CLASS X
SAMPLE PAPER
MATHS

Co-ordinate

Q. 1. The centre of the circle is (-1, 6) and one end of a diameter is (5, 9), find the coordinates of the other end.

Q. 2. If (3, 0), (2, a) and (b, 6) are the vertices of a triangle ABC whose centroid is (2, 5). Find the values of a and b.

Q. 3. If A(-1, 3), B(1, -1) and C(5, 1) are the three vertices of a triangle ABC, find the length of median through B.

Q. 4. If (3, 2), (4, 4) and (1, 3) are the mid-points of the sides of a triangle, find the coordinates of the vertices of the triangle.

Q. 5. Using section formula show that (4, -11), (5, 3), (2, 15) and (1, 1) are the vertices of a parallelogram.

Q. 6. In what ratio is the line segment joining the points (-2, -3) and (3, 7) divided by the y-axis? Also find the coordinates of the point of division.

Q. 7. Find the point which represents the three-fourths of the distance from (3, 2) to (-5, 6).

Q. 8. Find the coordinates of the centre of circle, the coordinates of the end points of whose diameters are (-5, -2) and (7, -6). Also find the radius of the circle.

Q. 9. In what ratio does the point (3, 12) divide the line segment joining the points (1, 4) and (4, 16) ?

Q. 10. Find the coordinates of the points of trisection of the line segment joining the points (4, -8) and (7, 4).

Q. 11. Find the coordinates of a point which divide the segment AB in the ratio 3:5 internally, where A and B are (4, -1) & (7, 4) respectively.

Q. 12. Find the coordinates of point on the line joining A(3, -4) and B(-2, 5) that is twice as far from A as from B.

Q. 13. The mid-point of the line segment joining (3p, 4) and (-2, 2q) is (2, 2p + 2). Find the values of p and q.

Q. 14. Find the coordinates of a point whose distance from (3, 5) is 5 units and that from (0, 1) is 10 units.

Q. 15. An equilateral triangle has one vertex at (3, 4) and another at (-2, 3). Find the coordinates of the third vertex.

Q . 1. Find a point on the x-axis which is equidistance from the points (7, 6) and (-3, 4).

Q . 2. Show that the points A (1,2),B (5,4),C (3,8) and D (-1,6) are the vertices of a square.

Q . 3. If A(6,-1), B(1,3) and C(k,8) are three points such that AB = BC, find the value of k.

Q . 4. By distance formula, shoe that the points (1,-1), (5,2), (9,5), are collinear.

Q . 5. Find the ratio in which the point P (m,6) divides the join of A(-4,3) and B(2,8). Also find the value of m.

Q . 6. In what ratio is the line segment joining the points (-2,-3) and (3,7) divided by the y-axis . Also. find the coordinates of the points of division.

Q . 7. Two vertices of a $\triangle$ ABC are given by A(6,4) and (-2,2), and its centroid is G(3,4).Find the coordinates of the third vertex C of $\triangle$ ABC.

Q . 8. Show that the points (a, b + c), (b, c + a), (c, a + b), are collinear . .

Q . 9. Find the area of quadrilateral ABCD whose vertices are A (-5,7),B (-4,-5),C (-1,-6) and D(4,5).

Height & distance

Q. 1. The angle of elevation of a cloud from a point 60 meters above a lake is 30° and the angle of depression of the reflection of the cloud in the lake is 60° .Find the height of cloud.

Q. 2. From the top of a tower 60 meters high , the angles of depression of the top and bottom of a pole are observed to be 45° and 60° respectively. Find the height of the pole if the Pole and tower stand on the same plane.

Q. 3. A vertical tower stands on a horizontal plane and is surmounted by a vertical flagstaff of height h. At a point on the plane, the angles of elevation of the bottom and the top of the flagstaff are α and β respectively. Prove that the height of the tower is

$$\left(\frac{h \tan \alpha}{\tan \beta - \tan \alpha} \right)$$

Q. 4. The angle of elevation of an aeroplane from a point on the ground is 45° . After flying for 15 seconds, the elevation changes to 30° .If the aeroplane is flying at a height of 2500 meters, find the speed of the aeroplane .

Q. 5. An aeroplane when 3000 m heigh passes vertically above another aeroplane at an instance when their angles of elevation , at the same observation point are 60° and 45° respectively. How many meters higher is the one than the other.

Q. 6. A round balloon of radius r subtends an angle α at the eye of the observer while the angle of elevation of its center is β. Prove that the height of the centre of the balloon is

$$\left(r \sin \beta \operatorname{cosec} \frac{\alpha}{2} \right)$$

Q. 7. Two stations due south of leaning tower which leans towards the north are at distance a and b from its foot . If α , β be the elevations of the top of the tower from these stations , Prove that its inclination θ to the horizontal is given by

$$\cot \theta = \left(\frac{b \cot \alpha - a \cot \beta}{b - a} \right).$$

Q. 1. A man standing on the deck of the 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°. Calculate the distance of the hill from the ship and the height of the hill.

Q. 2. From a window x m high above the ground in a street, the angles of elevation and depression of the top and foot of the other house on the opposite side of the street are a and b resp. Show that the height of the house is $x(1+\tan\alpha \cdot \cot\beta)$ metres.

Q. 3. Two pillars of equal heights stand on the either side of the roadway 150 m wide. From a point on the roadway between the pillars, the angles of elevation of the top of the pillars are 60° and 30°. Find the height of pillars and the position of the point.

Q. 4. On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. At a point 9 m away from the foot of the tower the angle elevation of the top and bottom of the flag pole are 60° and 30°. Find the heights of the tower and the flag pole mounted on it.

Q. 5. The angles of depression of the top and bottom of a tower, as seen from the top of a 100 m high cliff, are 30° and 60° respectively. Find the height of the tower.

Q. 6. A bird sitting on the top of a tree, which is 80 m 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 from the point of observation becomes 30°. Find the speed of flying of the bird.

Q. 7. From an aeroplane vertically above a straight line horizontal plane, the angles of depression of two consecutive km stones on the opposite sides of the aeroplane are found to be a and b. Show that the height of the aeroplane is $\frac{\tan\alpha \cdot \tan\beta}{\tan\alpha+\tan\beta}$ km.

Q. 8. If the angle of elevation of a cloud from a point h metres above a lake is a and the angle of its refection in the lake is b, prove that the distance of the cloud from the point of observation is $\frac{2h\sec\alpha}{\tan\beta-\tan\alpha}$ metres.

Q. 9. The angles of elevation and depression of the top and bottom of a light-house from the top of a building 60 m high, 30° and 60° respectively. Find

i. the difference the heights of the light-house and the building,
ii. distance between the light-house and the building.

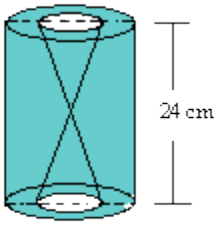
Q. 10. From a window 60 metres high above the ground of a house in a street, the angles of elevation and depression of the top and the foot of another house on the opposite side of the street are 60° and 45° respectively. Show that the height of the opposite house is $60(1+\sqrt{3})$ metres.

Q. 11. The angles of elevation of the top of a tower, as seen from two points A and B situated in the same straight line and at distances a and b respectively from the foot of the tower, are complementary. Prove that the height of the tower is $\sqrt{ab}$.

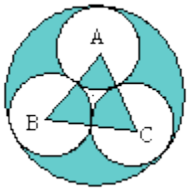
Q. 12. An aeroplane when 3000 metres high, passes vertically above another aeroplane at an instant when the angles of elevation of the two aeroplanes from the same point on the ground are 60° and 45° respectively. Find the vertical distance between the two planes.

Mensuration

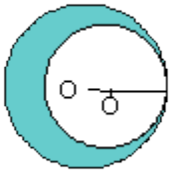
Q. 1. Find the volume of the metal used in making the solid as shown in figure. Also find its total surface area. Its given that diameter of cylinder is 20 cm and diameter of each of two equal conical cavity is 10 cm.



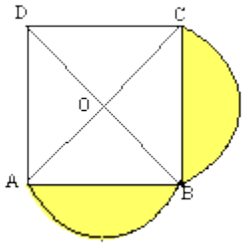
Q. 2. Three circles of radius of radius 2 cm touch one another externally. These circles are circumscribed by a circle of radius R cm. Find the value of R and the area of the shaded region in terms of p and $\sqrt{3}$.



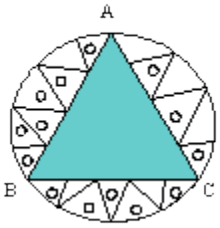
Q. 3. Two circles touch internally, the sum of their areas is 116 p sq. cm and distance between their centres is 6 cm. Find the radii of the circles and area of shaded region.



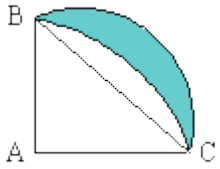
Q. 4. In the adjoining figure, two circular flower beds have been shown on two sides of a square lawn ABCD of side 56 m. If the centre of each circular flower bed is the point of intersection of the diagonals of the square lawn, find the sum of the areas of the lawns and the flower beds.



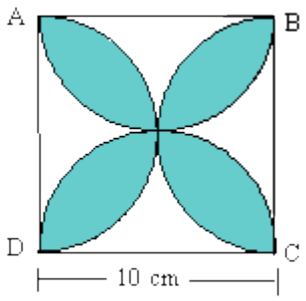
Q. 5. On a circular table cover of radius 32 cm, a design is formed leaving an equilateral triangle ABC in the middle. Find the area of shaded region.



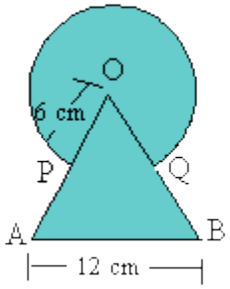
Q. 6. In the adjoining figure, ABC is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC as diameter. Find the area of the shaded region.



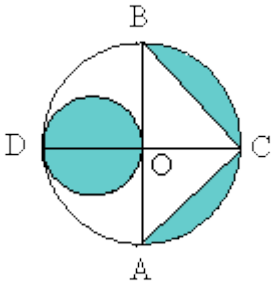
Q. 7. Find the area of shaded design where ABCD is a square of side 10 cm and semicircles are drawn with each side of the square as diameter $(\pi = 3 \cdot 14)$.



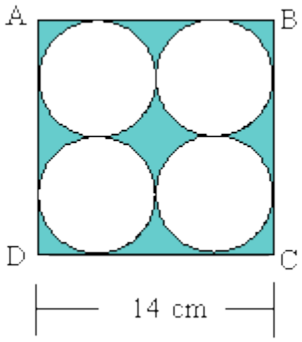
Q. 8. Find the area of the shaded region where a circle of radius 6 cm has been drawn with vertex O of an equilateral triangle ABC of side 12 cm as centre.



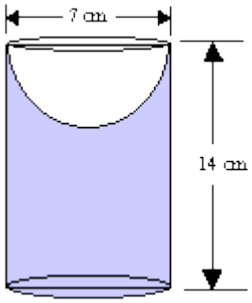
Q. 9. In the adjoining figure, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle. If OA = 7 cm, find the area of the shaded region.



Q. 10. Find the area of the shaded region in the adjoining figure, where ABCD is a square of side 14 cm.



Q. 11. Find the volume of the shaded region as shown in the figure.



Probability

Q. 1. A die is thrown once. Find the probability of getting 3 or 4.

Q. 2. If the probability of winning a game is 0.7, find the probability of losing it.

Q. 3. One card is drawn at random from a well shuffled deck of 52 cards. Find the probability of getting a king of red suit.

Q. 4. A bag contains 6 white and 7 red balls. A ball is drawn at random from the bag. Find the probability that it is a white ball.

Q. 5. Two players A and B play tennis match. It is known that probability of A winning the match is 0.62. Find the probability of B winning the match. "

Q. 6. If P(E') is 0.99, then find P(E).

Q. 7. A bag contains 5 white and 7 red balls. One ball is drawn at random from the bag. Find the probability that it is either white or red ball.

Q. 8. There are 9 cards bearing numbers 1, 2, 3, ... 8, 9, in a bag. A card is drawn from the bag. Find the probability of getting a card having a multiple of 3.

Q. 9. A bag contains 3 red, 4 blue and 2 yellow balls. A ball is drawn at random from the bag. Find the probability that it is not a yellow ball.

Q. 10. A card is drawn from a well shuffled deck of 52 playing cards. Find the probability that it is not an ace.

Q. 11. A lot of 20 bulbs contain 4 defective bulbs. A bulb is drawn at random from the lot. Find the probability of having a good bulb.

Group B (2 or 3 marks)

Q. 12. A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be

i. red
ii. white
iii. not green.

Q. 13. A bag contains 20 cards numbering from 1, 2, 3, ...,20. One card is drawn at random from the bag. Find the probability that if has a prime number on it.

Q. 14. It is known that a box of 600 screws, 12 screws are defective. One screw is taken out at random from this box. Find the probability that it is a good screw.

Q. 15. In 1000 lottery tickets there are 5 prize winning tickets. Find the probability of winning a prize if a person buys one ticket. "

Q. 16. A card is drawn at random from a pack of cards. Find the probability of having

i. a face card
ii. a black face card.

Q. 17. A bag contains 3 red, 4 white and 5 black balls. One ball is drawn at random from the bag. Find the probability that it i s not red.

Q. 18. One card is drawn at random from a pack of cards. Find the probability that it is a black card.

Q. 19. The king, queen and jack of clubs are removed from a deck of 52 cards. Then the cards are well shuffled. One card is drawn at random from the remaining cards. Find the probability of getting

i. a heart
ii. a king
iii. a club
iv. a 'six' of heart

Q. 20. Find the probability that a leap year has 53 Sundays.

Q. 21. 12 defective pens are accidentally mixed with 132 good ones. It is not possible to just look at a pen and tell whether or not it is defective. One pen is taken out at random from this lot. Find the probability that the pen taken out is a good one.

Q. 22. A die in the shape of tetrahedron has four faces on which 3,4, 6 and 8 are written. The die is rolled once. Find the probability of getting

i. a prime number
ii. a number less than 6.

Arithmetic progression

Q. 1. Determine k so that k + 2, 4k - 6 and 3k - 2 are three consecutive terms of an AP.

Q. 2. If mth term of A.P. is , and n^{th} term is , show that the mn^{th} terms is 1.

Q. 3. The first, second and the last terms of an AP are p, q and 2p respectively. Show that its sum is $\frac{3pq}{2(q-p)}$.

Q. 4. A circle is completely divided into n sectors in such a way that the angles of the sectors are in arithmetic progression. If the smallest-of these angles is 8° and the largest 72°, calculate n and the angle in the fourth sector.

Q. 5. Which term of AP: 3, 10, 17 ... will be 84 more than its 13^{th} term?

Q. 6. If 9^{th} term of an AP is zero, prove that 29^{th} term is double the 19^{th} term.

Q. 7. Find a, b such that 27, a, b - 6 are in A.P.

Q. 8. For what value of n, the n^{th} terms of the sequences 3, 10, 17,... and 63, 65, 67,... are equal.

Q. 9. If m times the m^{th} term of an AP is equal to n times its n^{th} term show that the $(m + n)^{th}$ term of the AP is zero.

Q. 10. A person buys National Savings Certificates of value exceeding the last year's purchase by Rs.500. After 10 years he finds the total face value of certificates purchased by him is Rs. 27,500. Find the value of certificates purchased by him in the first year.

Q. 11. In a children's potato race, n potatoes are placed, each, one meter apart in a straight line. A competitor starts from a point in this line which is 5 meters from the nearest potato. Find the expression for the total distance run in collecting all the potatoes bringing one at a time to the starting point. Also, calculate the value of n if the total distance run is 162 meters.

Q. 12. A person borrows Rs.4500 and promises to pay back (without any interest) in 30 instalments each of value Rs. 10 more than the last (preceding one). Find the first and the last instalments.

Q. 13. Find the sum of all integers between 50 and 500 which are divisible by 7.

Q. 14. Find the common difference of an A.P. whose first term is 1 and the sum of the first four terms is one-third the sum of the next four terms.

Q. 15. Each year a tree grows 5 cm. less than it did in the preceding Year. If it grew 1m. in the first year, in how many years will it have ceased growing?

Quadratic Equation

Q. 1. If - 4 is a root of the quadratic equation $x^2 + px - 4 = 0$ and the quadratic equation $x^2 + px + k = 0$ has equal roots, find the value of k.

Q. 2. Find the value of k such that the quadratic equation $(k-4)x^2 + 2(k-4)x + 4 = 0$ has equal roots.

Q. 3. Find the values of k so that $(x-1)$ is a factor of $k^2x^2 - 2kx - 3$.

Q. 4. If one root of the equation $3x^2 - kx - 2 = 0$ is 2, find the value of k. Also find the other root.

Q. 5. For what value of k, $(4-k)x^2 + (2k+4)x + (8k+1) = 0$ is a perfect square?

Q. 6. For what values of p, the equation $(1+p)x^2 + 2(1+2p)x + (1+p) = 0$ has coincident roots?

Q. 7. Find the value of p so that the equation $3x^2 - 5x + 2p = 0$ has equal roots. Also find the roots.

Q. 8. If one root of the quadratic equation $2x^2 - 3x + p = 0$ is 3, find the other root. Also find the value of p.

Q. 9. If -5 is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equationhas equal roots, find the value of k.

Q. 10. Find the value of p which will make the product of $2p - 5$ and $p - 4$ equal in value of p.

II. Solve for x: (3 marks each)

Q. 11.

$$\frac{x-1}{x-2} + \frac{x-3}{x-4} = \frac{10}{3} \; ; \; (x \neq 2 \, , \, x \neq 4).$$

Q. 12.

$$\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4} \; ; \quad (x \neq -1, -2, -4).$$

Q. 13.

$$\frac{4x}{x-2} - \frac{3x}{x-1} = 7\frac{1}{2}.$$

III. Using the quadratic formula, solve the following equations for x: (3 marks each)

Q. 14.

$$ab\,x^2 + (b^2 - ac)\,x - bc = 0.$$

Q. 15.

$$x^2 - (a^2 + b^2)\,x + a^2b^2 = 0.$$

Q. 16.

$9x^2 - 9(a+b)x + \left(2a^2 + 5ab + 2b^2\right) = 0.$

IV. Solve the following quadratic equations by completing the square method:

Q. 17.

$5x^2 - 2x - 2 = 0.$

Q. 18.

$4x^2 + 4\sqrt{3}x + 3 = 0.$

V. (6 marks each)

Q. 19. One-fourth of a herd of camels were seen in the forest. Twice the square root of the herd had gone to mountains and the remaining 15 camels were seen on the bank of a river. Find the total number of camels.

Q. 20. A motorboat, whose speed is $9\ km/h$ in still water, goes 12 km downstream and comes back in a total time of 3 hrs. Find the speed of the stream.

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