stays : Hospital records indicated that maternity patients stayed in the hospital for the number of days shown in the distribution.

Number of days stayed	Frequency
3	13
4	22
5	45
6	14
7	6
	100

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Find these probabilities.

- (i) A patient stayed exactly 5 days.
- (ii) A patient stayed less than 6 days.
- (iii) A patient stayed at most 4 days.

OR

A patient stayed at least 5 days.