MATHEMATICS QUESTION BANK CLASS X

Chapter-1 Number System

1. What is the HCF of smallest prime number and the smallest composite number?

2. Given that $\sqrt{2}$ is irrational, prove that $(5 + 3\sqrt{2})$ is an irrational number.

3. Find HCF and LCM of 404 and 96 and verify that HCF × LCM = Product of the two given numbers.

4. Write whether $\frac{2\sqrt{45}+3\sqrt{20}}{2\sqrt{5}}$ on simplification gives an irrational or a rational number.

5. Given that $\sqrt{3}$ is an irrational number, prove that $(2 + \sqrt{3})$ is an irrational number.

6. Using Euclid's division algorithm find the HCF of the numbers 867 and 255.

7. Write whether the rational number 7/75 will have a terminating decimal expansion or a or-terminating repeating decimal expansion.

8. If two positive integers p and q are written as $p=a^2b^3$ and $q=a^3b$ where a and b are prime numbers, then verify:
LCM (p, q) × HCF (p, q) = pq

9. Show that exactly one of the numbers n, n + 2 or n + 4 is divisible by 3.

Chapter-2 Algebra

1. If $x = 3$ is one root of the quadratic equation $x^2 - 2kx - 6 = 0$, then find the value of k.

2. In an AP, if the common difference (d) = –4, and the seventh term (a_7) is 4, then find the first term.

3. In Fig. 1, ABCD is a rectangle. Find the values of x and y.

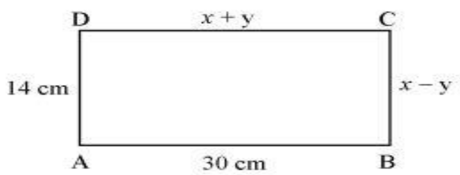


Fig. – 1

4. Find the sum of first 8 multiples of 3.

5. Find all zeroes of the polynomial $(2x^4 - 9x^3 + 5x^2 + 3x - 1)$ if two of its zeroes are $(2 + \sqrt{3})$ and $(2 - \sqrt{3})$.

6. A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500 km away in time, it had to increase its speed by 100 km/h from the usual speed. Find its usual speed.

7. A motor boat whose speed is 18 km/hr in still water takes 1hr more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

OR

A train travels at a certain average speed for a distance of 63 km and then travels at a distance of 72 km at an average speed of 6 km/hr more than its original speed. If it takes 3 hours to complete total journey, what is the original average speed?

8. The sum of four consecutive numbers in an AP is 32 and the ratio of the product of the first and the last term to the product of two middle terms is 7 : 15. Find the numbers.

9. If $x = a$, $y = b$ is the solution of the pair of equations $x - y = 2$ and $x + y = 4$, find the values of a and b.

10. If one root of $5x^2 + 13x + k = 0$ is the reciprocal of the other root, then find value of k.

11. Divide 27 into two parts such that the sum of their reciprocals is 3/20.

12. In an A.P if sum of its first n terms is $3n^2 + 5n$ and its k^{th} term is 164, find the value of k.

13. For what values of m and n the following system of linear equations has infinitely many solutions?

$3x + 4y = 12$

$(m + n)x + 2(m - n)y = 5m - 1$

14. Obtain all zeroes of $3x^4 - 15x^3 + 13x^2 + 25x - 30$, if two of its zeroes are $\sqrt{5/3}$ and $-\sqrt{5/3}$.

15. A faster train takes one hour less than a slower train for a journey of 200 km. If the speed of slower train is 10 km/hr less than that of faster train, find the speeds of two trains.

OR

Solve for x

$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$, , $a \neq 0$, $b \neq 0$, $x \neq 0$

16. Find the value(s) of k, if the quadratic equation $3X2 - K\sqrt{3}X + 4 = 0$ has equal roots.

17. Find the eleventh term from the last term of the AP: 27, 23, 19... –65.

18. The sum of first n terms of an AP is given by $S_n=2n^2+3n$. Find the sixteenth term of the AP.

19. 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.

20. Find all the zeroes of the polynomial $3x^4+6x^3-2x^2-10x-5$ if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$.

21. Seven times a two digit number is equal to four times the number obtained by reversing the order of its digits. If the difference of the digits is 3, determine the number.

22. A train travelling at a uniform speed for 360 km would have taken 48 minutes less to travel the same distance if its speed were 5 km/hour more. Find the original speed of the train.

OR

Check whether the equation $5x^2 - 6x - 2 = 0$ has real roots and if it has, find them by the method of completing the square. Also verify that roots obtained satisfy the given equation.

23. An AP consists of 37 terms. The sum of the three middle most terms is 225 and the sum of the last three terms is 429. Find the AP.

Chapter-3 Co-ordinate Geometry

1. Find the distance of a point P(x, y) from the origin

2. Find the ratio in which P (4, m) divides the line segment joining the points A (2, 3) and B (6, –3). Hence find m.

3. If A (–2, 1), B (a, 0), C (4, b) and D (1, 2) are the vertices of a parallelogram ABCD, find the values of a and b. Hence find the lengths of its sides.

OR

If A (–5, 7), B (–4, –5), C (–1, –6) and D (4, 5) are the vertices of a quadrilateral, find the area of the quadrilateral ABCD.

4. A (5, 1); B (1, 5) and C (–3, –1) are the vertices of ΔABC. Find the length of median AD.

5. Find the linear relation between x and y such that P(x, y) is equidistant from the points A (1, 4) and B (–1, 2).

6. If coordinates of two adjacent vertices of a parallelogram are (3, 2), (1, 0) and diagonals bisect each other at (2, –5), find coordinates of the other two vertices.

OR

If the area of triangle with vertices (x, 3), (4, 4) and (3, 5) is 4 square units, find x.

7. Find the coordinates of the point on y-axis which is nearest to the point (–2, 5).

8. If $\left(1, \frac{p}{3}\right)$ is the mid-point of the line segment joining the points (2, 0) and $\left(0, \frac{2}{9}\right)$, then show that the line 5x + 3y + 2 = 0 passes through the point (–1, 3p).

9. In what ratio does the x-axis divide the line segment joining the points (–4, –6) and (–1, 7)? Find the co-ordinates of the point of division.

OR

The points A (4, –2), B (7, 2), C (0, 9) and D (–3, 5) form a parallelogram. Find the length of the altitude of the parallelogram on the base AB

Chapter-4 Trigonometry

1. What is the value of ($\cos^2 67° - \sin^2 23°$)?
2. If 4 tan θ = 3, evaluate $\left(\frac{4\,sin\theta - cos\theta + 1}{4\,sin\theta + cos\theta - 1}\right)$

OR

If tan 2A = cot (A – 18°), where 2A is an acute angle, find the value of A

3. Prove that : $\frac{Sin\ A - 2Sin^3\ \text{A}}{2\text{Cos}^3\ \text{A} - \text{Cos A}} = \tan A$
4. A, B, C are interior angles of ΔABC. Prove that cosec$\frac{A+B}{2}$ = sec C/2
5. Prove that $\left(\frac{1+tan^2 A}{1+cot^2 A}\right) = \left(\frac{1-tanA}{1-cotA}\right)^2 = tan^2$A OR

Evaluate $\frac{\cos 58^0}{\sin 32^0} + \frac{\sin 22^0}{\cos 68^0} - \frac{\cos 38^0 cosec\ 52^0}{\sqrt{3}(\tan 18^0 \tan 35^0\ tan 60^0 \tan 72^0 \tan 55^0)}$

6. If sin $(A + 2B) = \frac{\sqrt{3}}{2}$ and cos (A + 4B) = 0, A > B, and A + 4B ≤ 90º, then find A and B.
7. If cos A =$\frac{2}{5}$, find the value of 4 + 4 $\tan^2$ A
8. Evaluate: $\frac{cosec^2 63^0 + tan^2 24^0}{cot^2\ 66^0 + sec^2 27^0} + \frac{sin^2\ 63^0 + cos 63^0 sin 27^0 + sin 27^0 \sec 63^0}{2(cosec^2 65^0 - tan^2 25^0\ )}$

OR

If $Sin\theta + Cos\theta = \sqrt{2}$, then evaluate: tan θ + cot θ .

9. Prove that $\frac{COS\theta - sin\theta + 1}{cos\theta + sin\theta - 1} = cosec\theta + cot\theta$

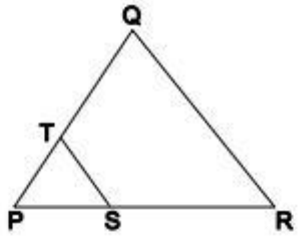
Chapter -5 Similar Triangle

1. Given Δ ABC ~ Δ PQR, if $\frac{AB}{PQ} = \frac{1}{3}$, then find $\frac{ar\ \triangle\text{ABC}}{\text{ar}\ \triangle\text{PQR}}$
2. Prove that the area of an equilateral triangle described on one side of the square is equal to half the area of the equilateral triangle described on one of its diagonal.

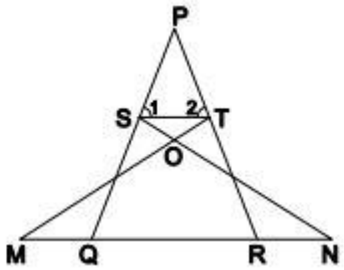
OR

If the area of two similar triangles are equal, prove that they are congruent.

3. In an equilateral Δ ABC, D is a point on side BC such that BD = 1/3 BC. Prove that $9(AD)^2 = 7(AB)^2$.
4. If Δ ABC ~ ΔQRP, $\frac{\text{ar}(\Delta\text{ABC})}{\text{ar}(\Delta\text{QRP})} = \frac{9}{4}$, and BC = 15 cm, then find PR.
5. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.
6. In given figure, ST || RQ, PS = 3 cm and SR = 4 cm. Find the ratio of the area of Δ PST to the area of Δ PRQ

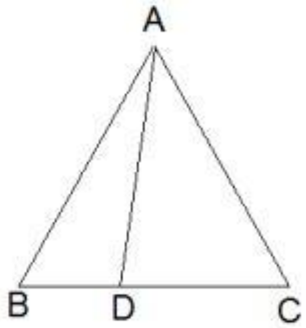


7. In given figure $\angle = \angle\ \Delta \cong \Delta$ 1 2 and NSQ MTR, then prove that $\Delta\ \Delta$ PTS ~ PRQ.



OR

In an equilateral triangle ABC, D is a point on the side BC such that BD = $\frac{1}{3}BC$. Prove that $9AD^2 = 7AB^2$.



8. Show that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

OR

9. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides

Chapter-5 Tangent to a Circle

1. Prove that the lengths of tangents drawn from an external point to a circle are equal.

2. X is a point on the side BC of ΔABC. XM and XN are drawn parallel to AB and AC respectively meeting AB in N and AC in M. MN produced meets CB produced at T. Prove that $TX^2 = TB \times TC$

3. In Fig. (1), ABC is a triangle in which ∠B = 90º, BC = 48 cm and AB = 14 cm. A circle is inscribed in the triangle, whose centre is O. Find radius r of in-circle.

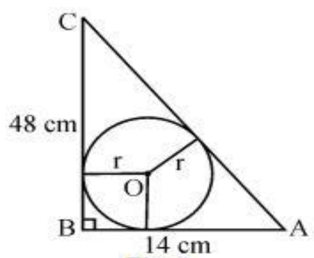


Fig. 1

4. In fig. (2) AB is a chord of length 8 cm of a circle of radius 5 cm. The tangents to the circle at A and B intersect at P. Find the length of AP.

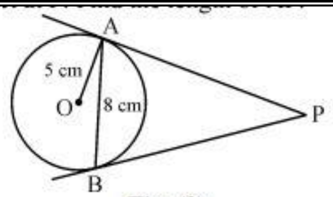
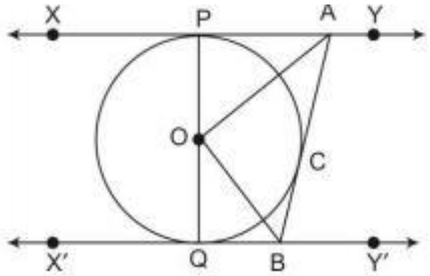


Fig. (2)

OR

Prove that the lengths of tangents drawn from an external point to a circle are equal.

5. In given figure XY and X Y′ ′ are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and X Y′ ′ at B. Prove that ∠ AOB = 90°.



Chapter-6 Construction

1. Draw a triangle ABC with BC = 6 cm, AB = 5 cm and ∠ ABC = 60°. Then construct a triangle whose sides are 3/4 of the corresponding sides of the Δ ABC.
2. Construct a triangle with sides 6 cm, 8 cm and 10 cm. Construct another triangle whose sides are 3/5 of the corresponding sides of original triangle.
3. Draw a triangle ABC with side BC = 7 cm, ∠ B= 45°, ∠A = 105°. Then, construct a triangle whose sides are 4/3 times the corresponding sides of ΔABC.

Chapter-7 Probability

1. Two different dice are tossed together. Find the probability:
   (i) of getting a doublet
   (ii) of getting a sum 10, of the numbers on the two dice.
2. An integer is chosen at random between 1 and 100. Find the probability that it is :
   (i) divisible by 8.
   (ii) Not divisible by 8.
3. A box contains cards numbered from 1 to 20. A card is drawn at random from the box. Find the probability that number on the drawn card is
   (i) a prime number
   (ii) a composite number (iii) a number divisible by 3

   OR

   The King, Queen and Jack of clubs are removed from a pack of 52 cards and then the remaining cards are well shuffled. A card is selected from the remaining cards. Find the probability of getting a card
   (i) of spade (ii) of black king (iii) of club (iv) of jacks
4. A box contains cards numbered 11 to 123. A card is drawn at random from the box. Find the probability that the number on the drawn card is (i) a square number (ii) a multiple of 7
5. A box contains 12 balls of which some are red in colour. If 6 more red balls are put in the box and a ball is drawn at random, the probability of drawing a red ball doubles than what it was before. Find the number of red balls in the bag

Chapter-8 Statistics

1. The table below shows the salaries of 280 persons :

Salary (In thousand ₹)	No. of Persons
5 – 10	49
10 – 15	133
15 – 20	63
20 – 25	15
25 – 30	6
30 – 35	7
35 – 40	4
40 – 45	2
45 – 50	1

Calculate the median salary of the data.

2. The mean of the following distribution is 18. Find the frequency f of the class 19 – 21.

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

OR

The following distribution gives the daily income of 50 workers of a factory:

Daily Income (in ₹)	100-120	120-140	140-160	160-180	180-200
Number of workers	12	14	8	6	10

Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive.

3. By changing the following frequency distribution 'to less than type' distribution, draw its ogive.

Classes	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75
Frequency	6	8	10	6	4

4. Find the mean and mode for the following data :

Classes	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Frequency	4	8	10	12	10	4	2

5. Find the mode of the following distribution of marks obtained by the students in an examination:

Marks obtained	0-20	20-40	40-60	60-80	80-100
Number of students	15	18	21	29	17

Given the mean of the above distribution is 53, using empirical relationship estimate the value of its median.

6. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is rs 18. Find the missing frequency k.

Daily pocket allowance (in ₹)	11–13	13–15	15–17	17–19	19–21	21–23	23–25
Number of children	3	6	9	13	k	5	4

OR

The following frequency distribution shows the distance (in metres) thrown by 68 students in a Javelin throw competition

Distance (in m)	0–10	10–20	20–30	30–40	40–50	50–60	60–70
Number of students	4	5	13	20	14	8	4

Draw a less than type Ogive for the given data and find the median distance thrown using this curve.

Chapter-9 Areas related to Circles

1. Find the area of the shaded region in Fig. 2, where arcs drawn with centres A, B, C and D intersect in pairs at mid-points P, Q, R and S of the sides AB, BC, CD and DA respectively of a square ABCD of side 12 cm. [Use $\pi = 3.14$]

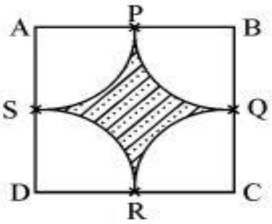


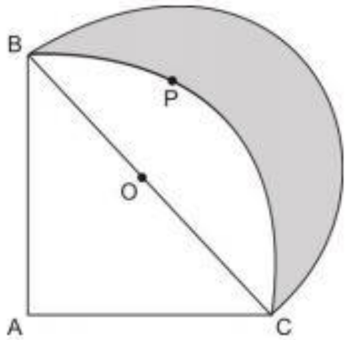
Fig. – 2

2. The short and long hands of a clock are 4 cm and 6 cm long respectively. Find the sum of distances travelled by their tips in 48 hours.

OR

The side of a square is 10 cm. Find the area between inscribed and circumscribed circles of the square.

3. In given figure ABPC 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



4. Water in a canal, 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed?

Chapter-10 Volume and surfaces of Solids

1. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in Fig. 3. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm. find the total surface area of the article.

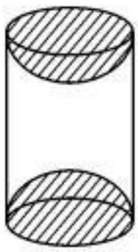


Fig. 3

A heap of rice is in the form of a cone of base diameter 24 m and height 3.5 m. Find the volume of the rice. How much canvas cloth is required to just cover the heap?

2. The diameters of the lower and upper ends of a bucket in the form of a frustum of a cone are 10 cm and 30 cm respectively. If its height is 24 cm, find :
   (i) the area of the metal sheet used to make the bucket.
   (ii) Why we should avoid the bucket made by ordinary plastic? [Use π = 3.14]
3. Two cubes have their volumes in the ratio 1: 27. Find the ratio of their surface areas.
4. A right circular cylinder and a cone have equal bases and equal heights. If their curved surface areas are in the ratio 8: 5, show that the ratio between radius of their bases to their height is 3: 4.
5. A man donates 10 aluminum buckets to an orphanage. A bucket made of aluminum is of height 20 cm and has its upper and lowest ends of radius 36 cm and 21 cm respectively. Find the cost of preparing 10 buckets if the cost of aluminum sheet is ` 42 per 100 cm2. Write your comments on the act of the man.
6. A cone of maximum size is carved out from a cube of edge 14 cm. Find the surface area of the remaining solid after the cone is carved out.
7. Two dairy owners A and B sell flavoured milk filled to capacity in mugs of negligible thickness, which are cylindrical in shape with a raised hemispherical bottom. The mugs are 14 cm high and have diameter of 7 cm as shown in given figure. Both A and B sell flavoured milk at the rate of ` 80 per litre. The dairy owner A uses the formula 2 πr h to find the volume of milk in the mug and charges ` 43.12 for it. The dairy owner B is of the view that the price of actual quantity of milk should be charged. What according to him should be the price of one mug of milk? Which value is exhibited by the dairy owner B? $\left(use\ \pi = \frac{22}{7}\right)$.

Chapter-11 Application of Trigonometry

1. As observed from the top of a 100 m high light house from the sea-level, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side of the light house, find the distance between the two ships. [Use 3 = 1.732]
2. The angle of elevation of the top of a hill at the foot of a tower is 60º and the angle of depression from the top of tower to the foot of hill is 30º. If tower is 50 metre high, find the height of the hill.

   OR

   Two poles of equal heights are standing opposite to each other on either side of the road which is 80 m wide. From a point in between them on the road, the angles of elevation of the top of poles are 60º and 30º respectively. Find the height of the poles and the distances of the point from the poles.
3. The angles of depression of the top and bottom of a building 50 metres high as observed from the top of a tower are 30° and 60°, respectively. Find the height of the tower and also the horizontal distance between the building and the tower.