CBSE (AI) EXAMINATION PAPER—2019
MATHEMATICS
CLASS–X

Time : 3 hrs. *Max. Marks : 80*

GENERAL INSTRUCTIONS:

(*i*) ***All*** *questions are compulsory.*

(*ii*) *The question paper consists of* ***30*** *questions divided into four sections – A, B, C and D.*

(*iii*) *Section A contains* ***6*** *questions of* ***1*** *mark each. Section* ***B*** *contains* ***6*** *questions of* ***2*** *marks each, Section C contains* ***10*** *questions of* ***3*** *marks each and Section D contains* ***8*** *questions of* ***4*** *marks each.*

(*iv*) *There is no overall choice. However, an internal choice has been provided in* ***two*** *questions of* ***1*** *mark each,* ***two*** *questions of* ***2*** *marks each,* ***four*** *questions of* ***3*** *marks each and* ***three*** *questions of* ***4*** *marks each. You have to attempt only* ***one*** *of the alternatives in all such questions.*

(*v*) *Use of calculators is* ***not*** *permitted.*

Set–I

SECTION-A

Question numbers 1 to 6 carry 1 mark each.

1. Write the discriminant of the quadratic equation $(x + 5)^2 = 2(5x - 3)$.

2. Find after how many places of decimal the decimal form of the number $\dfrac{27}{2^3 \cdot 5^4 \cdot 3^2}$ will terminate.

OR

Express 429 as a product of its prime factors.

3. Find the sum of first 10 multiples of 6.

4. Find the value(s) of x, if the distance between the points A(0, 0) and B(x, – 4) is 5 units.

5. Two concentric circles of radii a and b ($a > b$) are given. Find the length of the chord of the larger circle which touches the smaller circle.

6. In Figure 1, PS = 3 cm, QS = 4 cm, $\angle$ PRQ = θ, $\angle$ PSQ = 90°, PQ $\perp$ RQ and RQ = 9 cm. Evaluate tan θ.

OR

If $\tan \alpha = \dfrac{5}{12}$, find the value of sec α.

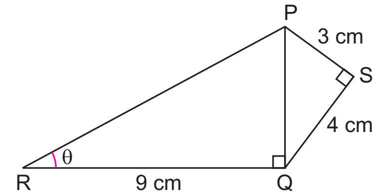

Figure 1

SECTION-B

Question numbers 7 to 12 carry 2 marks each.

7. Points A(3, 1), B(5, 1), C(a, b) and D(4, 3) are vertices of a parallelogram ABCD. Find the values of a and b.

OR

Points P and Q trisect the line segment joining the points A(– 2, 0) and B(0, 8) such that P is near to A. Find the coordinates of points P and Q.

8. Solve the following pair of linear equations:

$$3x - 5y = 4$$
$$2y + 7 = 9x$$

9. If HCF of 65 and 117 is expressible in the form $65n - 117$, then find the value of n.

OR

On a morning walk, three persons step out together and their steps measure 30 cm, 36 cm, and 40 cm respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps?

10. A die is thrown once. Find the probability of getting (*i*) a composite number, (*ii*) a prime number.

11. Using completing the square method, show that the equation $x^2 - 8x + 18 = 0$ has no solution.

12. Cards numbered 7 to 40 were put in a box. Poonam selects a card at random. What is the probability that Poonam selects a card which is a multiple of 7?

SECTION-C

Question numbers 13 to 22 carry 3 marks each.

13. The perpendicular from A on side BC of ΔABC meets BC at D such that DB = 3CD. Prove that $2AB^2 = 2AC^2 + BC^2$.

OR

AD and PM are medians of triangles ABC or PQR respectively where $\Delta ABC \sim \Delta PQR$.

Prove that $\frac{AB}{PQ} = \frac{AD}{PM}$.

14. Check whether $g(x)$ is a factor of $p(x)$ by dividing polynomial $p(x)$ by polynomial $g(x)$, where $p(x) = x^5 - 4x^3 + x^2 + 3x + 1$, $g(x) = x^3 - 3x + 1$.

15. Find the area of the triangle formed by joining the mid-points of the sides of the triangle ABC, whose vertices are A(0, – 1), B(2, 1) and C(0, 3).

16. Draw the graph of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Using this graph, find the values of x and y which satisfy both the equations.

17. Prove that $\sqrt{3}$ is an irrational number.

OR

Find the largest number which on dividing 1251, 9377 and 15628 leaves remainders 1, 2 and 3 respectively.

18. A, B and C are interior angles of a triangle ABC. Show that

(*i*) $\sin\left(\frac{B+C}{2}\right) = \cos\frac{A}{2}$

(*ii*) If $\angle A = 90°$, then find the value of $\tan\left(\frac{B+C}{2}\right)$.

OR

If $\tan(A + B) = 1$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$, $0° < A + B < 90°$, $A > B$, then find the values of A and B.

19. In Figure 2, 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.

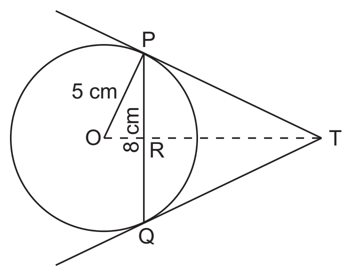

Figure 2

OR

Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

20. 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?

21. A class teacher has the following absentee record of 40 students of a class for the whole term. Find the mean number of days a student was absent.

Number of days:	0 – 6	6 – 12	12 – 18	18 – 24	24 – 30	30 – 36	36 – 42
Number of students:	10	11	7	4	4	3	1

22. A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle 120°. Find the total area cleaned at each sweep of the blades.

$\left(\text{Take } \pi = \frac{22}{7}\right)$

SECTION-D

Question numbers 23 to 30 carry 4 marks each.

23. A pole has to be erected at a point on the boundary of a circular park of diameter 13 m in such a way that the difference of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 m. Is it possible to do so? If yes, at what distances from the two gates should the pole be erected?

24. If m times the m^{th} term of an Arithmetic Progression is equal to n times its n^{th} term and $m \neq n$, show that $(m + n)^{th}$ term of the A.P. is zero.

OR

The sum of the first three numbers in an Arithmetic Progression is 18. If the product of the first and the third term is 5 times the common difference, find the three numbers.

25. Construct a triangle ABC with side BC = 6 cm, AB = 5 cm and $\angle ABC = 60°$. Then construct another triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the triangle ABC.

26. In Figure 3, a decorative block is shown which is made of two solids, a cube and a hemisphere. The base of the block is a cube with edge 6 cm and the hemisphere fixed on the top has a diameter of 4.2 cm. Find

(*a*) the total surface area of the block.

(*b*) the volume of the block formed. $\left(\text{Take } \pi = \frac{22}{7}\right)$

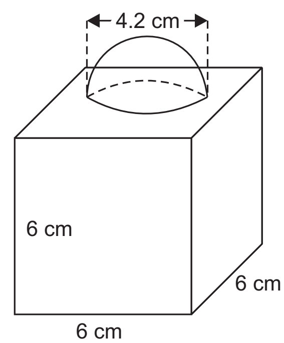

Figure 3

OR

A bucket open at the top is in the form of a frustum of a cone with a capacity of 12308.8 cm^3. The radii of the top and bottom circular ends are 20 cm and 12 cm respectively. Find the height of the bucket and the area of metal sheet used in making the bucket. (Use $\pi = 3.14$)

27. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

OR

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

28. If $1 + \sin^2 \theta = 3 \sin \theta \cos \theta$, then prove that $\tan \theta = 1$ or $\tan \theta = \frac{1}{2}$.

29. Change the following distribution to a 'more than type' distribution. Hence draw the 'more than type' ogive for this distribution.

Class interval:	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Frequency:	10	8	12	24	6	25	15

30. The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it was 60°. Find the height of the tower.

(Given $\sqrt{3} = 1.732$)

Set–II

Questions different from Set-I.

SECTION-A

6. Find the positive value of m for which the distance between the points A(5, – 3) and B(13, m) is 10 units.

SECTION-B

12. In the quadratic equation $kx^2 - 6x - 1 = 0$, determine the values of k for which the equation does not have any real root.

SECTION-C

20. Find the area of the triangle ABC with the coordinates of A as (1, – 4) and the coordinates of the mid-points of sides AB and AC respectively are (2, – 1) and (0, – 1).

21. Two numbers are in the ratio 5 : 6. If 7 is subtracted from each of the numbers, the ratio becomes 4 : 5. Find the numbers.

22. Water is flowing at the rate of 2.52 km/h through a cylindrical pipe into a cylindrical tank, the radius of whose base is 40 cm. If the increase in the level of water in the tank, in half an hour is 3.15 m, find the internal diameter of the pipe.

Set–III

Questions different from Sets-I & II.

SECTION-B

11. Solve the following pair of linear equations:

$$3x + 4y = 10$$
$$2x - 2y = 2$$

SECTION-C

20. A chord of a circle of radius 14 cm subtends an angle of 60° at the centre. Find the area of the corresponding minor segment of the circle. (Use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.73$)

21. Find the value of k so that the area of triangle ABC with A(k + 1, 1), B(4, – 3) and C(7, – k) is 6 square units.

22. If $\frac{2}{3}$ and – 3 are the zeroes of the polynomial $ax^2 + 7x + b$, then find the values of a and b.

SECTION-D

25. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

OR

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

28. Construct a triangle, the lengths of whose sides are 5 cm, 6 cm and 7 cm. Now construct another triangle whose sides are $\frac{5}{7}$ times the corresponding sides of the first triangle.