

Class- X Exam - 2022-23

Mathematics - Standard

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.
-

Section - A

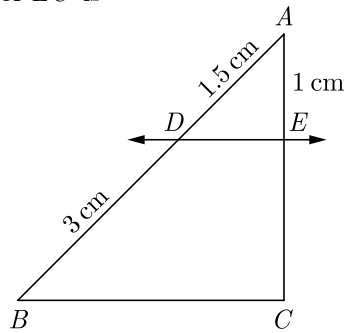
Section A consists of 20 questions of 1 mark each.

1. Lowest value of $x^2 + 4x + 2$ is
(a) 0 (b) -2
(c) 2 (d) 4
2. The pair of equations $y = 0$ and $y = -7$ has
(a) one solution
(b) two solutions
(c) infinitely many solutions
(d) no solution
3. The equation $2x^2 + 2(p + 1)x + p = 0$, where p is real, always has roots that are
(a) Equal
(b) Equal in magnitude but opposite in sign
(c) Irrational
(d) Real
4. **Assertion :** The equation $8x^2 + 3kx + 2 = 0$ has equal roots then the value of k is $\pm \frac{8}{3}$.
Reason : The equation $ax^2 + bx + c = 0$ has equal roots if $D = b^2 - 4ac = 0$
(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.

5. The sum of first 16 terms of the AP 10, 6, 2, is
 (a) -320 (b) 320
 (c) -352 (d) -400

6. Which of the following statement is false?
 (a) All isosceles triangles are similar.
 (b) All quadrilaterals are similar.
 (c) All circles are similar.
 (d) None of the above

7. In the given figure, $DE \parallel BC$. The value of EC is



- (a) 1.5 cm (b) 3 cm
 (c) 2 cm (d) 1 cm
8. If a regular hexagon is inscribed in a circle of radius r , then its perimeter is
 (a) $3r$ (b) $6r$
 (c) $9r$ (d) $12r$
9. Two concentric circles are of radii 10 cm and 8 cm, then the length of the chord of the larger circle which touches the smaller circle is
 (a) 6 cm (b) 12 cm
 (c) 18 cm (d) 9 cm
10. **Assertion :** If in a circle, the radius of the circle is 3 cm and distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm.
Reason : $(\text{hypotenuse})^2 = (\text{base})^2 + (\text{height})^2$
 (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.
11. If $\sin \theta - \cos \theta = 0$, then the value of $(\sin^4 \theta + \cos^4 \theta)$ is
 (a) 1 (b) $\frac{3}{4}$
 (c) $\frac{1}{2}$ (d) $\frac{1}{4}$

12. If $x = p \sec \theta$ and $y = q \tan \theta$, then
- (a) $x^2 - y^2 = p^2 q^2$ (b) $x^2 q^2 - y^2 p^2 = pq$
(c) $x^2 q^2 - y^2 p^2 = \frac{1}{p^2 q^2}$ (d) $x^2 q^2 - y^2 p^2 = p^2 q^2$
13. The length of a string between a kite and a point on the ground is 85 m. If the string makes an angle θ with level ground such that $\tan \theta = \frac{15}{8}$, then the height of kite is
- (a) 75 m (b) 78.05 m
(c) 226 m (d) None of these
14. If the angle of depression of an object from a 75 m high tower is 30° , then the distance of the object from the tower is
- (a) $25\sqrt{3}$ m (b) $50\sqrt{3}$ m
(c) $75\sqrt{3}$ m (d) 150 m
15. A race track is in the form of a ring whose inner and outer circumference are 437 m and 503 m respectively. The area of the track is
- (a) 66 sq. cm. (b) 4935 sq. cm.
(c) 9870 sq. cm (d) None of these
16. Ratio of volumes of two cones with same radii is
- (a) $h_1 : h_2$ (b) $s_1 : s_2$
(c) $r_1 : r_2$ (d) None of these
17. The median of a set of 9 distinct observations is 20.5. If each of the largest 4 observation of the set is increased by 2, then the median of the new set
- (a) Is increased by 2
(b) Is decreased by 2
(c) Is two times the original median
(d) Remains the same as that of the original set

18. Mode of the following grouped frequency distribution is

Class	Frequency
3-6	2
6-9	5
9-12	10
12-15	23
15-18	21
18-21	12
21-24	03

- (a) 13.6 (b) 15.6
(c) 14.6 (d) 16.6

19. A fair die is thrown once. The probability of getting a composite number less than 5 is
- (a) $\frac{1}{3}$ (b) $\frac{1}{6}$
- (c) $\frac{2}{3}$ (d) 0
20. If a letter is chosen at random from the letter of English alphabet, then the probability that it is a letter of the word DELHI is
- (a) $\frac{1}{5}$ (b) $\frac{1}{26}$
- (c) $\frac{5}{26}$ (d) $\frac{21}{26}$

Section - B

Section B consists of 5 questions of 2 marks each.

21. If the sum of first m terms of an AP is the same as the sum of its first n terms, show that the sum of its first $(m + n)$ terms is zero.
22. A circle is inscribed in a ΔABC touching AB , BC and AC at P , Q and R respectively. If $AB = 10$ cm $AR = 7$ cm and $CR = 5$ cm, then find the length of BC
23. Find a relation between x and y such that the point $P(x, y)$ is equidistant from the points $A(-5, 3)$ and $B(7, 2)$.
24. Explain whether $3 \times 12 \times 101 + 4$ is a prime number or a composite number.

OR

Show that $5\sqrt{6}$ is an irrational number.

25. Is 184 a term of the sequence 3, 7, 11,?

OR

The ninth term of an AP is -32 and the sum of its eleventh and thirteenth term is -94 . Find the common difference of the AP

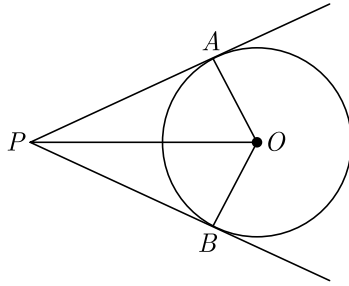
Section - C

Section C consists of 6 questions of 3 marks each.

26. Solve graphically :
 $2x - 3y + 13 = 0$; $3x - 2y + 12 = 0$
27. Solve the following equation: $\frac{1}{x} - \frac{1}{x-2} = 3$, $x \neq 0, 2$
28. If tangents PA and PB drawn from an external point P to a circle with centre O are inclined to each other at an angle of 80° , then find $\angle POA$.

OR

In the given figure, OP is equal to the diameter of a circle with centre O and PA and PB are tangents. Prove that ABP is an equilateral triangle.



29. The angle of elevation of the top of a building from the foot of a tower is 30° and the angle of elevation of the top of a tower from the foot of the building is 60° . If the tower is 50 m high, then find the height of the building.
30. From a solid cylinder whose height is 15 cm and the diameter is 16 cm, a conical cavity of the same height and same diameter is hollowed out, Find the total surface area of remaining solid. (Given your answer in terms of π).

OR

A solid right-circular cone of height 60 cm and radius 30 cm is dropped in a right-circular cylinder full of water of height 180 cm and radius 60 cm. Find the volume of water left in the cylinder in cubic metre. Use $\pi = \frac{22}{7}$.

31. An integer is chosen between 70 and 100. Find the probability that it is
 (i) a prime number (ii) divisible by 7

Section - D

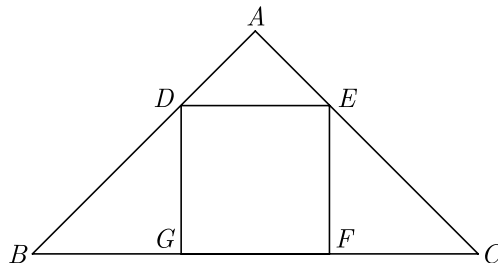
Section D consists of 4 questions of 5 marks each.

32. Polynomial $x^4 + 7x^3 + 7x^2 + px + q$ is exactly divisible by $x^2 + 7x + 12$, then find the value of p and q .

OR

If α and β are the zeroes of polynomial $p(x) = 3x^2 + 2x + 1$, find the polynomial whose zeroes are $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$.

33. In the given figure, $DEFG$ is a square and $\angle BAC = 90^\circ$. Show that $FG^2 = BG \times FC$.



34. If $\sin \theta + \cos \theta = \sqrt{3}$, then prove that $\tan \theta + \cot \theta = 1$.

OR

Evaluate :

$$\tan^2 30^\circ \sin 30^\circ + \cos 60^\circ \sin^2 90^\circ \tan^2 60^\circ - 2 \tan 45^\circ \cos^2 0^\circ \sin 90^\circ$$

35. Four equal circles are described at the four corners of a square so that each touches two of the others. The shaded area enclosed between the circle is $\frac{24}{7}$ cm². Find the radius of each circle.

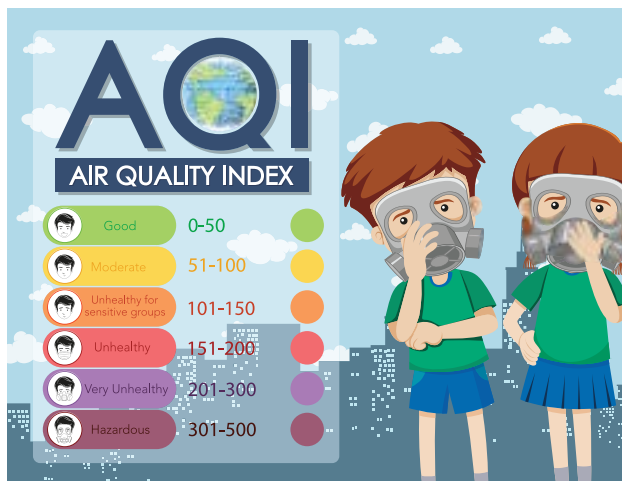
Section - E

Case study based questions are compulsory.

36. Air Quality Index : AQI is an index for reporting air quality on a daily basis. The purpose of the AQI is to help people know how the local air quality impacts their health. The Environmental Protection Agency (EPA) calculates the AQI for five major air pollutants :

1. Ground-level ozone
2. Particle pollution/particulate matter (PM_{2.5}/pm 10)
3. Carbon Monoxide
4. Sulfur dioxide
5. Nitrogen dioxide

The higher the AQI value, the greater the level of air pollution and the greater the health concerns.



Following frequency distribution shows the Air Quality Index of different localities of Delhi on 27th December 2020 reported by Times of India Newspaper on 28th December 2020.

AIQ	Number of weeks f
270-280	4
280-290	10
290-300	14
300-310	20
310-320	24
320-330	8
Total	80

Based on the above information, answer the following questions.

- (i) Estimate the mean AQI.
- (ii) In which class does the median of distribution lie ?
- (iii) In which class does the mode of distribution lie ?

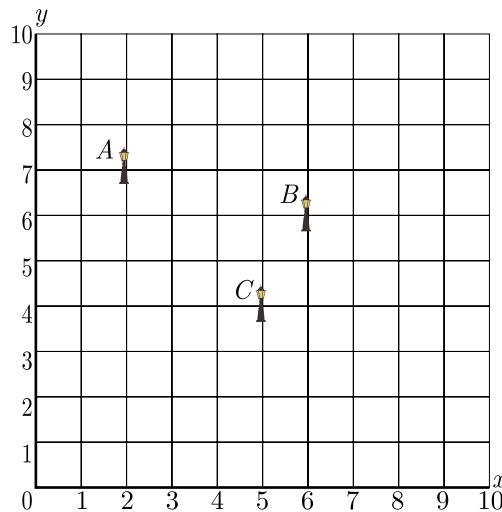
OR

What is the median AQI?

- 37.** Resident Welfare Association (RWA) of a Gulmohar Society in Delhi have installed three electric poles A , B and C in a society's common park. Despite these three poles, some parts of the park are still in dark. So, RWA decides to have one more electric pole D in the park.



The park can be modelled as a coordinate systems given below.



On the basis of the above information, answer any four of the following questions:

- (i) What is the position of the pole C ?
- (ii) What is the distance of the pole B from the corner O of the park ?
- (iii) Find the position of the fourth pole D so that four points A , B , C and D form a parallelogram .

OR

What is the distance between poles A and C ?

38. Box : For the box to satisfy certain requirements, its length must be three unit greater than the width, and its height must be two unit less than the width.



- (i) If width is taken as x , find the polynomial that represent volume of box.
- (ii) Find the polynomial that represent the area of paper sheet used to make box.
- (iii) If it must have a volume of 18 unit, what must be its length and height ?

OR

If box is made of a paper sheet which cost is Rs 100 per square unit, what is the cost of paper?

□□□□□□