DAV PUBLIC SCHOOLS, ODISHA   **SET- 2**
PRE-BOARD EXAMINATION
(2023-24)

- Please check that this question paper contains 6 printed pages.
- Check that this question paper contains 38 questions.
- Write down the Serial Number of the question in the left side of the margin before attempting it.
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed 15 minutes prior to the commencement of the examination. The students will read the question paper only and will not write any answer on the answer script during this period.

CLASS –X
SUB: MATHEMATICS (STANDARD-041)

Time Allowed: 3 Hours   **Maximum Marks:80**

General Instructions:
1. This Question Paper has 5 Sections A, B, C, D and 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 1,1and 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 Qs 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 π =22/7 wherever required if not stated.

SECTION-A

(Section A consists of 20 questions of 1 mark each)

1. Let 'a' and 'b' be two positive integers such that a = p^3q^4 and b = p^2q^3 , where p and q are prime numbers. If HCF (a , b) = $p^m q^n$ and LCM(a , b) = $p^r q^s$, then (m + n + r + s) =

   (a) 12   (b) 13   (c) 10   (d) 7

2. If $a = 2^3 \times 3$, $b = 2 \times 3 \times 5$, $c = 3^n \times 5$ and LCM $(a, b, c) = 2^3 \times 3^2 \times 5$, then n is

   (a) 1   (b) 2   (c) 3   (d) 4

3. The angles of the elevation of the top of a tower are 60^0 and 30^0 respectively , as seen from two points A and B situated in the same line and at distances x & y from the foot of the tower. The height of the tower will be

   (a) $\sqrt{x+y}$ (b) $\sqrt{xy}$ (c) xy (d) $\sqrt{x}+\sqrt{y}$

4. The pair of linear equations (3k +1)x + 3y −5 =0 and 2x −3y +5 =0 have infinite number of solutions. Then the value of k is
   (a) 1   (b) 0   (c) 2   (d) −1

5. If the quadratic equation $x^2 – 8x + k = 0$ has real roots, then
   (a) k< 16   (b) $k \leq 16$ (c) $k > 16$ (d) $k \geq 16$

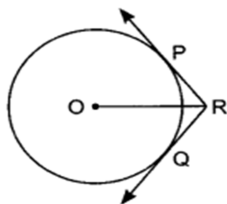6. In trapezium ABCD, If AB ∥ DC, AB = 9 cm, DC = 6cm and BD = 12 cm, then BO is equal to
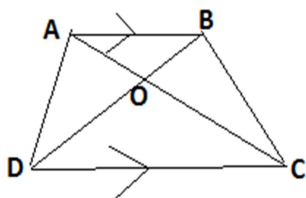
(a) 7.4 cm   (b) 7cm   (c) 7.5 cm   (d) 7.2 cm

7. In the given figure, PQ ∥ BC. If $\frac{AP}{PB} = \frac{AQ}{QC} = \frac{1}{2}$, then
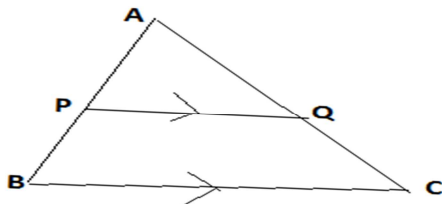
(a) PQ = BC   (b) $PQ^2 = BC^2$

(c) $PQ = \frac{BC}{3}$ (d) $PQ = \frac{BC}{2}$

8. In the given figure, two tangents RQ and RP are drawn from an external point R to the circle with centre O. If ∠PRQ = 120°, then

(a) OP = PR   (b) OR = PR+RQ

(c) OP = QR   (d) PR = OR+RQ

9. If the distance between the points (4, p) and (1, 0) is 5, then the value of p is

(a) 4 only   (b) ±4   (c) −4 only   (d) 0

10. The fourth vertex D of a parallelogram ABCD whose three vertices are A(−2, 3) , B(6, 7) and C (8, 3)is

(a) (0, 1)   (b) (0,−1)   (c) (−1, 0)   (d) (1, 0)

11. If $\sin\alpha = \frac{1}{2}$ and $\cos\beta = \frac{1}{2}$ then the value of $(\alpha + \beta)$ is

(a) 0°   (b) 30^0 (c) 60^0 (d) 90^0

12. (sec A + tan A) (1 – sin A) is equal to

(a) sec A   (b) sin A   (c) cosec A   (d) cos A

13. A piece of wire 20 cm long is bent into the form of an arc of a circle subtending an angle of 60^0 at its centre. The radius of the circle is

(a) $\frac{60}{\pi}$ (b) $\frac{30}{\pi}$ (c) $\frac{20}{\pi}$ (d) $\frac{40}{\pi}$

14. The area of the largest triangle that can be inscribed in a semi-circle of radius 'r' units is

(a) r^2 sq. units   (b) $\frac{1}{2}r^2$ sq. units   (c) $2 r^2$ sq. units   (d) $\sqrt{2}r^2$ sq. units

15. If volumes of two spheres are in the ratio 64 : 27 , then the ratio of their surface areas is

(a) 3 : 4   (b) 4 : 3   (c) 9 : 16   (d) 16 : 9

16. If the mean of first 'n' natural numbers is $\frac{5n}{9}$, then the value of 'n' is

(a) 5   (b) 4   (c) 9   (d) none of these

17. If the difference of mode and median of a data is 24, then the difference of median and mean is
    (a) 8   (b) 12   (c) 24   (d) 36

18. In a single throw of a pair of dice, the probability of getting 'the sum a perfect square' is
    (a) $\dfrac{1}{18}$ (b) $\dfrac{7}{36}$ (c) $\dfrac{1}{6}$ (d) $\dfrac{2}{9}$

    DIRECTION: In the question number 19 and 20, statement of **Assertion (A)** is followed by a statement of **Reason(R).**

    Choose the correct option.

19. **Assertion (A)**: If the HCF of 65 and 117 is expressible in the form $65m - 117$, then $m = 2$
    Reason(R): HCF (a, b) × LCM (a, b)= a × b
    (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 and reason (R) is false.
    (d) Assertion (A) is false and reason (R) is true

20. **Assertion (A)**: For $0 < \theta \leq 90^0$, $(\cosec \theta - \cot\theta)$ and $(\cosec\theta + \cot\theta)$ are reciprocal of each other.
   **Reason(R):** $\cosec^2\theta - \cot^2\theta = 1$
    (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 and 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.
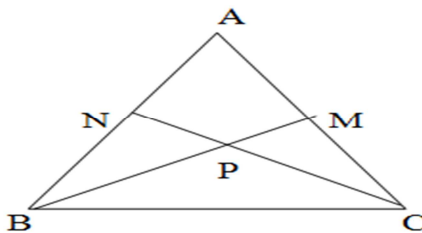
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SECTION - B

(Section B consists of 5 questions of 2 marks each)
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21. Find the value(s) of k for which the pair of linear equations $kx + y = k^2$ and $x + ky = 1$ have infinitely many solutions.

22. In the given figure, ∠ACB = ∠CDA, AC = 6 cm and AD = 3 cm, then find the length of AB.
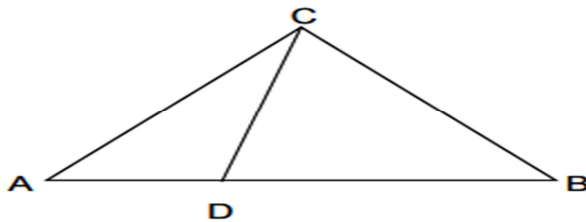
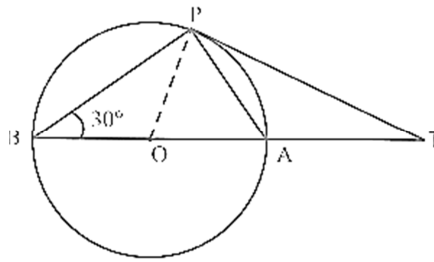<div align="center">OR</div>

In the given figure AM: MC = 3: 4, BP: PM = 3: 2 and BN = 12 cm. Find AN.

23. In the given figure, BOA is a diameter of a circle and the tangent at a point P meets BA extended at T. If ∠PBO = 30°, then find the measure of ∠PTA.

24. Prove that $\sec^2A + \cosec^2A = \sec^2A.\cosec^2A$

OR

Prove that $\dfrac{tanA}{1+secA} - \dfrac{tanA}{1-secA} = 2\cosec A$

25. A chord of a circle of radius 15 cm subtends an angle of 60^0 at the centre. Find the area of the corresponding minor sector of the circle. (use $\pi = 3.14$)

SECTION - C
(Section C consists of 6 questions of 3 marks each)

26. Three sets of English, Hindi and Mathematics books have to be stacked in such a way that all the books are stored subject wise and the height of each stack is same. The number of English books is 96, the number of Hindi books is 240 and the number of Mathematics books is 336. Assuming that the books are of the same thickness, determine the number of stacks of English, Hindi and Mathematics books.

27. A drone vertically above a Jeep moving towards a building at the same speed as the Jeep. When the horizontal distance between the building and the Jeep is 30 m, then the angle of depression of the top of the building from the drone is 30^0. Find the height of the drone above the top of the building and the shortest distance from the top of the building to the drone.

OR

A ladder of height 10 m is inclined to a vertical wall at an angle of 60^0 to the horizontal. When its top slides down below its original position, the angle of elevation changes to 30^0.Find the height by which it slides down from its original position.

28. If sum of *n* terms of an AP is (3n^2+4n*)*, then find its first term, second term, common difference and the nth term .

29. A circle touches the sides of a quadrilateral ABCD at P, Q, R, S respectively. Show that the angle subtended at the centre by a pair of opposite sides is supplementary.

OR

AB is a diameter and AC is a chord of a circle with centre O such that ∠BAC = 30^0. The tangent at C intersects extended AB at a point D. Prove that BC = BD.

30. Prove that $(sin^4\theta - cos^4\theta + 1) \cosec^2\theta = 2$

31. A survey regarding the heights (in cm) of 51 boys of class X of a school was conducted and the following data was obtained. Find mode of the data.

| Height(in cm)	130-140	140-150	150-160	160-170	170-180	180-190
Number of Boys	4	7	18	11	6	5

SECTION – D
(Section D consists of 4 questions of 5 marks each)

32. While boarding an aeroplane, a passenger got hurt. The pilot showing promptness and concern made arrangements to hospitalize the injured and the plane started late by 30 minutes. To reach the destination 1500 km away in time, the pilot increased the speed by 100 km/hour. Find the original speed of the plane.

OR

To fill a swimming pool two pipes are used. If the pipe of larger diameter is used for 4 hours and the pipe of smaller diameter for 9 hours, only half of the pool can be filled. Find how long it would take for each pipe to fill the pool separately, if the pipe of smaller diameter takes 10 hours more than the pipe of larger diameter to fill the pool?

33. (a) State and prove basic proportionality theorem.

(b) In the given figure, if ∠ADE =∠ABC, AD = 2 cm, BD = 3cm, and AE = 3cm, then using the above theorem, find CE.
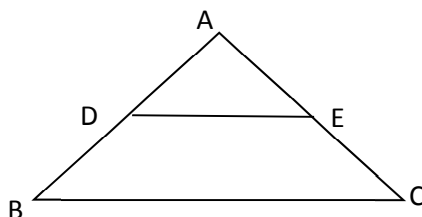
34. A building is in the form of a cylinder surmounted by a hemispherical vaulted dome and contains $41\frac{19}{21}$m^3 of air. If the internal diameter of dome is equal to its total height above the floor, find the height of the building?

OR

A solid toy is in the form of a right circular cylinder with a hemisphere at one end and a cone at the other end having same base diameter 4.2cm.The heights of the cylindrical and conical portions are 12 cm and 7 cm respectively. Find the volume of the toy.

35. The median of the following data is 525. Find the values of x and y,if the total frequency is 100.

Class interval	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
Frequency	2	5	x	12	17	20	Y	9	7	4

SECTION - E
(Case study-based questions are compulsory)

36. **Case Study-1**

Your elder brother wants to buy a car and plans to take loan from a bank for his car. He repays his total loan of 1,18,000 rupees by paying every month starting with the first Instalment of 1000 rupees. If he increases the instalment by 100 rupees every month, then answer the following questions.

(i) Find the amount paid by him in 30th instalment.

(ii) Find the total amount paid by him in 25 instalments.

(iii) (a) Find the total number of instalments in which he cleared the loan. Also find the amount
of last instalment.

OR

(b)Find the outstanding amount of the loan after 30th instalment.

37. **Case Study – 2**

A group of class X students goes to picnic during vacation. There were three different
slides and three friends are Ajay, Ram and Shyam are sliding in three slides. The position
of the three friends shown by P, Q and R respectively, in three different slides are given below.
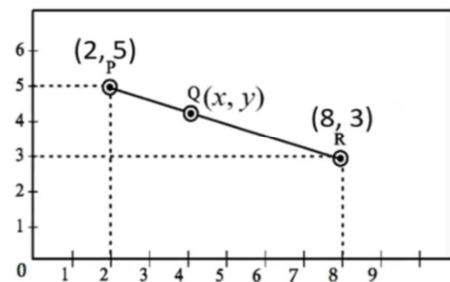

(i)Find the distance between Ajay and Shyam.
(ii) What is the coordinates of mid-point of Ajay and Shyam?
(iii) (a) Find the coordinates of point on x-axis which is at equal distance from P and R.

OR

(b) What are the co-ordinates of Q if it divides the line segment PR in the ratio 1:2
internally?

38. **Case Study-3**

Meera throws a ball upwards, from a rooftop, which is 20 m above the ground. It will reach a
maximum height and then fall back to the ground. The height of the ball from the ground at
time t is h (t), which is given by $h(t) = -4t^2 + 11t + 20$.
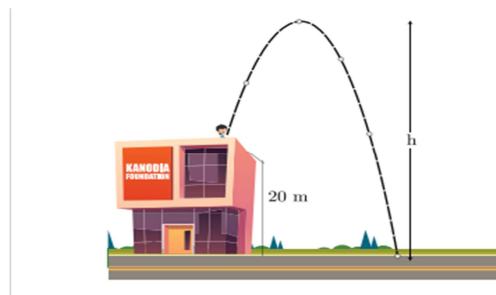
(i) Find the height reached by the ball after 1 second?
(ii) Find the time that the ball will take to hit the ground?
(iii) (a) Write a quadratic polynomial whose zeroes are reciprocal of the zeroes of the polynomial
h(t).

OR

(b)Determine the possible time(s) to reach the ball at the same height of 27 m?

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