

Class- X Exam - 2022-23

Mathematics - Standard

Time Allowed: 3 Hours

Maximum Marks : 80

General Instructions :

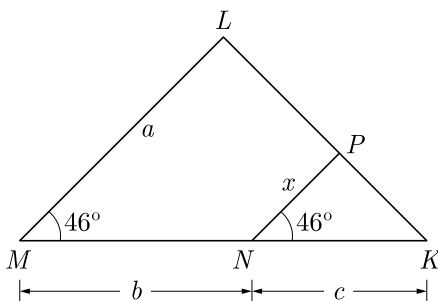
1. This Question Paper has 5 Sections A-E.
 2. Section A has 20 MCQs carrying 1 mark each
 3. Section B has 5 questions carrying 02 marks each.
 4. Section C has 6 questions carrying 03 marks each.
 5. Section D has 4 questions carrying 05 marks each.
 6. Section E has 3 case based integrated units of 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.
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Section - A

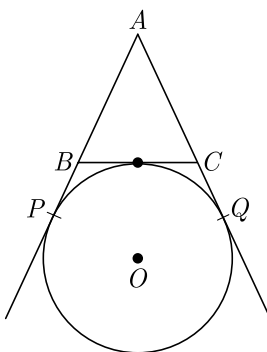
Section A consists of 20 questions of 1 mark each.

1. If α and β are the zeroes of the polynomial $x^2 + 2x + 1$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is equal to
(a) -2 (b) 2
(c) 0 (d) 1
2. The quadratic polynomial, the sum of whose zeroes is -5 and their product is 6 , is
(a) $x^2 + 5x + 6$ (b) $x^2 - 5x + 6$
(c) $x^2 - 5x - 6$ (d) $-x^2 + 5x + 6$
3. In a number of two digits, unit's digit is twice the tens digit. If 36 be added to the number, the digits are reversed. The number is
(a) 36 (b) 63
(c) 48 (d) 84
4. x and y are 2 different digits. If the sum of the two digit numbers formed by using both the digits is a perfect square, then value of $x + y$ is
(a) 10 (b) 11
(c) 12 (d) 13
5. If $\frac{1}{2}$ is a root of the equation $x^2 + kx - \frac{5}{4} = 0$, then the value of k is
(a) 2 (b) -2
(c) $\frac{1}{4}$ (d) $\frac{1}{2}$

6. The real roots of the equation $x^{2/3} + x^{1/3} - 2 = 0$ are
 (a) 1, 8 (b) -1, -8
 (c) -1, 8 (d) 1, -8
7. **Assertion :** Common difference of the AP $-5, -1, 3, 7, \dots$ is 4.
Reason : Common difference of the AP $a, a + d, a + 2d, \dots$ is given by $d = a_2 - a_1$
 (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.
8. Which term of an AP, 21, 42, 63, 84, ... is 210?
 (a) 9th (b) 10th
 (c) 11th (d) 12th
9. In the given figure, x is



- (a) $\frac{ab}{a+b}$ (b) $\frac{ac}{b+c}$
 (c) $\frac{bc}{b+c}$ (d) $\frac{ac}{a+c}$
10. In figure, AP, AQ and BC are tangents of the circle with centre O . If $AB = 5$ cm, $AC = 6$ cm and $BC = 4$ cm, then the length of AP (in cm) is



- (a) 15 (b) 10
 (c) 9 (d) 7.5

11. If $\sin \theta = \frac{a}{b}$, then $\cos \theta$ is equal to
- (a) $\frac{b}{\sqrt{b^2 - a^2}}$ (b) $\frac{b}{a}$
(c) $\frac{\sqrt{b^2 - a^2}}{b}$ (d) $\frac{a}{\sqrt{b^2 - a^2}}$
12. If the height and length of the shadow of a man are equal, then the angle of elevation of the sun is,
(a) 45°
(b) 60°
(c) 90°
(d) 120°
13. The area of a circular ring formed by two concentric circles whose radii are 5.7 cm and 4.3 cm respectively is (Take $\pi = 3.1416$)
(a) 44 sq. cm. (b) 66 sq. cm.
(c) 22 sq. cm. (d) 33 sq. cm.
14. A sphere is melted and half of the melted liquid is used to form 11 identical cubes, whereas the remaining half is used to form 7 identical smaller spheres. The ratio of the side of the cube to the radius of the new small sphere is
(a) $\left(\frac{4}{3}\right)^{1/3}$ (b) $\left(\frac{8}{3}\right)^{1/3}$
(c) $(3)^{1/3}$ (d) 2
15. The cumulative frequency table is useful in determining
(a) Mean (b) Median
(c) Mode (d) All of these
16. The $P(A)$ denotes the probability of an event A , then
(a) $P(A) < 0$ (b) $P(A) > 1$
(c) $0 \leq P(A) \leq 1$ (d) $-1 \leq P(A) \leq 1$
17. The ratio in which the point $(2, y)$ divides the join of $(-4, 3)$ and $(6, 3)$, hence the value of y is
(a) $2:3, y = 3$ (b) $3:2, y = 4$
(c) $3:2, y = 3$ (d) $3:2, y = 2$
18. If the points $A(4, 3)$ and $B(x, 5)$ are on the circle with centre $O(2, 3)$, then the value of x is
(a) 0 (b) 1
(c) 2 (d) 3
19. 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

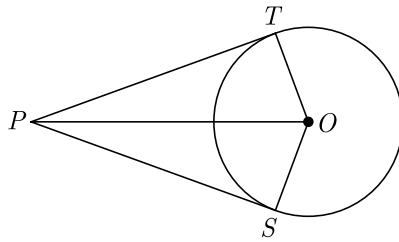
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20. **Assertion :** 34.12345 is a terminating decimal fraction.
Reason : Denominator of 34.12345, when expressed in the form $\frac{p}{q}$, $q \neq 0$, is of the form $2^m \times 5^n$, where m and n are non-negative integers.
- (a) Both assertion (A) 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 an equilateral triangle of side 24 cm, find the length of the altitude.
22. In the given figure, from a point P , two tangents PT and PS are drawn to a circle with centre O such that $\angle SPT = 120^\circ$, Prove that $OP = 2PS$.



23. Evaluate :

$$\frac{3 \tan^2 30^\circ + \tan^2 60^\circ + \operatorname{cosec} 30^\circ - \tan 45^\circ}{\cot^2 45^\circ}$$
24. The mode of the following frequency distribution is 36. Find the missing frequency f .

Class	0- 10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	10	f	16	12	6	7

OR

Find the median for the given frequency distribution :

Class	40-45	45-50	50-55	55-60	60-65	65-70	70-75
Frequency	2	3	8	6	6	3	2

25. Given that $\text{HCF} (306, 1314) = 18$. Find $\text{LCM} (306, 1314)$

OR

Check whether 4^n can end with the digit 0 for any natural number n .

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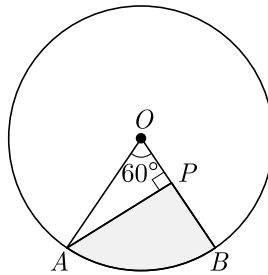
Section - C

Section C consists of 6 questions of 3 marks each.

26. The sum of the first 7 terms of an AP is 63 and that of its next 7 terms is 161. Find the AP.
27. If $\sin \theta + \cos \theta = \sqrt{2}$ prove that $\tan \theta + \cot \theta = 2$
28. Three horses are tied each with 7 m long rope at three corners of a triangular field having sides 20 m, 34 m and 42 m. Find the area of the plot which can be grazed by the horses.

OR

In the given figure, AOB is a sector of angle 60° of a circle with centre O and radius 17 cm. If $AP \perp OB$ and $AP = 15$ cm, find the area of the shaded region.



29. The mean of the following frequency distribution is 18. The frequency f in the class interval 19-21 is missing. Determine f .

Class interval	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Frequency	3	6	9	13	f	5	4

30. If the point $C(-1, 2)$ divides internally the line segment joining $A(2, 5)$ and $B(x, y)$ in the ratio 3 : 4 find the coordinates of B .

OR

Prove that the diagonals of a rectangle $ABCD$, with vertices $A(2, -1)$, $B(5, -1)$, $C(5, 6)$ and $D(2, 6)$ are equal and bisect each other.

31. Given that $\sqrt{2}$ is irrational, prove that $(5 + 3\sqrt{2})$ is an irrational number.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Find c if the system of equations $cx + 3y + (3 - c) = 0$; $12x + cy - c = 0$ has infinitely many solutions?

OR

Solve for x and y :

$$2x - y + 3 = 0,$$

$$3x - 5y + 1 = 0$$

33. Prove that tangent drawn at any point of a circle perpendicular to the radius through the point contact.
34. The angle of elevation of an aeroplane from a point on the ground is 60° . After a flight of 30 seconds the angle of elevation becomes 30° . If the aeroplane is flying at a constant height of $3000\sqrt{3}$ m, find the speed of the aeroplane.

OR

Amit, standing on a horizontal plane, find a bird flying at a distance of 200 m from him at an elevation of 30° . Deepak standing on the roof of a 50 m high building, find the angle of elevation of the same bird to be 45° . Amit and Deepak are on opposite sides of the bird. Find the distance of the bird from Deepak.

35. The weight of two spheres of same metal are 1 kg and 7 kg. The radius of the smaller sphere is 3 cm. The two spheres are melted to form a single big sphere. Find the diameter of the new sphere.

Section - E

Case study based questions are compulsory.

36. Model Rocketry : A model rocket is a small rocket designed to reach low altitudes and be recovered by a variety of means. Flying model rockets is a relatively safe and inexpensive way for person to learn the basics of forces and the response of a vehicle to external forces. Like an airplane, a model rocket is subjected to the forces of weight, thrust, and aerodynamics during its flight.



Shalvi is a member of first rocket club of India named STAR Club. She launches her latest rocket from a large field. At the moment its fuel is exhausted, the rocket has a velocity of 240 ft/sec and an altitude of 544 ft. After t sec, its height $h(t)$ above the ground is given by the function $h(t) = -16t^2 + 240t + 544$.

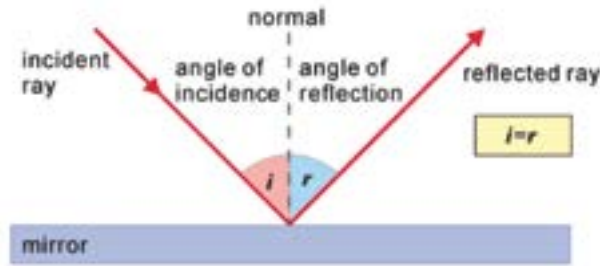
- (i) How high is the rocket 5 sec after the fuel is exhausted?
- (ii) How high is the rocket 10 sec after the fuel is exhausted?
- (iii) What is the maximum height attained by the rocket?

OR

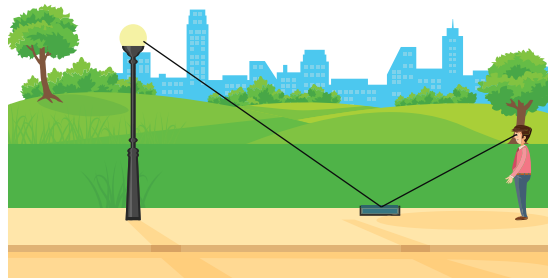
How many seconds was the rocket airborne after its fuel was exhausted?

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37. The law of reflection states that when a ray of light reflects off a surface, the angle of incidence is equal to the angle of reflection.



Ramesh places a mirror on level ground to determine the height of a pole (with traffic light fired on it). He stands at a certain distance so that he can see the top of the pole reflected from the mirror. Ramesh's eye level is 1.5 m above the ground. The distance of Ramesh and the pole from the mirror are 1.8 m and 6 m respectively.



- (i) Which criterion of similarity is applicable to similar triangles?
- (ii) What is the height of the pole?
- (iii) If angle of incidence is i , find $\tan i$.

OR

Now Ramesh move behind such that distance between pole and Ramesh is 13 meters. He place mirror between him and pole to see the reflection of light in right position. What is the distance between mirror and Ramesh ?

38. Eight Ball : This is a game played on a pool table with 15 balls numbered 1 through 15 and a cue ball that is solid white. Of the 15 numbered balls, 8 are a solid (nonwhite) color and numbered 1 through 8, and seven are striped balls numbered 9 through 15.



The fifteen numbered pool balls (no cueball) are placed in a large bowl and mixed, then one is drawn out.

- (i) What is the probability of drawing the eight ball ?
- (ii) What is the probability of drawing a number greater than fifteen ?
- (iii) What is the probability of drawing an even number ?
- (iv) What is the probability of drawing a multiple of three ?

OR

What is the probability of drawing a solid color and an even number ?

□□□□□□