PRACTICE QUESTIONS SET – 5 (2024-25)

MATHEMATICS

CLASS – X

Section A

Answer ALL the following Questions. Each question carries 2 marks.

1. If θ is an acute angle and $\tan\theta + \cot\theta = 2$, find the value of $\tan^9\theta + \cot^9\theta$
2. The mean monthly wages of a group of 15 workers in a factory was ₹3351. 4 workers whose mean monthly wage was ₹3310 left the factory and a new worker was appointed at a monthly wage of ₹3025. Find the mean wage of the remaining group.
3. If $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$, determine $\cot\theta$.
4. Determine the value of x such that $2\,\text{cosec}^2 30^\circ + x\sin^2 60^\circ - \frac{3}{4}\tan^2 30^\circ = 10$
5. The weight of coffee in 70 packets are shown in the following table:

Weight (in grams)	200 – 201	201 – 202	202 – 203	203 – 204	204 – 205	205 – 206
Number of Packets	12	26	20	9	2	1

Determine the modal weight.

Section B

Answer ALL the following Questions. Each question carries 3 marks.

6. If $1 + \sin^2\theta = 3\sin\theta\cos\theta$, then prove that $\tan\theta = 1$ or $\frac{1}{2}$.
7. A man on the top of a vertical tower observes a car moving at a uniform speed coming directly towards it. If it takes 12 minutes for the angle of depression to change from 30° *to* 45°, how soon after this, will the car reach the tower?
8. Prove that $\sec^4 A(1 - \sin^4 A) - 2\tan^2 A = 1$
9. If $a\sin\theta + b\cos\theta = c$, prove that $(a\cos\theta - b\sin\theta) = \pm\sqrt{a^2 + b^2 - c^2}$

10. Find the mean age (using step-deviation method) of 100 residents of a town from the following data.

Age equal and above(in years)	0	10	20	30	40	50	60	70
Number of persons	100	90	75	50	25	15	5	0

Section C

Answer ALL the following Questions. Each question carries 5 marks.

11. Two lamp-posts are of equal height. A boy measured the elevation of the top of each lamp-post from the midpoint of the line segment joining the feet of lamp-post as $30°$. After walking 15 m towards one of them, he measured the elevation of the top of nearest lamp-post at the point where he stands at $60°$. Determine the height of each lamp-post and the distance between them.

12. The median of the following data is 525.

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

Find the values of X and Y, if the total frequency is 100.

13. (a) If $4\tan\theta = 3$, evaluate $\left(\frac{4\sin\theta - \cos\theta + 1}{4\sin\theta + \cos\theta - 1}\right)$

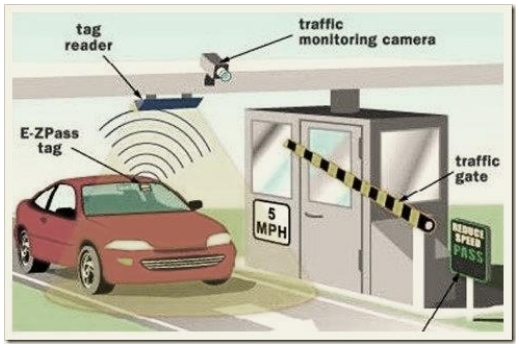
(b) If $\sin\theta$ and $\sec\theta, (0° < \theta < 90°)$ are the roots of the equation $\sqrt{3}x^2 + kx + 3 = 0$, then find the value of k.

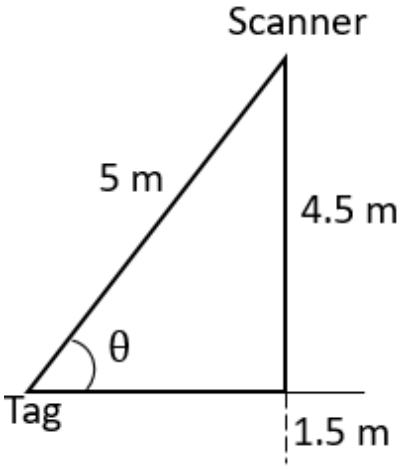
Section – D : Case Study

14. At a toll plaza, an electronic toll collection system has been installed. FASTag can be used to pay the fare. The tag can be pasted on the windscreen of a car.

At a toll plaza a tag scanner is placed at a height of 6 m from the ground. The scanner reads the information on the tag of the vehicle and debits the desired toll amount from a linked bank account.

For the tag scanner to function properly the speed of a car needs to be less than 30 km per hour. A car with a tag installed at a height of 1.5 m from the ground enters the scanner zone.





Based on the above information, answer the following questions:

i. The scanner gets activated when the car's tag is at a distance of 5 m from it. Give one trigonometric ratio for the angle: between the horizontal and the line between the car tag and the scanner?

ii. Which trigonometric ratio in a right triangle varies from 0 to 1?

iii. (a) The scanner reads the complete information on the car's tag while the angle between chip and scanner changes from 30° to 60° due to car movement. What is the distance moved by the car?

OR

(b) A vehicle with a tag pasted at a height of 2 m from the ground stops in the scanner zone. The scanner reads the data at an angle of 45°. What is the distance between the tag and the scanner? (Draw the necessary figure)

15. **ASSERTION REASON BASED QUESTIONS**

A statement of assertion (A) is followed by a statement of Reason (R).

Choose the correct answer out of the following choices.

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

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

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

Assertion(A): The mean of first fifty nine natural numbers is 30.

Reason(R): The sum of first n natural numbers is $\frac{n(n+1)}{2}$.

General Guidelines:

1. You are advised against doing selective study.
2. The questions to be given in the question paper are sample questions for practice prior to Board examination.
3. Although Answer keys will be provided within two/three days of posting of these questions you are advised to answer them yourself.
4. In case you have queries regarding a portion of the chapters being revised here you may send your query to your teacher through Chat section in MS Teams.