SUBJECT: MATHEMATICS (STANDARD)

TIME: 3 HOURS **CLASS: X** **TOTAL MARKS: 80**

General Instructions:

Read the following instructions carefully and follow them:

(i) This question paper contains 38 questions. All questions are compulsory.

(ii) This question paper is divided into five Sections A, B, C, D and E.

(iii) In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) and questions number 19 and 20 are Assertion-Reason based questions of 1 mark each.

(iv) In Section B, Questions no. 21 to 25 are very short answer (VSA) type questions, carrying 2 marks each.

(v) In Section C, Questions no. 26 to 31 are short answer (SA) type questions, carrying 3 marks each.

(vi) In Section D, Questions no. 32 to 35 are long answer (LA) type questions carrying 5 marks each.

(vii) In Section E, Questions no. 36 to 38 are case study-based questions carrying 4 marks each. Internal choice is provided in 2 marks questions in each case-study.

(viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.

(ix) Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ *wherever required, if not stated.*

(x) Use of calculators is not allowed.

SECTION-A

1. The number of polynomials having zeroes 2 and 5 is:

(a) Only one (b) infinite (c) exactly two (d) at most two

2. The pair of equations ax + 2y = 9 and 3x + by = 18 represent coincident lines, where a and b are integers, if:

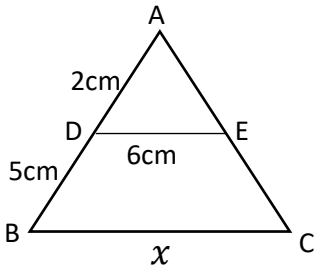
(a) a = b (b) 3a = 2b (c) 2a = 3b (d) ab = 6

3. The common difference of the A.P. whose nth term is given by a_n = 5n + 3, is:

(a) 3 (b) 5 (c) 5n (d) 1

4. In the given figure, $DE \parallel BC$. The value of x is:

(a) 6 cm
(b) 12 cm
(c) 21cm
(d) 10cm



5. The quadratic equation $4x^2 - 2kx + 9 = 0$ has real and equal zeroes then $k =$

(a) ± 2 (b) ± 3 (c) ± 6 (d) None of these

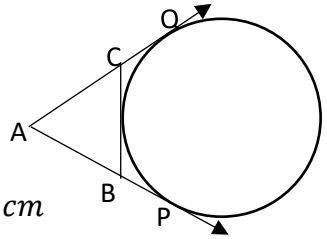
6. If $tanA = \frac{5}{12}$ then the value of $\frac{sin\theta + cos\vartheta}{sin\theta - cos\theta}$ is:

(a) $-\frac{7}{13}$ (b) $\frac{17}{13}$ (c) $-\frac{17}{13}$ (d) $-\frac{17}{7}$

7. The midpoint of line segment joining the points $(2asin^2\theta, 2bsec^2\theta)$ and $(2acos^2\theta, -2btan^2\theta)$ is:

(a) (1, 1) (b) (a, b) (c) (a^2, b^2) (d) $(a, -b)$

8. In figure AP, AQ and BC are tangents to the circle with centre O, if $AB = 5cm, AC = 6cm$ $BC = 4cm$ then the length of AP is:



(a) $15cm$ (b) $10cm$ (c) $15cm$ (d) $7.5cm$

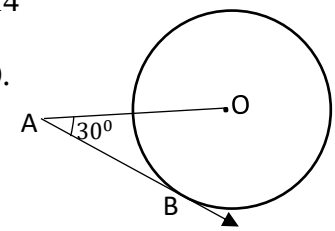
9. A cylinder, a cone and a hemisphere are of same base radii and same height. The ratio of their volumes is:

(a) 1: 2: 3 (b) 2: 1: 3 (c) 3: 1: 2 (d) 1: 3: 2

10. If the mean and the median of a data are 12 and 15 respectively, then its mode is:

(a) 13·5 (b) 21 (c) 6 (d) 14

11. In the given figure, AB is a tangent to the circle centered at O. If OA = 6 cm and $\angle OAB = 30^0$, then the radius of the circle is:



(a) 3 cm (b) $3\sqrt{3}$ cm

(c) 2 cm (d) $\sqrt{3}$ cm

12. If $secA - tanA = \frac{1}{3}$ then $secA + tanA$ is

(a) 3 (b) $\frac{1}{3}$ (c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$

13. If $\Delta ABC \sim \Delta PQR$ with $\angle A = 40^0$, $\angle R = 52^0$ then $\angle B =$

(a) 98^0 (b) 92^0 (c) 88^0 (d) 78^0

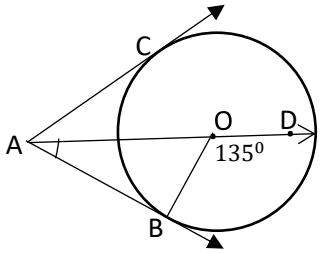
14. The 11th term from the end of the A.P.: 10, 7, 4, ..., -62 is:

(a) -25 (b) -16 (c) -32 (d) – 0

15. Two coins are tossed together. The probability of getting at least one tail is:

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $\frac{3}{4}$ (d) 1

16. In the given figure, AC and AB are tangents to a circle centered at O. If $\angle BOD = 135^0$, then $\angle BAO$ is equal to:



(a) 30^0 (b) 60^0
(c) 45^0 (d) 90^0

17. If every term of the statistical data consisting of n terms is decreased by 5, then the mean of the data:
(a) decreases by 5 (b) remains unchanged (c) decreases by 5n (d) increases by 5

18. The probability of happening the event be x and that of the probability of not happening the event be y then relation between x and y is:
(a) $x = y + 1$ (b) $x = y - 1$ (c) $x = y$ (d) $x + y = 1$

Questions number 19 and 20 are Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

19. ***Assertion (A)***: If the points A (4, 3), B (x, 5) and C (2, 4) are vertices of ΔABC and its centroid is $(2, 3)$ then $x = 0$

Reason (R): Centroid of a triangle is given by $G = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$

20. ***Assertion(A):*** The HCF of two numbers is 36 and their product is 3888, then their LCM is 180.

Reason(R): For any two positive integers a and b, $HCF(a, b) \times LCM(a, b) = a \times b$

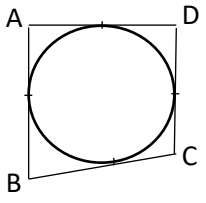
SECTION-B

21. Using fundamental theorem of Arithmetic, find HCF and LCM of 96 and 120

22. (a) Find the ratio in which line segment joining the points (-1, 1) and (5, 7) is divided by a line $x + y = 4$

OR

(b) Point P (x, y) is equidistant from points A (5, 1) and B (1, 5). Prove that x = y.



23. If A (1,2), B (4, 3), C (6, 6) are the vertices of a parallelogram ABCD, find the coordinates of fourth vertex D.

24. A quadrilateral ABCD is drawn to circumscribe a circle (see Fig.). Prove that

AB + CD = AD + BC

25. Find A and B, if $cos(A - B) = \frac{\sqrt{3}}{2}$ and $sin(A + B) = \frac{\sqrt{3}}{2}$, where A and B are acute angles.

OR

Prove that: $\sqrt{\frac{\sec A - 1}{secA + 1}} + \sqrt{\frac{\sec A + 1}{secA - 1}} = 2\ cosecA$

SECTION-C

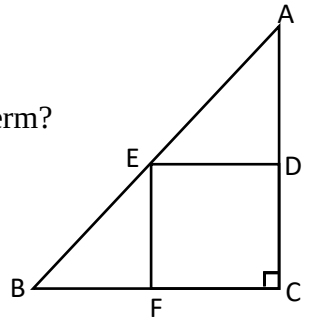
26. Prove that $\sqrt{5}$ is an irrational number.

27. If sum of three consecutive terms of A.P. is 30 and their product is 910. Find these three terms.

OR

Which term of the A.P.: 65, 61, 57, 53, ... is the first negative term?

28. In $\Delta ABC, \angle ACB = 90^0\ and\ DCEF\ is\ a\ square,$ as shown in figure. Prove that $DE^2 = AD \times BF$



29. Solve the pair of linear equations $4x - y - 8 = 0\ \ and\ x + 2y = 11$ graphically.

OR

A man wished to give ₹ 12 to each person and found that he fell short of ₹6 when he wanted to give present to all persons. He therefore, distributed ₹ 9 to each person and found that ₹ 42 where left over. How much money did he have and how many persons were there?

30. Prove that: $\frac{1}{secA - tanA} - \frac{1}{cosA} = \frac{1}{cosA} - \frac{1}{secA + tanA}$

31. A survey regarding the heights (in cm) of 50 girls of class X[th] of a school was conducted and the following data was obtained:

Height (in cm)	120-130	130-140	140-150	150-160	160-170	Total
Number of girls	2	8	12	20	8	50

Find median height of girls.

SECTION-D

32. Prove that, if a line is drawn parallel to one side of a triangle intersecting the other two sides in distinct points, then the other two sides are divided in the same ratio

Using the above theorem prove that a line through the point of intersection of the diagonals and parallel to the base of the trapezium divides the non-parallel sides in the same ratio.

33. (a) Aeroplane left 30 minute later than its scheduled time and in order to reach the destination 1500 km away in time, it has to increase its speed by $250\ km/h$ from its usual speed. Determine its usual speed.

OR

(b) Two water tap together can fill a tank in 6 hours. The tap of larger diameter takes 9 hours less than smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

34. A horse is tied to a peg at one corner of a square shaped grass field of side 20 m by means of a 7 m long rope. Find the area of that part of the field in which the horse can graze. Also find the increase in the grazing area if the rope were 14 m long instead of 7 m.

35. (a) As observed from the top of a 75 m high lighthouse from the sea-level, the angles of depression of two ships are 30^0 and 60^0. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. ($Use\ \sqrt{3}\ =\ 1 \cdot 73$)

OR

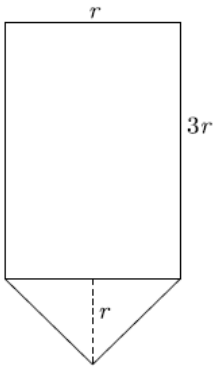
(b) From a point on the ground, the angle of elevation of the bottom and top of a transmission tower fixed at the top of 30 m high building are 30^0 and 45^0, respectively. Find the height of the transmission tower. ($Use\ \sqrt{3}\ =\ 1 \cdot 73$)

SECTION-E

36. Conical Tank: The advantages of cylindrical tank having conical bottom are found in nearly every industry, especially where getting every last drop from the tank is important. This type of tank has excellent geometry for draining, especially with high solids content slurries as these cone tanks provide a better full-drain solution. The conical tank eliminates many of the problems that flat base tanks have as the base of the tank is sloped towards the centre giving the greatest possible full- drain system in vertical tank design.

Rajesh has been given the task of designing a conical bottom tank for his client. Height of conical part is equal to its radius. Length of cylindrical part is the 3 times of its radius. Tank is

closed from top. The cross section of conical tank is given below. If radius of cylindrical part is taken as 3 meters.



(i) What is the volume of above conical portion of tank? 1

(ii) What is the of volume of cylindrical portion of tank? 1

(iii) What is the area of metal sheet used to make this entire tank? Assume that tank is covered from top. 2

OR

(iv) The cost of oil that this tank can hold at the rate ₹ 200 per liter. 2

37. Computer-based learning (CBL) refers to any teaching methodology that makes use of computers for information transmission. At an elementary school level, computer applications can be used to display multimedia lesson plans. A survey was done on 1000 elementary and secondary schools of country and they were classified by the number of computers they had.

Number of Computers	1-10	11-20	21-50	51-100	101 and more
Number of Schools	250	200	290	180	80

One school is chosen at random. Then:

(i) Find the probability that the school chosen at random has more than 100 computers. 1

(ii) (a) Find the probability that the school chosen at random has 50 or fewer computers. 2

OR

(ii) (b) Find the probability that the school chosen at random has more than 20 computers. 2

(iii) Find the probability that the school chosen at random has 10 or less than 10 computers. 1

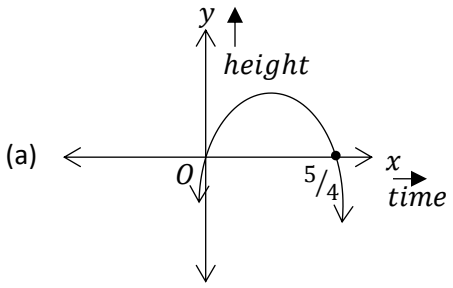
38. In a pool at an aquarium, a dolphin jumps out of the water travelling at 20 cm per second. Its height above water level after t seconds is given by $h(t) = 20t - 16t^2$.

Based on the above, answer the following questions:

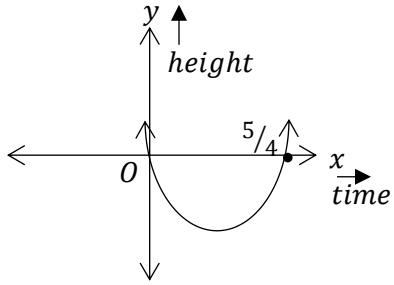
(i) Find zeroes of polynomial $h(t) = 20t - 16t^2$. 1

(ii) Which of the following types of graph represents h(t)? 1

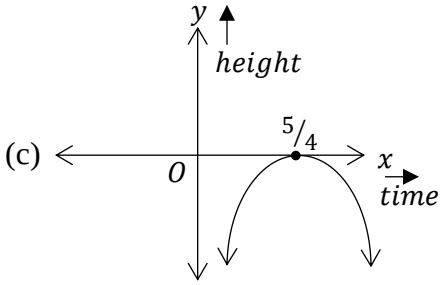
(a)



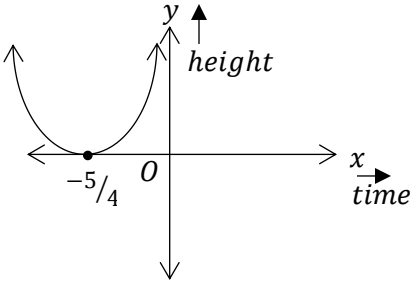
(b)



(c)



(d)



(iii) (a) What would be the value of h(t), at t $= \frac{1}{2}$? Interpret the result. 2

OR

(iii) (b) How much distance has the dolphin covered before hitting the water level again? 2

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