

1. If $\cot \theta + \cos \theta = m$, $\cot \theta - \cos \theta = n$, where $0 < \theta < \frac{\pi}{2}$, then what is $\frac{m^2 - n^2}{\sqrt{mn}}$ equal to?

(a) 1.

(b) 2

(c) $2\sqrt{2}$

(d) 4

2. If $\frac{1}{\operatorname{cosec} \theta + \cot \theta} - \frac{1}{\sin \theta} = p$, then what is $\frac{1}{\sin \theta} - \frac{1}{\operatorname{cosec} \theta - \cot \theta}$ equal to?

(a) $-p$

(b) $-\frac{1}{p}$

(c) p

(d) $\frac{1}{p}$

3. If $8 \sin \theta - \cos \theta = 4$, where $\frac{\pi}{6} < \theta < \frac{\pi}{3}$, then what is $\sin \theta$ equal to?

(a) $\frac{3}{5}$

(b) $\frac{5}{13}$

(c) $\frac{4}{5}$

(d) $\frac{12}{13}$

4. A person walking along a straight road observes that at two consecutive kilometer-stones the angles of elevation of a hill in front of him are 30° and 60° respectively. What is the height of the hill?

(a) $3\sqrt{3}$ km

(b) $2\sqrt{3}$ km

(c) $\sqrt{3}$ km

(d) $\frac{\sqrt{3}}{2}$ km

5. A tower subtends an angle α at a point P on the same level as the foot of the tower. Q is a point vertically above P and $PQ = h$. If the angle of depression of the foot of the tower measured from Q is β , then what is the height of the tower?

(a) $h \tan \alpha \tan \beta$

(b) $h \cot \alpha \tan \beta$

(c) $h \tan \alpha \cot \beta$

(d) $h \cot \alpha \cot \beta$

6. If $5 \sin \theta + 12 \cos \theta = 13$, where $0 < \theta < \frac{\pi}{2}$, then what is $\tan \theta + \cot \theta$ equal to?

(a) $\frac{194}{65}$

(b) $\frac{169}{60}$

(c) $\frac{313}{156}$

(d) $\frac{371}{120}$

7. What is the ratio of the greatest value of $\sin^2 x + 2$ (where $0 \leq x \leq \frac{\pi}{2}$) to its least value ?
- 2
 - $\frac{3}{2}$
 - 2
 - $\frac{1}{2}$
8. If $A + B + C = \pi$ ($A, B, C > 0$) and the angle C is obtuse, then which of the following is/are correct ?
- $\sin A \cdot \sin B < 1$
 - $\tan A \cdot \tan B > 1$
- Select the answer using the code given below :
- I only
 - II only
 - Both I and II
 - Neither I nor II
9. If $(\cos 35^\circ + \cos 55^\circ) = p$, then what is $\sin 35^\circ \cdot \cos 35^\circ$ equal to ?
- $\frac{(1 - p^2)}{2}$
 - $\frac{(p^2 - 1)}{2}$
 - $\frac{(1 + p^2)}{2}$
 - $\frac{(p - 1)}{2}$
10. If $p = \sec \theta + \tan \theta$ and $q = \operatorname{cosec} \theta - \cot \theta$, then what is $(p - q - pq)$ equal to ?
- 1
 - 0
 - 1
 - 2
11. Consider the following statements :
- The set of all birds living on the Earth is an infinite set.
 - The set of all real numbers between 0 and 10 is a finite set.
- Which of the statements given above is/are correct ?
- I only
 - II only
 - Both I and II.
 - Neither I nor II
12. Consider the following sets :
- The set of even prime numbers
 - $\{x \in \mathbb{R} : x^3 + 1 = 0\}$
 - $\{n \in \mathbb{Z} : n^2 < 1\}$
- How many of the above are null sets ?
- None
 - One
 - Two
 - All the three
13. Consider the following statements :
- If A is a subset of U and U is the Universal set, then the complement of the set A is also a subset of U .
 - The complement of a Universal set is a singleton set.
- Which of the statements given above is/are correct ?
- I only
 - II only
 - Both I and II
 - Neither I nor II

14. What should be added to $\frac{x^2 - 1}{x^2 + 1}$ to get

$$\frac{2x^3 + 3x^2 - 1}{(x + 2)(x^2 + 1)} ?$$

- (a) $\frac{x^2 - 1}{(x + 2)(x^2 + 1)}$
- (b) $\frac{x^2 + 2}{(x + 2)(x^2 + 1)}$
- (c) $\frac{x + 1}{x + 2}$
- (d) $\frac{x - 1}{x + 2}$
15. If $x + y + z = 0$, then what is $x(y + z)^2 + y(z + x)^2 + z(x + y)^2$ equal to ?
- (a) xyz
- (b) $2xyz$
- (c) $3xyz$
- (d) $6xyz$
16. If $\tan 6\theta \cdot \tan 3\theta = 1$, where $0 < \theta < 30^\circ$, then what is θ equal to ?
- (a) 5°
- (b) 10°
- (c) 15°
- (d) No such value exists
17. If $\frac{1 - \tan x}{1 + \tan x} = 1 - \frac{2 \tan x}{1 + \tan^2 x}$, $0 \leq x < \frac{\pi}{2}$, $x \neq \frac{\pi}{4}$, then what is $(\sin x + \cos x)$ equal to ?

- (a) $\frac{1}{2}$
- (b) $\frac{3}{4}$
- (c) 1
- (d) $\sqrt{2}$

18. If $\cos^2 x + \cos^4 x = 1$, where $0 < x < \frac{\pi}{2}$, then what is $(\sin^2 x + \sin^3 x) + (\sin^3 x + \sin^4 x)$ equal to ?

- (a) $\frac{21 + 12\sqrt{3}}{16}$
- (b) $\frac{3 + 2\sqrt{2}}{4}$
- (c) $\frac{9}{8}$
- (d) 1

19. If $\sin^4 x + \cos^4 x = 1$, where $0 \leq x \leq \frac{\pi}{2}$, then what is $\sin x \cdot \cos x$ equal to ?

- (a) 0
- (b) $\frac{1}{2}$
- (c) $\frac{3}{4}$
- (d) 1

20. If $3 \cos \theta + 4 \sin \theta = 4$, where $0 \leq \theta < \frac{\pi}{2}$, then what is $4 \cos \theta + 3 \sin \theta$ equal to ?

- (a) $\frac{117}{25}$
- (b) 3
- (c) $\frac{107}{25}$
- (d) 4

21. If $\frac{1}{x+k} + \frac{1}{x+2k} + \frac{1}{x+5k} = \frac{1}{k}$, then what is the solution of the equation?

- (a) $\frac{k}{3}$
- (b) $\frac{k}{2}$
- (c) $\frac{2k}{3}$
- (d) k

22. Consider the polynomial

$$p(x) = x^5 + 2x^4 + x^3 - x^2 - 2x - 1 :$$

I. $x^2 + 2x + 1$ is a factor of $p(x)$.

II. $x^2 + x + 1$ divides $p(x)$.

Which of the statements given above is/are correct?

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

23. If 5 is a root of the equation $x^2 + px - 55 = 0$ and the quadratic equation $x^2 + px + k = 0$ has equal roots, then what is the value of k ?

- (a) 3
- (b) 6
- (c) 9
- (d) 12

24. Had I walked 0.5 km/hr faster, I would have taken 8 minutes less to walk 2 km. What is my original speed?

- (a) 2.5 km/hr
- (b) 2.75 km/hr
- (c) 3 km/hr
- (d) 3.25 km/hr

25. If the roots of the equation $x^2 + mx + n = 0$ are increased by the same quantity k , then they become the roots of the equation $x^2 + nx + m = 0$. What is the value of $(m + n)$?

- (a) -4
- (b) -2
- (c) 2
- (d) 4

26. If α and β are the roots of the equation $2x^2 - 2(n+1)x + (n^2 + n + 1) = 0$, then what is $(2\alpha^3 + 2\beta^3)$ equal to?

- (a) $n^3 - 1$
- (b) $1 - n^3$
- (c) $-(n^3 + 1)$
- (d) $-(2n^3 + 1)$

27. The product of two numbers is 1050. The quotient when the larger number is divided by the smaller number is 4 and the remainder is 10. What is the sum of the two numbers?

- (a) 70
- (b) 75
- (c) 80
- (d) 85

28. What is the HCF of $x^3 + x^2y - 10xy^2 + 8y^3$ and $x^3 + x^2y - 4xy^2 - 4y^3$?

- (a) $(x - y)$
- (b) $(x - 2y)$
- (c) $(x + 2y)$
- (d) $(x + 4y)$

29. What is $(\sqrt{2} + \sqrt{3} + \sqrt{5})(\sqrt{2} + \sqrt{3} - \sqrt{5})$
 $(\sqrt{2} - \sqrt{3} + \sqrt{5})(-\sqrt{2} + \sqrt{3} + \sqrt{5})$

equal to ?

- (a) 60
- (b) 40
- (c) 24
- (d) 12

30. The LCM and HCF of two polynomials $p(x)$ and $q(x)$ are $(x + k)^2(x^2 - 7x + 6)$ and $(x + k)$ respectively. If $[x^3 + (2k - 1)x^2 + k(k - 2)x - k^2]$ is one of the polynomials, then which of the following statements is/are correct?

I. The other polynomial is $(x + k)(x - 6)$ where $k \neq -6$.

II. $(x + k)$ cannot be the HCF if $k = -6$.

Select the answer using the code given below :

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

31. Two positive integers x and y are in the ratio 17 : 19. If the LCM of the two numbers is 1615, then what is $(x + y)$ equal to ?

(a) 36

(b) 180

(c) 360

(d) Cannot be determined due to insufficient data

32. If $\frac{p}{q} = \frac{q}{r} = \frac{r}{s} = k$, then what is $\frac{p^3 + q^3 + r^3}{q^3 + r^3 + s^3}$

equal to ?

(a) $\frac{p}{s}$

(b) $\frac{r}{q}$

(c) $\frac{s}{p}$

(d) $\frac{q}{r}$

33. If $x^2 - 4x + 3$ is a factor of $x^4 + px^2 + q$, then what is $(p - q)$ equal to ?

(a) -19

(b) -17

(c) 17

(d) 19

34. Suppose p and q are positive integers where q is not a perfect square. If $\frac{1}{p + \sqrt{q}}$ is a root of a quadratic equation having integer coefficients, then which of the following statements is/are correct?

- I. The sum of the roots is $2p$ times the product of the roots.
- II. The sum of the reciprocals of the roots is equal to $2p$.

Select the answer using the code given below :

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

35. If $\frac{1}{2b+2c} + \frac{1}{2c+2a} = \frac{1}{a+b}$, then what is $a^2 + b^2 + c^2$ equal to?

- (a) $9c^2$
- (b) $4c^2$
- (c) $3c^2$
- (d) $2c^2$

36. A train completely crossed two persons X and Y moving in the same direction as the train in 8 seconds and 8.1 seconds respectively. X is walking at a uniform speed of 3 km/hr and Y is walking at a uniform speed of 4 km/hr. What is the speed of the train?

- (a) 81 km/hr
- (b) 82 km/hr
- (c) 83 km/hr
- (d) 84 km/hr

37. A number is formed by three digits, each less by unity than the digit that follows it. If 15 is added to the number, then the sum is 30 times the sum of the digits of the number. What is the product of the digits of the number?

- (a) 6
- (b) 24
- (c) 60
- (d) 120

38. Consider the following statements in respect of common logarithms :

- I. The logarithm of a number greater than 100 but less than 1000 lies between 2 and 3.
- II. The logarithm of a positive number less than unity is negative.

Which of the statements given above is/are correct?

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

39. What is the number of zeros immediately after the decimal point in $(0.5)^{1000}$? (Given that $\log_{10} 2 = 0.30103$)

- (a) 300
- (b) 301
- (c) 302
- (d) 303

40. If $x = 11 + 2\sqrt{30}$, then what is the value of $x^{1/2} + x^{-1/2}$?

- (a) $2\sqrt{2}$
- (b) $2\sqrt{3}$
- (c) $2\sqrt{5}$
- (d) $2\sqrt{6}$

41. A shopkeeper sold his goods at the cost price. By using false weights, he gained $11\frac{1}{9}\%$. What weight did he use for 1 kg?
- (a) 960 gm
(b) 950 gm
(c) 925 gm
(d) 900 gm
42. If the roots of the equation $px^2 - 40x + 96 = 0$ are even integers, then what is the value of p ?
- (a) 1
(b) 2
(c) 3
(d) 4
43. A number N consists of two digits. The digit in the tens place is 3 times the digit in the units place. The digits are reversed and the resulting number is denoted by R . If $N \times R = 3627$, then what is the product of the digits of the number N ?
- (a) 27
(b) 18
(c) 12
(d) 3
44. A boatman can row to a place (Y) at a distance of 24 km from the starting point (X) and back in 14 hours. If he can row 4 km with the stream in the same time as 3 km against it, what is the speed of the stream?
- (a) 0.5 km/hr
(b) 1 km/hr
(c) 2 km/hr
(d) 2.5 km/hr
45. An alloy (X) of gold and silver is taken in the ratio 1 : 2 and another alloy (Y) of gold and silver is taken in the ratio 2 : 3. How many parts of X and Y must be taken to obtain a new alloy Z consisting of gold and silver in the ratio 4 : 7?
- (a) 5 : 6
(b) 2 : 1
(c) 3 : 5
(d) 6 : 5
46. N is a 3-digit number. The middle digit of N is equal to the sum of the other two digits and the sum of the digits is 10. How many such numbers (N) can be possible?
- (a) 3
(b) 4
(c) 5
(d) 6

47. The ratio of the cost price of two articles X and Y is 1 : 2. A businessman earns a profit of $p\%$ by selling X and a loss of $3p\%$ by selling Y. If he loses 20% in this transaction, then what is the value of p ?

- (a) 6%
- (b) 8%
- (c) 10%
- (d) 12%

48. A sum of money at the rate of 5% per annum compounded annually becomes n times in 100 years. What is the value of n ?
(Given $\log_{10} 2 = 0.301$, $\log_{10} 3 = 0.477$ and $\log_{10} 7 = 0.845$)

- (a) 98
- (b) 99
- (c) 100
- (d) More than 100

49. A variable y is directly proportional to a variable quantity x^n . Given that when $x = 2$, $y = 20.8$ and when $x = 3$, $y = 105.3$. Which one of the following is the constant of proportionality if it is greater than 1?

- (a) 1.1
- (b) 1.3
- (c) 2
- (d) 4

50. If $x = 3 - 3^{1/3} - 3^{2/3}$, then what is $x(x-3)(x-6)$ equal to?

- (a) -12
- (b) -9
- (c) 0
- (d) 12

51. If the mean of a set of 7 observations is 10 and the mean of a set of 3 observations is 5, then what is the combined mean?

- (a) 9
- (b) 8.5
- (c) 6.5
- (d) 5.5

52. The average weekly wages of male employees in a company is ₹ 4,200 and that of females is ₹ 3,200. If the average weekly wage of all employees is ₹ 4,000, then what is the ratio of male to female employees?

- (a) 3 : 2
- (b) 5 : 3
- (c) 4 : 1
- (d) 3 : 5

53. Consider the observations $x, x + 4, 30, 33, 74, 78, 49, 52, 98, 85$. If the median of the data is 67, then what is the value of x ?

- (a) 66
- (b) 65
- (c) 63
- (d) Cannot be determined due to insufficient data

54. A cyclist pedals from her house to her office at a speed of 3 kmph and back from the office to her house at 6 kmph. What is the average speed?

- (a) 5 kmph
- (b) 4.5 kmph
- (c) 4 kmph
- (d) 3.5 kmph

55. If the heights (in cm) of 9 students of a class are 150, 165, 145, 149, 150, 147, 152, 144 and 148, then what is the algebraic sum of the heights measured from their arithmetic mean?

- (a) -5
- (b) 0
- (c) 5
- (d) 150

56. Consider the following grouped data :

Class	Frequency
0 - 10	4
10 - 20	8
20 - 30	15
30 - 40	10
40 - 50	3

What is the mode of the above distribution?

- (a) 25.83
- (b) 25.43
- (c) 25.00
- (d) 24.73

57. If the mean of 15 observations, namely $x_1, x_2, x_3, \dots, x_{15}$ is 2.5, then what is the value of $\sum_{i=1}^{15} [5(4x_i + 1)]$?

- (a) 400
- (b) 525
- (c) 625
- (d) 825

58. Consider the following discrete grouped data :

x	f
12	6
14	8
10	10
16	9
18	3

$$\frac{70}{36}$$

What is the arithmetic mean of the above distribution?

- (a) 13.69
- (b) 13.39
- (c) 13.19
- (d) 13.09

59. Consider the following incomplete frequency distribution with a total frequency of 100 :

Class	Frequency
0 - 10	10
10 - 20	x
20 - 30	20
30 - 40	y

If the mean of the frequency distribution is 25, then what are the missing frequencies?

- (a) $x = 15, y = 55$
- (b) $x = 50, y = 20$
- (c) $x = 20, y = 45$
- (d) $x = 25, y = 45$

60. The following data gives the investment in different categories by a governmental organization :

Sr. No.	Item	Investment (₹ in crores)
1	Science, Technology and Environment	7,200
2	Transport and Communication	3,000
3	Rural Development	1,500
4	Industry and Minerals	3,800
5	Agricultural Services	2,500

Which of the following statements is/are correct ?

- I. The percentage investment in the 'Science, Technology and Environment' category is 40%.
- II. The angle (in degrees) for 'Agricultural Services' in a pie diagram is 50° .

Select the answer using the code given below :

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

For the next **three (03)** items that follow :

The centre O of a circle inside a triangle ABC is at a distance of 13 cm from each of the vertices of the triangle. The diameter of the circle is 10 cm and the circle touches only two sides of the triangle, AB and AC.

61. If x is the perimeter, in cm, of the triangle, then which one of the following is correct ?
- (a) $63 \text{ cm} < x < 65 \text{ cm}$
- (b) $65 \text{ cm} < x < 67 \text{ cm}$
- (c) $67 \text{ cm} < x < 69 \text{ cm}$
- (d) $69 \text{ cm} < x < 71 \text{ cm}$
62. If y is the area in cm^2 of the triangle, then which one of the following is correct ?
- (a) $190 \text{ cm}^2 < y < 200 \text{ cm}^2$
- (b) $200 \text{ cm}^2 < y < 210 \text{ cm}^2$
- (c) $210 \text{ cm}^2 < y < 220 \text{ cm}^2$
- (d) $220 \text{ cm}^2 < y < 230 \text{ cm}^2$
63. Consider the following statements :
- I. $\angle ABC$ lies between 60° and 90° .
- II. If z is the distance in cm from the centre O of the circle to the midpoint of BC, then $7 \text{ cm} < z < 8 \text{ cm}$.

Which of the statements given above is/are correct ?

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

For the next **three (03)** items that follow :

A circle with centre O passes through the vertex A of an equilateral triangle ABC and touches BC at its midpoint M. The circle cuts AB at D and AC at E.

64. What is AD : DB equal to ?

- (a) 2 : 1
- (b) 3 : 2
- (c) 3 : 1
- (d) 4 : 3

65. If x is the area of the circle and y is the area of the triangle such that $z = \left(\frac{x}{y}\right)^2$, then which one of the following is correct ?

- (a) $0.5 < z < 1$
- (b) $1 < z < 1.5$
- (c) $1.5 < z < 2$
- (d) $z > 2$

66. What is the ratio of the area of the triangle ADO to the area of the quadrilateral BDOM ?

- (a) 3 : 5
- (b) 4 : 5
- (c) 3 : 3
- (d) 2 : 3

For the next **two (02)** items that follow :

ABC is an equilateral triangle. BP is perpendicular to AC, PR is perpendicular to AB, and PQ is perpendicular to BC.

67. What is the ratio of $AB^2 : BP^2 : PR^2$?

- (a) 4 : 3 : 1
- (b) 16 : 12 : 3
- (c) 16 : 12 : 5
- (d) 5 : 4 : 3

68. What is the ratio of the area of $\triangle PRB$ to the area of $\triangle PQC$?

- (a) 1 : 1
- (b) 2 : 1
- (c) 3 : 1
- (d) 3 : 2

For the next **two (02)** items that follow :

PQR is a triangle such that $QP = QR = 15$ cm and $PR = 18$ cm. PN, QM and RT are the altitudes of the triangle which intersect at O.

69. What is QT : QO equal to ?

- (a) 3 : 4
- (b) 4 : 5
- (c) 3 : 5
- (d) 1 : 2

70. What is the ratio of QO to OM ?

- (a) 11 : 9
- (b) 11 : 8
- (c) 25 : 27
- (d) 7 : 9

71. A Question is given followed by two Statements I and II. Consider the Question and the Statements and mark the correct option.

Question : ABCD is a rhombus of side 10 cm. What is the sum of the squares of the diagonals of the rhombus ?

Statement I : $AC : BD = 3 : 4$.

Statement II : $AC = 6$ cm.

Which one of the following is correct in respect of the above Question and Statements ?

- (a) The Question can be answered by using one of the Statements alone, but cannot be answered using the other Statement alone.
- (b) The Question can be answered by using either Statement alone.
- (c) The Question can be answered by using both the Statements together, but cannot be answered using either Statement alone.
- (d) The Question can be answered even without using both the Statements.

72. A Question is given followed by two Statements I and II. Consider the Question and the Statements and mark the correct option.

Question : The diagonal of a rectangle ABCD ($AB > BC$) is $5\sqrt{2}$ cm. What is its perimeter ?

Statement I : Length AB is an integer.

Statement II : Length BC is an integer.

Which one of the following is correct in respect of the above Question and Statements ?

- (a) The Question can be answered by using one of the Statements alone, but cannot be answered using the other Statement alone.
- (b) The Question can be answered by using either Statement alone.
- (c) The Question can be answered by using both the Statements together, but cannot be answered using either Statement alone.
- (d) The Question can be answered even without using both the Statements.

73. A Question is given followed by two Statements I and II. Consider the Question and the Statements and mark the correct option.

Question : ABC is a triangle right-angled at A and AD is perpendicular to BC. If $AD = 7.2$ cm, then what is $BD \times CD$ equal to ?

Statement I : $AB : AC = 3 : 4$.

Statement II : $BC = 15$ cm.

Which one of the following is correct in respect of the above Question and Statements ?

- (a) The Question can be answered by using one of the Statements alone, but cannot be answered using the other Statement alone.
- (b) The Question can be answered by using either Statement alone.
- (c) The Question can be answered by using both the Statements together, but cannot be answered using either Statement alone.
- (d) The Question can be answered even without using both the Statements.

74. A Question is given followed by two Statements I and II. Consider the Question and the Statements and mark the correct option.

Question : ABCD is a quadrilateral with $AB = 6$ cm, $BC = 8$ cm, $CD = 4\sqrt{5}$ cm, $DA = 2\sqrt{5}$ cm and inscribed in a circle. What is the diameter of the circle ?

Statement I : The area of the quadrilateral is 44 cm^2 .

Statement II : $\angle ABC = 90^\circ$.

Which one of the following is correct in respect of the above Question and Statements ?

- (a) The Question can be answered by using one of the Statements alone, but cannot be answered using the other Statement alone.
- (b) The Question can be answered by using either Statement alone.
- (c) The Question can be answered by using both the Statements together, but cannot be answered using either Statement alone.
- (d) The Question can be answered even without using both the Statements.

75. A Question is given followed by two Statements I and II. Consider the Question and the Statements and mark the correct option.

Question : ABC is a triangle inscribed in a semi-circle such that AC coincides with the diameter of the semi-circle. Let P be any point on the arc of the semi-circle. What is $AP^2 + CP^2 + AC^2$ equal to ?

Statement I : The radius of the circle is 5 cm.

Statement II : $AB = 6$ cm and $BC = 8$ cm.

Which one of the following is correct in respect of the above Question and Statements ?

- The Question can be answered by using one of the Statements alone, but cannot be answered using the other Statement alone.
- The Question can be answered by using either Statement alone.
- The Question can be answered by using both the Statements together, but cannot be answered using either Statement alone.
- The Question can be answered even without using both the Statements.

76. A thin metallic sheet, 1.92 m^2 in area, is cut into two equal pieces. One piece is used to make a hollow cube of volume P (in m^3) and the other is used to make a hollow cuboid of volume Q (in m^3) with dimensions in the ratio 4 : 2 : 1. If no sheet is wasted, which one of the following is correct ?

- $343Q^2 = 216P^2$
- $343Q^2 = 225P^2$
- $49Q^2 = 64P^2$
- $49Q^2 = 25P^2$

77. ABC is a triangle such that $\angle ABC = 120^\circ$. If BD is the bisector of $\angle B$ that meets AC at D, then what is the ratio of the area of $\triangle ABD$ to the area of $\triangle CBD$?

- $AB : BC$
- $BC : AB$
- $AB^2 : BC^2$
- 1 : 1

78. Consider the following statements :

- The areas of two similar triangles are in the ratio of the squares of the corresponding medians.
- The areas of two similar triangles are in the ratio of the squares of the corresponding heights.

Which of the statements given above is/are correct ?

- I only
- II only
- Both I and II
- Neither I nor II

79. If two similar scalene triangles ABC and PQR have the same area, then which of the following statements is/are correct ?

- Both the triangles are congruent.
- Both the triangles have equal perimeters.

Select the answer using the code given below :

- I only
- II only
- Both I and II
- Neither I nor II

80. In a triangle ABC, $AB = 8$ cm and D and E are points on AB and AC respectively such that DE is parallel to BC. If $BC = 5DE$, then what is $AD \times BD$ equal to ?

- 10 cm^2
- 10.24 cm^2
- 10.56 cm^2
- 12 cm^2

81. In a cyclic quadrilateral ABCD,
 $\angle A = (4x + 3)^\circ$, $\angle B = (3y + 9)^\circ$,
 $\angle C = (4y - 3)^\circ$, $\angle D = (5x - 10)^\circ$. What is
 $\angle A + \angle B$ equal to ?
- (a) 200°
 (b) 190°
 (c) 180°
 (d) 170°
82. The area of a rhombus is 720 cm^2 and the
 sum of its diagonals is 98 cm. What is the
 perimeter of the rhombus ?
- (a) 160 cm
 (b) 164 cm
 (c) 168 cm
 (d) 172 cm
83. A chord of a circle makes an angle of 90° at
 the centre of the circle. If the area of the
 major segment is k times the area of the
 minor segment, then what is the value of k ?
 (Take $\pi = \frac{22}{7}$)
- (a) 8
 (b) 9
 (c) 10
 (d) 11
84. ABC is a triangle in which $(AB + BC)$ exceeds
 CA by 10 cm, $(BC + CA)$ exceeds AB by
 8 cm and $(CA + AB)$ exceeds BC by 72 cm.
 What is the area of the triangle ?
- (a) 196 cm^2
 (b) 180 cm^2
 (c) 172 cm^2
 (d) 160 cm^2

85. A reservoir is in the form of a cuboid. Its
 length is 30 m. If 24 kL of water is removed
 from the reservoir, the water level goes down
 by 20 cm. What is the width of the reservoir ?
- (a) 4 m
 (b) 3.5 m
 (c) 3 m
 (d) 2.5 m
86. A well is dug with a diameter of 3.5 m and
 16 m depth. The earth soil so excavated is
 spread in the form of a right circular cone of
 radius 7 m. What is the height of the cone ?
- (a) 1.5 m
 (b) 2 m
 (c) 2.5 m
 (d) 3 m
87. The chord of a circle is 20 cm and the height
 of the minor segment is 5 cm. What is the
 diameter of the circle ?
- (a) 24 cm
 (b) 25 cm
 (c) 26 cm
 (d) 30 cm

8. On a circular metal plate of uniform thickness, 16 holes, each of diameter 2 cm, are made. If the plate thereby has lost one-ninth of its original weight, then what is the diameter of the plate ?

- (a) 12 cm
- (b) 15 cm
- (c) 21 cm
- (d) 24 cm

9. A square of side length 4 cm has its corners cut away in such a manner so as to form a regular octagon. What is the length of the side of the octagon ? (Take $\sqrt{2} = 1.41$)

- (a) 1.00 cm
- (b) 1.64 cm
- (c) 1.68 cm
- (d) 1.72 cm

10. A tall cylindrical reservoir kept vertically is 20 m in diameter. Water is poured into it at the rate of 264 m^3 per hour. What is the rate at which the water level rises in the reservoir per minute ? (Take $\pi = \frac{22}{7}$)

- (a) 1.0 cm
- (b) 1.2 cm
- (c) 1.4 cm
- (d) 14 cm

91. How many square metres of canvas (approximately) will be required to make a conical tent 3 m high so that a man 2 m tall may stand anywhere within a radius of 1 m from its centre without stooping ?

- (a) 36 m^2
- (b) 40 m^2
- (c) 44 m^2
- (d) 48 m^2

92. PQRS is a square. M is a point on PS such that $PM : MS = 2 : 1$ and N is a point on SR such that $SN : NR = 1 : 2$. If the area of triangle MQN is 10 square units, then what is the perimeter of the square ?

- (a) 24 units
- (b) 28 units
- (c) 32 units
- (d) 36 units

93. A cubical wooden block of length 10 cm is sliced to produce a cross-section of maximum area. What is the area of the cross-section ?

- (a) 100 cm^2
- (b) $100\sqrt{2} \text{ cm}^2$
- (c) $100\sqrt{3} \text{ cm}^2$
- (d) 200 cm^2

94. In a triangle ABC, AD is the bisector of angle A that meets BC at D. If $AB = 21 \text{ cm}$, $DC = 20 \text{ cm}$ and $AB : AC = 3 : 4$, then what is $AC^2 - BD^2$ equal to ?

- (a) 441
- (b) 559
- (c) 588
- (d) 784

A square of maximum area is inscribed in an equilateral triangle. If the side of the triangle is equal to $(6 + 4\sqrt{3})$ cm, then what is the area of the square?

- (a) 36 cm^2
- (b) 27 cm^2
- (c) 21 cm^2
- (d) 18 cm^2

A room is L m long, B m wide and H m high. Further, $L > B > H$ and L , B and H are integers. The length of the longest pole that can be placed in the room is 17 m and the length of the longest pole that can be placed on the floor is 15 m. What is the volume of the room?

- (a) 432 m^3
- (b) 864 m^3
- (c) 1296 m^3
- (d) Cannot be determined due to insufficient data

7. A spherical metal ball is molten and made into n smaller identical spheres. In this process, the surface area of the smaller balls increases by 900%. What is the value of n ?

- (a) 729
- (b) 900
- (c) 1000
- (d) Cannot be determined due to insufficient data

98. ABCD is a parallelogram with $\angle ABC = 150^\circ$ and the sides have integer values. If the area of the parallelogram is 17.5 cm^2 , then consider the following statements:

- I. It is possible to have a perimeter equal to 24 cm.
- II. It is possible to have a perimeter equal to 72 cm.

Which of the statements given above is/are correct?

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

99. N number of cubes each of side length equal to 10 cm are joined end to end in a row. If the total surface area of the resulting cuboid is 3800 cm^2 , then what is the value of N ?

- (a) 8
- (b) 9
- (c) 10
- (d) 12

100. In a quadrilateral ABCD, $\angle ABC = 90^\circ$ and $\angle ACD = 90^\circ$. Let $AB = p$ units, $BC = q$ units, $AC = r$ units, $CD = s$ units, $AD = t$ units, where $p < q < r < s < t < 15$. If p , q , r , s and t are integers, then what is the area of the quadrilateral?

- (a) 24 square units
- (b) 36 square units
- (c) 48 square units
- (d) Cannot be determined due to insufficient data