

MOST IMPORTANT QUESTIONS (PART – 01)

(STANDARD MATHS)

X CBSE BOARD 2024- 25

CH - 8 INTRODUCTION TO TRIGONOMETRY

Q1. If $\tan(\theta + \phi) = \frac{\tan \theta + \tan \phi}{1 - \tan \theta \tan \phi}$, such that $\tan \theta = \frac{1}{2}$ and $\tan \phi = \frac{1}{3}$ find the value of $\tan(\theta + \phi)$.

Q2. If $2\cos\theta - \sin\theta = x$ and $\cos\theta - 3\sin\theta = y$, prove that $2x^2 + y^2 - 2xy = 5$.

Q3. If $\frac{x}{a} \cos\theta + \frac{y}{b} \sin\theta = 1$ and $\frac{x}{a} \sin\theta - \frac{y}{b} \cos\theta = 1$, prove that $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2$.

Q4. If $\sqrt{3}\cot^2\theta - 4\cot\theta + \sqrt{3} = 0$, find the value of $\cot^2\theta + \tan^2\theta$.

Q5. Prove that $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 - \tan^2\theta - \cot^2\theta = 7$

Q6. If $7\operatorname{cosec}\theta - 3\cot\theta = 7$, prove that $7\cot\theta - 3\operatorname{cosec}\theta = \pm 3$.

Q7. If $\cot\theta + \tan\theta = x$ and $\sec\theta + \cos\theta = y$, prove that $(x^2y)^{\frac{2}{3}} - (xy^2)^{\frac{2}{3}} = 1$

Q8. $\cos\theta + \sin\theta = \sqrt{2} \cos\theta$, show that $\cos\theta - \sin\theta = \sqrt{2} \sin\theta$.

Q9. Prove that $\frac{\sec\theta + \tan\theta - 1}{\tan\theta - \sec\theta + 1} = \frac{\cos\theta}{1 - \sin\theta}$.

Q10. If $\frac{1 - \tan\theta}{1 + \tan\theta} = \frac{\sqrt{3} - 1}{\sqrt{3} + 1}$, show that $\frac{\sin\theta}{\cos 2\theta} = 1$.

Q11. If $\tan\theta + \sin\theta = m$, $\tan\theta - \sin\theta = n$, then prove that $m^2 - n^2 = 4\sqrt{mn}$.

Q12. Prove that $\frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} = \sec\theta + \tan\theta$.

Q13. If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$.

Q14. If $\sec\theta = x + \frac{1}{4x}$, prove that $\sec\theta + \tan\theta = 2x$ or $\frac{1}{2x}$.

Q15. Evaluate $\frac{\tan^2 60^\circ + 4 \cos^2 45^\circ + 3 \sec^2 30^\circ + 5 \cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ}$.

CH - 9 SOME APPLICATION OF TRIGONOMETRY

Q1. Find the height of a chimney, when it is found that on walking towards it 50 m in a horizontal line through its base, the angular elevation of its top changes from 30° to 45° .

Q2. Two poles of equal heights are standing opposite to each other on either side of a road, which is 100 m wide. From a point between them on the road, the angles of elevation of the tops are 30° and 60° . Find the height of each pole.

Q3. At a point on a level ground, the angle of elevation of a vertical tower is found to be such that its tangent is $\frac{5}{12}$. On walking 192 m towards the tower, the tangent of the angle of elevation is $\frac{3}{4}$. Find the height of the tower

Q4. An aeroplane flying 300 m high passes vertically above another aeroplane at a distance when the angles of elevation of two aeroplanes from the same point on the ground are 60° and 45° respectively. Find the vertical distance between the two aeroplanes.

Q5. A bird is sitting on the top of a tree which is 80m high. The angle of elevation of the bird, from a point on the ground is 45° . The bird flies away from the point of observation horizontally and remains at a constant height. After 2 seconds, the angle of elevation of the bird becomes 30° . Find the speed of the flying bird.

Q6. A man standing on the deck of a ship, which is 10m above water level, observes the angle of elevation of the top of a hill as 60° and the angle of depression of the base of the hill as 30° . Calculate the distance of the hill from the ship and height of the hill.

Q7. If the angle of elevation of a cloud from a point h metre above a lake is α and the angle of depression of its reflection in the lake is β . Prove that the height of the cloud is $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$.

Q8. A man standing on the deck of a ship, which is 10 m above the water level, observes the angle of elevation of the top of a hill as 60° , and the angle of depression of the base of the hill as 30° . Find the distance of the hill from the ship and the height of the hill.

Q9. A moving boat is observed from the top of a 150 m high cliff moving away from the cliff. The angle of depression of the boat changes from 60° to 45° in 2 minutes. Find the speed of the boat in m/h.

Q10. The angle of elevation of a cloud from a point 60 m above a lake is 30° and the angle of depression of the reflection of cloud in the lake is 60° . Find the height of the cloud.

Q11. The tops of the two towers of height x and y standing on level ground, subtend angle of 30° and 60° respectively at the centre of the line joining their feet, then find x : y.

Q12. A man standing on the deck which is 10 m above the water level, observes the angle of elevation of the top of a hill as 60° , and the angle of depression of the base of the hill as 30° . Find the distance of the hill from the ship and the height of the hill.

Q13. If the angle of elevations of a cloud from a point h metres above a lake be 30° and the angle of depression of its reflection in the lake be 60° , prove that the distance of the cloud is 2h, also find the distance of observer from cloud.

Q14. The angles of elevation of the top of height h meter from two points P and Q at a distance of x m and y m from the base of the tower respectively and in the same straight line with it, are 60° and 30° , respectively prove that height of tower be \sqrt{xy} m.

Q15. At a point on level ground, the angle of elevation of a vertical tower is found to be α such that $\tan \alpha = \frac{1}{3}$. After walking 200m towards the tower, then angle of elevation β become such that $\tan \beta = \frac{3}{4}$, find the height of the tower.

CH – 5 ARITHMETIC PROGRESSION

Q1. If the ratio of the sum of the first n terms of the two AP is $7n+1 : 4n+27$, find the ratio of their 5th term.

Q2. Find the sum of the following series- $5+(-41)+9+(-39)+13+(-37)+17+\dots\dots\dots+(-5)+81+(-3)$

Q3. If pth term of an A.P. is $\frac{1}{q}$ and qth term is $\frac{1}{p}$ prove that the sum of the first 'pq' terms is $\frac{1}{2} [pq+1]$.

Q4. In a polygon the smallest interior angle is 120° . Angles are increased by 5° . Find the number of sides of the polygon.

Q5. Show that the sum of an AP whose 1st term is a , second term is b and the last term is c , is equal to $\frac{(a+c)(b+c-2a)}{2(b-a)}$

Q6. The 24th term of an AP is twice its 10th term. Show that its 72th term is 4 times its 15th term.

Q7. The houses of a row are numbered consecutively from 1 to 49. Show that there is the value of x such that the sum of the numbers of the houses preceding the house numbered x is equal to the sum of the numbers of the houses following it. Find the value of x .

Q8. Solve the equation: $1 + 4 + 7 + 10 + \dots + x = 287$

Q9. Find three numbers in A.P. whose sum is 21 and their product is 231

Q10. A ladder has rungs 25cm apart. The rungs decrease uniformly in length from 45cm at the bottom to 25cm at the top and the bottom rungs are $2\frac{1}{2}$ m apart, what is the length of the wood required for the rungs?

Q11. Two APs have the same common difference. The first terms -1 and -8 respectively. Find the difference between the 4th terms.

Q12. A small terrace at a football ground comprises of 15 steps each of which is 50m long and built of solid concrete. Each step has a rise of $\frac{1}{4}$ m and a tread of $\frac{1}{2}$ m. Calculate the total volume of concrete required to build the terrace

Q13. If $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are in A.P., prove that a^2, b^2, c^2 are also in A.P.

Q14. The sum of $n, 2n, 3n$ terms of an AP is S_1, S_2 and S_3 respectively. Prove that $S_3 = 3(S_2 - S_1)$.

Q15. Find the sum of the integers between 100 and 200 that are-

(i) divisible by 9

(ii) not divisible by 9

Ch – 12 SURFACE AREA & VOLUME

Q1. A cone, a hemisphere and a cylinder stand on equal bases and have the same height what is the ratio of their volumes?

Q2. The slant height of the frustum of a cone is 5cm if the difference between the radii of its two circular ends is 4cm, find the height of the frustum.

Q3. The radius and height of a solid right circular cone are in the ratio of 5:12. If its volume is 314 cm^3 , find its total surface area.

Q4. A well of diameter 3m is dug 14m deep. The soil taken out of it is spread evenly all around it to a width of 5m to form an embankment. Find the height of the embankment.

Q5. An iron pillar has some part in the form of a right circular cylinder and remaining in the form of a right circular cone. The radius of the base of each of cone and cylinder is 8 cm. The cylindrical part is 240 cm high and the conical part is 36 cm high. Find the weight of the pillar if one cu. cm of iron weighs 7.8 grams.

Q6. An open container made up of a metal sheet is in the form of a frustum of a cone of height 8 cm with radii of its lower and upper ends as 4 cm and 10 cm respectively. Find the cost of oil which can completely fill the container at the rate of Rs. 50 per litre. Also, find the cost of metal used, if it costs Rs. 5 per 100 cm^2 .

- Q7.** A building is in the form of a cylinder surmounted by a hemispherical dome as shown in the figure. The base diameter of the dome is equal to $\frac{2}{3}$ of the total height of the building. Find the height of the building, if it contains $67\frac{1}{21} m^3$ of air.
- Q8.** The diameter of a sphere is 28 cm. Find the cost of painting it all around at Rs. 0.10 per square cm.
- Q9.** The perimeter of one face of a wooden cube is 20 cm. Find its weight if 1 cm³ of wood weighs 8.25 g.
- Q10.** The radii of two cylinders are in the ratio of 1 : $\sqrt{3}$. If the volumes of two cylinders be same, find the ratio of their respective heights
- Q11.** If the radius of the base of a cone is doubled keeping the height same. What is the ratio of the volume of the larger cone to the smaller cone?
- Q12.** If the length, breadth and height of a solid cube are in the ratio 4 : 3 : 2 and total surface area is 832 cm². Find its volume.
- Q13.** Three cubes of a metal whose edges are in the ratio 3 : 4 : 5 are melted and converted into a single cube whose diagonal is $12\sqrt{3} cm$. Find the edges of the three cubes.
- Q14.** A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 4 cm and diameter of the base is 8 cm. Determine the volume of the toy. If the cube circumscribes the toy, then find the difference of the volumes of the cube and the toy. Also, find the total surface area of the toy
- Q15.** If h , c and V respectively represent the height, curved surface area and volume of a cone, prove that $c^2 = \frac{3\pi Vh^3 + 9V^2}{h^2}$.

CH – 13 STATISTICS

- Q1.** What measure of central tendency is used to obtain graphically as the x-coordinate of meeting point of the two ogives for grouped data?
- Q2.** The average weight of students in 4 sections A, B, C and D is 60 kg. The average weights of the students of A, B, C and D individually are 45kg, 50kg, 72kg and 80kg respectively. If the average weight of the students of section A and B together is 48 kg and that of the students of B and C together is 60 kg, what is the ratio of the number of students in section A and D ?
- Q3.** The mode of a distribution is 55 & the modal class is 45-60 and the frequency preceding the modal class is 5 and the frequency after the modal class is 10. Find the frequency of the modal class.
- Q4.** The median of the following frequency distribution is 35. Find the value of x.

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	2	3	x	6	5	3	2

- Q5.** The Median and Mode of the following wage distribution are known to be Rs.33.5 and Rs.34 respectively. Three frequency values from the table, however are missing. Find the missing frequencies.

Wages	0 -10	10-20	20-30	30-40	40-50	50-60	60-70	Total
No. of persons	4	16	x	y	z	6	4	230

- Q6.** The mode of a distribution is 55 and mode class is 45-60 and the frequency preceding the modal class is 5 and the frequency after the modal class is 10. Find the frequency of the modal class.
- Q7.** Find the mean marks of students using the from the following cumulative frequency table

Marks	0 and above	10 and above	20 and above	30 and above	40 and above	50 and above	60 and above
No. of students	80	77	72	65	55	43	8

Q8. The mean of the following frequency table is 50, but the frequencies, f_1 and f_2 in classes 20–40 and 60–80 respectively are not known.

Class	0-20	20-40	40-60	60-80	80-100	Total
Frequency	17	F_1	32	F_2	19	120

Q9. Table shows the daily pocket allowance given to the children of a multi-storey building. The mean of the pocket allowances is 18.

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

Q10. The mean of 11 observations is 50. If the mean of first six observations is 49 and that of last six observations is 52, then find sixth observation.

Q11. Mean of a frequency distribution (\bar{x}) is 45. If $\sum f_i = 20$ then find $\sum f_i x_i$.

Q12. The mean and mode of a data are 24 and 12 respectively. Find the median.

Q13. If the mean of the given distribution is 65.6, then find the missing frequencies.

Class Interval	10-30	30-50	50-70	70-90	90-110	110-130	total
Frequency	5	8	F_1	20	F_2	2	50

Q14. The annual profit earned by 30 factories in an industrial area is given below :

Profit (Rs in lakh)	No. of factories
More than or equal to 5	30
More than or equal to 10	28
More than or equal to 15	16
More than or equal to 20	14
More than or equal to 25	10
More than or equal to 30	7
More than or equal to 35	3
More than or equal to 40	0

Find the median of the above data.

Q15. For some data x_1, x_2, \dots, x_n with respective frequencies f_1, f_2, \dots, f_n , find the value of $\sum_1^n f_i(x_i - \bar{x})$.

CH – 14 PROBABILITY

Q1. Two dice are thrown at the same time and the product of numbers appearing on them is noted. Find the probability that the product is less than 9.

Q2. Two dice are thrown simultaneously. What is the probability that

- (i) 5 will not come up on either of them?
- (ii) 5 will come up at least one?
- (iii) 5 will come up at both dice?

Q3. .From a well shuffled pack of playing cards, black jacks, black kings and black aces are removed. A card is then drawn from the pack. Find the probability of getting.

(i) a red card

(ii) not a diamond card.

Q4. .A bag contains cards which are numbered from 2 to 90. A card is drawn at random from the bag. Find the probability that it bears.

(i) a two-digit number

(ii) a number which is a perfect cube.

Q5. .Find the probability of getting 53 Mondays in

(i) a leap year

(ii) a non-leap year.

Q6. .A bag contains 5 red balls and some blue balls.If the probability of drawing a blue ball is double that of a red ball,determine the number of blue balls in the bag.

Q7. .A jar contains 24 marbles, some are green and others are blue. If a marble is drawn at random from the jar, the probability that it is green is $\frac{2}{3}$. Find the number of blue balls in the jar.

Q8. .An integer is chosen between 0 and 100.what is the probability that it is divisible by 2 or 3.

Q9. Two dice are numbered 1,2,3,4,5,6 and 1,2,2,3,3,4 respectively. They are thrown and the sum of the numbers on them is noted. Find the probability of getting

(i)sum 7

(ii)sum as perfect square

Q10. A bag contains 24 balls out of which x are white. If one ball is drawn at random the probability of drawing a white ball is y . 12 more white balls are added to the bag. Now if a ball is drawn from the bag, the probability of drawing the white ball is $\frac{5}{3}y$. Find the value of x .

Q11. A number is selected at random from the numbers 3,5,5,7,7,7,9,9,9,9. Find the probability that the selected number is their average.

Q12. A number x is chosen from the numbers 1,2,3 and a number y is selected from the numbers 1,4,9. Find the probability that $xy=10$.

Q13. The probability of guessing the correct answer to a certain test is $\frac{p}{12}$. If the probability of not guessing the correct answer to this question is $\frac{1}{3}$,find the value of p .

Q14. A die is thrown twice .Find the probability that

(i) 5 will come up at least once

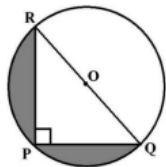
(ii) 5 will not come up either time

Q15.Two dice are numbered 1, 2, 3, 4, 5, 6 and 1, 1, 2, 2, 3, 3, respectively. They are thrown, and the sum of the numbers on them is noted. Find the probability of getting each sum from 2 to 9 separately.

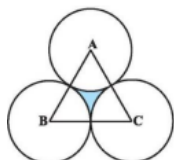
Ch – 11 AREA RELATED TO CIRCLES

Q1. If the perimeter and the area of a circle are numerically equal, then find the radius of the circle.

Q2. Find the area of the shaded region in figure , if $RP= 24$ cm and $PQ = 10$ cm and O is the centre of circle. (take $\pi = 3.14$).

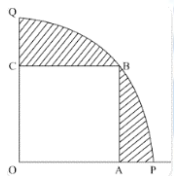


Q3. The area of an equilateral triangle is $49\sqrt{3}$ cm² . Taking each angular points centre ,circles are drawn with radius equal to half the length of the side of the triangle. Find the area of the triangle not included in the circles. (Take $\sqrt{3}=1.73$).

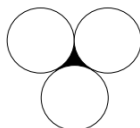


Q4. In the adjoining figure ABCD, is a square of side 10 cm. Semicircles are drawn with side of square as diameter. Find the area of the shaded region.(Use $\pi = \frac{22}{7}$).

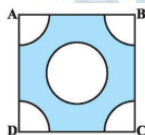
Q5. In Fig., a square OABC is inscribed in a quadrant OPBQ. If $OA = 20$ cm, find the area of the shaded region. (Use $\pi = 3.14$)



Q6. In the adjoining figure , three circles each of radius 3.5 cm are drawn in such a way that each of them touches the other two. Find the area enclosed between these three circles.



Q7. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut as shown in above sided Fig. Find the area of the remaining portion of the square.



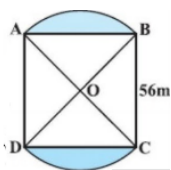
Q8.Two circles touch externally .The sum of their areas is 130π sq. cm and the distance between their centres is 14 cm.Find the radii of the circles .

Q9.Find the number of revolutions made by a circular wheel of area 6.16 sq.m. in rolling distance of 572 m

Q10.Three houses are tied at the vertices of a triangular park of sides 35m ,84 m and 91m with the help of a rope of length 14 m each .Calculate the ratio of the area which can be grazed to the area which can't be grazed .

Q11.Two circle touch each other internally .The sum of their area is 116π sq. cm . and distance between their centres is 6cm.Find the radii of the circles .

Q12. In Fig, two circular flower beds have been shown on two sides of a square lawn ABCD of side 56 m. If the centre of each circular flower bed is the point of intersection O of the diagonals of the square lawn, find the sum of the areas of the lawn and the flower beds.



Q13. A piece of wire 11 cm long is bent into the form of an arc of a circle subtending an angle of 45° at its centre .Find the radius of the circle.

Q14.The circumference of a circle exceeds the diameter by 16.8 cm .Find the radius of the circle.

Q15.A pendulum swings through an angle 45° and describes an arc of 22 cm in length. Find the length of the pendulum .(use $\pi = \frac{22}{7}$).

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