MATHEMATICS
Class 10 - Mathematics

Time Allowed: 3 hours   **Maximum Marks: 80**

General Instructions:

Read the following instructions carefully and follow them:

1. This question paper contains 38 questions.

2. This Question Paper is divided into 5 Sections A, B, C, D and E.

3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.

4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.

5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.

6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.

7. In Section E, Questions no. 36-38 are case study-based questions carrying 4 marks each with sub-parts of the values of 1,1 and 2 marks each respectively.

8. All Questions are compulsory. However, an internal choice in 2 Questions of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.

9. Draw neat and clean figures wherever required.

10. Take $\pi = 22/7$ wherever required if not stated.

11. Use of calculators is not allowed.

Section A

1. Which of the following is a pair of co-primes?   **[1]**

    a) (14, 35)   b) (18, 25)

    c) (32, 62)   d) (36, 96)

2. The graph of y = p(x) in a figure given below, for some polynomial p(x). Find the number of zeroes of p(x).   **[1]**

a) 4   b) 0

c) 1   d) 2

3. A system of linear equations is said to be consistent, if it has **[1]**

    a) two solutions   b) one or many solutions

    c) no solution   d) exactly one solution

4. _____ is called the Discriminant of the quadratic equation $ax^2 + bx + c = 0$. **[1]**

    a) $c^2 - 4ab$ b) $a^2 + 2bc$

    c) $b^2 - 4ac$ d) $a^2 - 4bc$

5. If the nth term of an A.P. is 2n + 1, then the sum of first n terms of the A.P. is **[1]**

    a) n (n + 1)   b) n (n – 2)

    c) n (n – 1)   d) n (n + 2)

6. The distance between the points (0, 0) and (a - b, a + b) is **[1]**

    a) $2\sqrt{ab}$ b) $\sqrt{2a^2 + 2b^2}$

    c) $2\sqrt{a^2 + b^2}$ d) $\sqrt{2a^2 + ab}$

7. The coordinates of the fourth vertex of the rectangle formed by the points (0, 0) (2, 0), (0, 3) are **[1]**

    a) (2, 3)   b) (3, 0)

    c) (3, 2)   d) (0, 2)

8. In the adjoining figure if exterior $\angle EAB = 110^0, \angle CAD = 35^0$, AB = 5cm, AC = 7cm and BC = 3cm, then CD is equal to **[1]**

    a) 1.9 cm   b) 2.25 cm

    c) 1.75 cm   d) 2 cm

9. In the given figure, if △ABC is circumscribing a circle, then the length of BC is: **[1]**

a) 10 cm

b) 7 cm

c) 11 cm

d) 18 cm

10. Two chords PQ and RS intersect at T outside the circle. If PQ = 5 cm, QT = 3 cm, TR = 2 cm. length of RS is : **[1]**

a) 8 cm

b) 15 cm

c) 12 cm

d) 10 cm

11. If x = 4 sin θ, y = 4 cos θ, then the value of $(x^2 + y^2)$ is: **[1]**

a) $\frac{1}{16}$

b) 16

c) $\frac{1}{4}$

d) 4

12. Which of the following is correct? **[1]**

i. $3(\sin\theta - \cos\theta)^4 + 6(\sin\theta + \cos\theta)^2 + 4(\sin^6\theta + \cos^6\theta)$ is independent of θ.

ii. If $\csc\theta - \sin\theta = a^3$, $\sec\theta - \cos\theta = b^3$, then $a^2b^2(a^2 + b^2) = 2$

a) Both (i) and (ii)

b) Neither (i) nor (ii)

c) Only (i)

d) Only (ii)

13. The angle of depression of a point on the horizontal from the top of a hill is 60°. If one has to walk 500 m to reach the top from this point, then the distance of this point from the base of the hill is **[1]**

a) $\frac{250}{\sqrt{3}}$ m

b) 250 m

c) $250\sqrt{3}$ m

d) $500\sqrt{3}$ m

14. A man goes to a walking track twice a day in the shape of a sector with an angle of 123° and a radius of 138 m. Find the area covered by the man of the walking track in a day. **[1]**

a) 20882.8 m^2

b) 81765.6 m^2

c) 40882.8 m^2

d) 20441.4 m^2

15. In the given figure (not drawn to scale), AP = AQ = 3 cm, the area of the shaded region is _____. **[1]**

a) 3π cm^2

b) 7π cm^2

c) 9π cm^2

d) 6π cm^2

16. One card is drawn at random from a well shuffled deck of 52 playing cards. The probability that it is a red king is: **[1]**

a) $\frac{2}{26}$

b) $\frac{2}{13}$

c) $\frac{1}{26}$ d) $\frac{1}{52}$

17. Two numbers 'a' and 'b' are selected successively without replacement in that order from the integers 1 to 10. The **[1]** probability that $\frac{a}{b}$ is an integer, is

    a) $\frac{17}{45}$ b) $\frac{8}{45}$

    c) $\frac{1}{5}$ d) $\frac{17}{90}$

18. The mean of the first 10 composite numbers is   **[1]**

    a) 11.2   b) 11.4

    c) 112   d) 12.2

19. **Assertion (A):** A sphere of radius 7 cm is mounted on the solid cone of radius 6 cm and height 8 cm. The **[1]** volume of the combined solid is 1737.97 cm^3.

    Reason (R): Volume of sphere is $\frac{4}{3}\pi r^3$.

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

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

    c) A is true but R is false.

    d) A is false but R is true.

20. **Assertion (A):** The sum of series with the nth term $t_n = (9 - 5n)$ is 220 when no. of terms n = 6. **[1]**

    Reason (R): Sum of first n terms in an A.P. is given by the formula: $Sn = 2 n \times [2a + (n - 1)d]$

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

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

    c) A is true but R is false.

    d) A is false but R is true.

Section B

21. 2002 cartons of Lassi bottles and 2618 cartons of Frooti are to be stacked in a storeroom. If each stack is of the **[2]** same height and is to contain cartons of the same type of bottles, what would be the greatest number of cartons each stack would have?

22. In the figure, PQRS is a trapezium in which PQ || RS. On PQ and RS, there are points E and F respectively such **[2]** that EF intersects SQ at G. Prove that $EQ \times GS = GQ \times FS$.
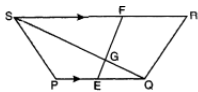
23. In the given figure, two circles touch each other at the point C. Prove that the common tangent to the circles at **[2]** C, bisects the common tangent at P and Q.
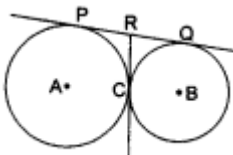
24. If sin A = $\frac{\sqrt{3}}{2}$, find the value of $2\cot^2 A - 1$.   **[2]**

<div align="center">OR</div>

Prov that: $\frac{\tan A + \sin A}{\tan A - \sin A} = \frac{\sec A + 1}{\sec A - 1}$

25. In a circle with centre O and radius 5 cm, AB is a chord of length $5\sqrt{3}$ cm. Find the area of sector AOB. **[2]**

<div align="center">OR</div>

A sector of 56°, cut out from a circle, contains 17.6 cm^2. Find the radius of the circle.

26. There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 12 minutes for the same. Suppose they both start at the same point and at the same time and go in the same direction. After how many minutes will they meet again at the starting point? **[3]**

27. Find the zeros of $f(x) = x^2 - 2x - 8$ and verify the relationship between the zeros and its coefficients. **[3]**

28. Father's age is three times the sum of the ages of his two children. After 5 years, his age will be twice the sum of the ages of two children. Find the age of father. **[3]**

OR

By the graphical method, find whether the pair of equations

$x + y = 3$,

$3x + 3y = 9$

is consistent or not. If consistent, solve it.

29. In figure, O is the centre of a circle of radius 5 cm. T is a point such that OT = 13 cm and OT intersects circle at E. If AB is a tangent to the circle at E, find the length of AB. where TP and TQ are two tangents to the circle. **[3]**
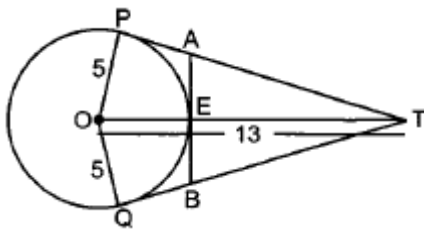
OR

ABC is an isosceles triangle in which AB = AC, circumscribed about a circle, as shown in the adjoining figure. Prove that the base is bisected at the point of contact.
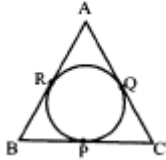
30. Prove: $\dfrac{1}{(\cot A)(\sec A) - \cot A} - \operatorname{cosec} A = \operatorname{cosec} A - \dfrac{1}{(\cot A)(\sec A) + \cot A}$ **[3]**

31. Find the mean of the following data using assumed mean method: **[3]**

Class:	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25
Frequency:	8	7	10	13	12

Section D

32. The product of two consecutive positive integers is 306. Find the integers. **[5]**

OR

The difference of the squares of two numbers is 45. The square of the smaller number is 4 times the larger number. Determine the numbers.

33. In the given figure, DEFG is a square and $\angle BAC = 90^\circ$. **[5]**

Prove that

i. $\triangle AGF \sim \triangle DBG$

ii. $\triangle AGF \sim \triangle EFC$

iii. $\triangle DBG \sim \triangle EFC$

iv. $DE^2 = BD \times EC$
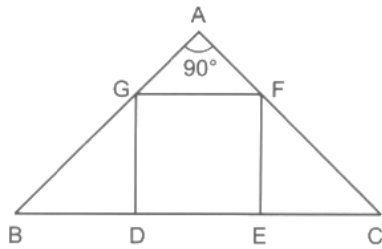
34. A hemispherical depression is cut out from one face of a cubical block of side 7 cm, such that the diameter of the **[5]** hemisphere is equal to the edge of the cube. Find the surface area of the remaining solid.

<div align="center">OR</div>

A solid is in the shape of a right-circular cone surmounted on a hemisphere, the radius of each of them being 7 cm and the height of the cone is equal to its diameter. Find the volume of the solid.

35. Find the median from the following data: **[5]**

Class	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45
Frequency	7	10	16	32	24	16	11	5	2

HINT Convert it to exclusive form.

<div align="center">Section E</div>

36. **Read the following text carefully and answer the questions that follow:** **[4]**

Saving money is a good habit and it should be inculcated in children from the beginning. Mrs. Pushpa brought a piggy bank for her child Akshar. He puts one five-rupee coin of his savings in the piggy bank on the first day. He increases his savings by one five-rupee coin daily.

  i. If the piggy bank can hold 190 coins of five rupees in all, find the number of days he can contribute to put the five-rupee coins into it. (1)
 ii. Find the total money he saved. (1)
iii. How much money Akshar saves in 10 days? (2)

   OR

   How many coins are there in piggy bank on 15th day? (2)

37. **Read the following text carefully and answer the questions that follow:** **[4]**

The top of a table is hexagonal in shape.
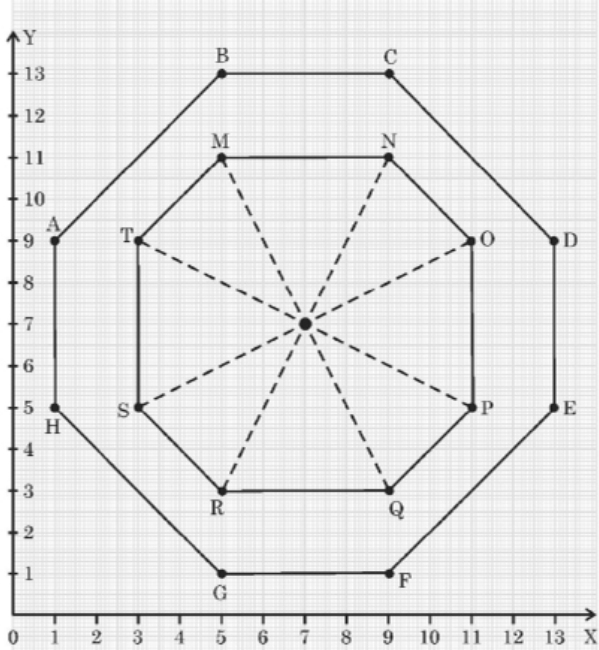
On the basis of the information given above, answer the following questions:

i. Write the coordinates of A and B.

ii. Write the coordinates of the mid-point of line segment joining C and D.

iii. a. Find the distance between M and Q.

    OR

  b. Find the coordinates of the point which divides the line segment joining M and N in the ratio 1:3 internally.

38. **Read the following text carefully and answer the questions that follow:**   **[4]**

Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure. On a similar concept, a radio station tower was built in two Sections A and B. Tower is supported by wires from a point O. Distance between the base of the tower and point O is 36 cm. From point O, the angle of elevation of the top of the Section B is 30° and the angle of elevation of the top of Section A is 45°.
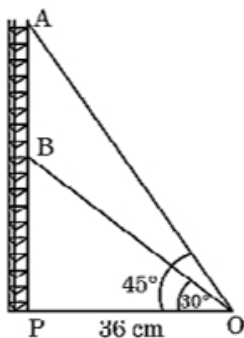
i. Find the length of the wire from the point O to the top of Section B. (1)

ii. Find the distance AB. (1)

iii. Find the area of $\triangle$OPB. (2)

OR

Find the height of the Section A from the base of the tower. (2)