

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

**SET-1**

- 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**

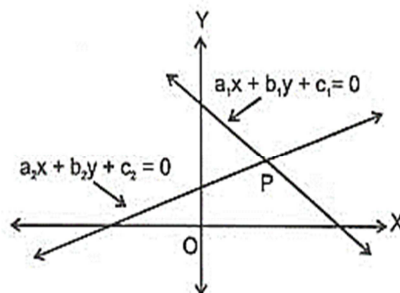
**General Instructions:**

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 1,1 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 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  $\pi = 22/7$  wherever required if not stated.

**SECTION- A**

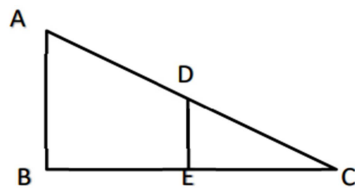
**(Section A consists of 20 questions of 1 mark each)**

1. If 'n' is an even prime number, then  $2(7^n + 8^n)$  ends with  
(a) 1                      (b) 4                      (c) 2                      (d) 6
2. The HCF and LCM of two rational numbers are equal. The numbers must be  
(a) prime                      (b) composite                      (c) not equal                      (d) equal
3. The length of shadow of a tower on the plane ground is  $\sqrt{3}$  times the height of the tower. The angle of elevation of the sun is  
(a)  $45^\circ$                       (b)  $30^\circ$                       (c)  $60^\circ$                       (d)  $90^\circ$
4. If the given figure shows a pair of linear equations in two variables, then which of the following statements is true?



- |  |  |
|--|--|
| (a) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ | (b) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$ |
| (c) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$                   | (d) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$    |

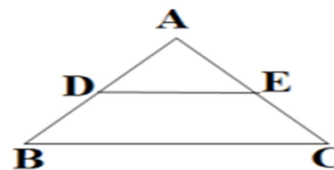
5.  $(x^2 + 1)^2 - x^2 = 0$  has  
 (a) four real roots      (b) two real roots      (c) no real roots      (d) one real root
6. In  $\triangle ABC$ ,  $DE \parallel AB$ . If  $AB = 8$  cm,  $CE = 4$  cm,  $BE = 6$  cm, then  $DE$  is



- (a) 5.3cm      (b) 3.2 cm      (c) 4.8cm      (d) 3.5 cm

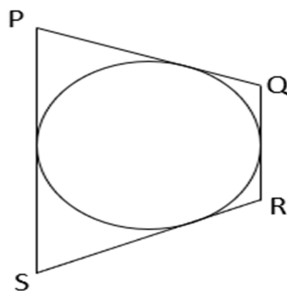
7. In the given figure,  $DE \parallel BC$ ,  $AE = a$  units,  $EC = b$  units,  $DE = x$  units and  $BC = y$  units. Which of the following is true?

- (a)  $x = \frac{a+b}{ay}$       (b)  $y = \frac{ax}{a+b}$   
 (c)  $x = \frac{ay}{a+b}$       (d)  $\frac{x}{y} = \frac{a}{b}$



8. A quadrilateral PQRS is drawn to circumscribe a circle. If  $PQ = 12$  cm,  $PS = 15$  cm and  $RS = 14$  cm, then the length of  $QR$  is

- (a) 15 cm  
 (b) 14 cm  
 (c) 12 cm  
 (d) 11 cm



9.  $P\left(\frac{a}{3}, 4\right)$  is the mid-point of the line segment joining the points  $Q(-6, 5)$  and  $R(-2, 3)$ , then the value of 'a' is

- (a) -4      (b) -12      (c) 12      (d) -6

10. The coordinates of the vertex A of the rectangle ABCD whose three vertices are given as  $B(0, 0)$ ,  $C(3, 0)$  and  $D(0, 4)$  is

- (a) (4, 0)      (b) (0, 3)      (c) (-3, 4)      (d) (4, 3)

11. If  $\sqrt{3} \sin \theta = \cos \theta$ , then  $\theta$  is

- (a)  $45^\circ$       (b)  $30^\circ$       (c)  $60^\circ$       (d)  $90^\circ$

12. The value of  $\frac{2 \tan \theta (\sec^2 \theta - 1)}{\cos^3 \theta}$  is

- (a)  $2 \tan^3 \theta \operatorname{cosec} \theta$       (b)  $2 \cot^3 \theta \operatorname{cosec}^3 \theta$       (c)  $2 \tan^3 \theta \sec^3 \theta$       (d)  $2 \cot^3 \theta \sec^3 \theta$

13. The circumference of a circle exceeds the diameter by 16.8 cm. The radius of the circle is

- (a) 3.29cm      (b) 3.79 cm      (c) 3.92 cm      (d) 3.73 cm

14. In a circle of radius 9 cm, the length of the major arc is  $\frac{5}{9}$  times the circumference of that circle.

Then the area of the minor sector is

- (a)  $36\pi \text{ cm}^2$       (b)  $45\pi \text{ cm}^2$       (c)  $9\pi \text{ cm}^2$       (d)  $12\pi \text{ cm}^2$

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)  $\frac{1}{18}$  (b)  $\frac{7}{36}$  (c)  $\frac{1}{6}$  (d)  $\frac{2}{9}$

**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):**  $\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$   
 (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 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
20. **Assertion(A) :**For  $0 < \theta \leq 90^\circ$ ,  $(\text{cosec } \theta - \cot \theta)$  and  $(\text{cosec} \theta + \cot \theta)$  are  
 reciprocal of each other.

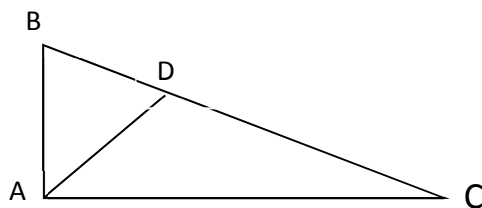
**Reason(R):**  $\text{cosec}^2 \theta - \cot^2 \theta = 1$

- (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

### SECTION- B

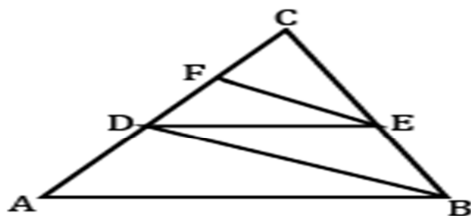
(Section B consists of 5 questions of 2 marks each)

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,  $\angle CAB = 90^\circ$  and  $AD \perp BC$ . If  $AC=25\text{cm}$ ,  $AB=1\text{m}$  and  $BD = 75\text{cm}$ , then find the value of AD.

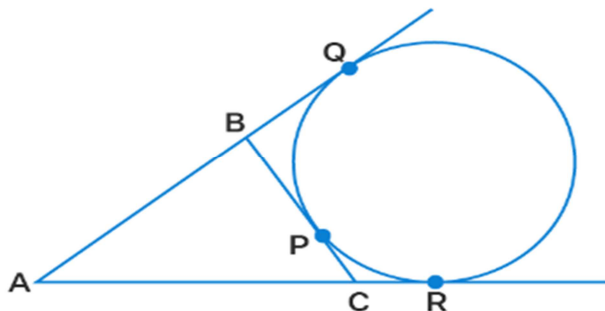


OR

In the given figure ABDE,  $AB \parallel DE$  and  $BD \parallel EF$ . Prove that  $DC^2 = CF \times AC$



23. If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that  $AQ = \frac{1}{2} (BC + CA + AB)$



24. If  $\cos\theta + \sin\theta = \sqrt{2} \cos\theta$ , show that  $\cos\theta - \sin\theta = \sqrt{2} \sin\theta$

OR

If  $x = a \sin\theta$  and  $y = b \tan\theta$ , then prove that  $\frac{a^2}{x^2} - \frac{b^2}{y^2} = 1$ .

25. A chord of a circle of radius 15cm subtends an angle of  $60^\circ$  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)

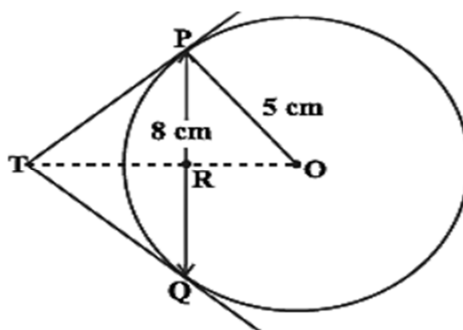
26. Three sets of English, Hindi and Mathematics books have to be stacked in such a way that all the books are stored subject wise and the height of each stack is same. The number of English books is 96, the number of Hindi books is 240 and the number of Mathematics books is 336. Assuming that the books are of the same thickness, determine the number of stacks of English, Hindi and Mathematics books.
27. The shadow of a vertical tower of height  $9\sqrt{3}$ m is found to be 9m. Find original angle of elevation and also find the minimum length of the shadow to be increased in order to change the angle of elevation to  $30^\circ$ .

OR

At a point on the level ground, it is found that the tangent of angle of elevation of a vertical tower is  $\frac{5}{12}$ . After walking 192 m towards the tower the tangent of the angle of elevation is  $\frac{3}{4}$

Find the height of the tower.

28. If sum of n terms of an AP is  $(n^2 - 5n)$ , then find its first term, second term, common difference and the nth term.
29. PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect at a point T. Find the length TP.



OR

Two tangent segments PA and PB are drawn to a circle with centre 'O' such that  $\angle APB = 120^\circ$ . Prove that  $OP = 2 AP$

30. If  $a \cos \theta + b \sin \theta = c$ , then prove that  $b \cos \theta + a \sin \theta = \pm \sqrt{a^2 + b^2 - c^2}$

31. Find the mean of the following distribution:

Classes	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	8	5	12	35	24	16

**SECTION – D**

(Section D consists of 4 questions of 5 marks each.)

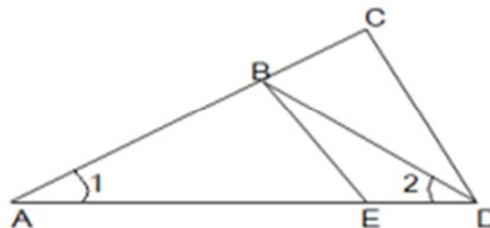
32. Two water taps together can fill a tank in  $9\frac{3}{8}$  hrs. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

OR

A person on tour has ₹ 4200 for his expenses. If he extends his tour for 3 days, he has to cut down his daily expenses by ₹ 70. Find his original duration of tour.

33. (a) State and prove Basic Proportionality theorem.

(b) In the given figure,  $\frac{AD}{AE} = \frac{AC}{BD}$  and  $\angle 1 = \angle 2$ . Show that  $\triangle BAE \sim \triangle CAD$



34. A tent is in the shape of a cylinder surmounted by a conical top. If the height and radius of the cylindrical part are 3m and 14m respectively, and the total height of the tent is 13.5 m, find the area of the canvas required for making the tent, keeping a provision of  $26 \text{ m}^2$  of canvas for stitching and wastage. Also, find the cost of the canvas to be purchased at the rate of Rs. 500 per  $\text{m}^2$ .

OR

A solid is in the shape of a right-circular cone surmounted on a hemisphere, the radius of each of them being 7cm and the height of the cone is equal to its diameter. Find the volume of the solid.

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**

Jaspal singh repays his total loan of 118000 rupees by paying every month starting with the first instalment of 1000 rupees. He wanted to repay the loan in less time so increases the instalment

by 100 rupees every month .

(i) What amount he will pay on 25<sup>th</sup> instalment?

(ii) Find the difference between 11<sup>th</sup> and 18<sup>th</sup> instalment.

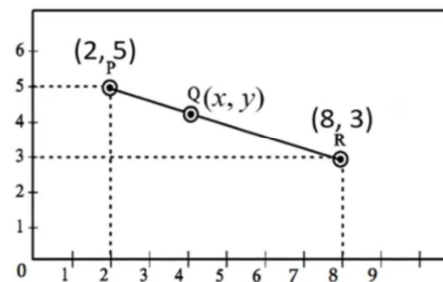
(iii) (a) What amount of loan does he still have to pay after 30<sup>th</sup> instalment?

OR

(b) If he paid 23,500 rupees before the first instalment then find in how many instalments he can repay the loan if he continues to pay in the above manner.

### 37. Case Study – 2

A group of class X students go to picnic during vacation. There were three different slides and three friends Ajay, Ram and Shyam are sliding in three slides. The positions 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?

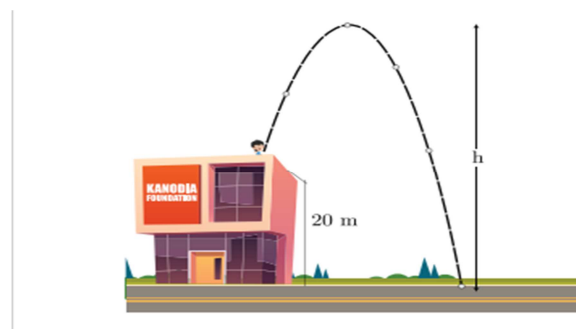
(iii)(a) Find the coordinates of point on x-axis which is at equal distance from P and R.

OR

(b) What is the coordinates of Q if it divides the line segment PR in the ratio 1:2 internally?

### 38. Case Study – 3

Meera throws a ball upward 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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