CDS - II 2016 Elementry Maths Question Paper

1. What is the solution of

 $\log_{10} \left[1 - \left\{ 1 - \left(1 - x^2 \right)^{-1} \right\}^{-1} \right]^{-\frac{1}{2}} = 1?$ A. x = 100 B. x = 10C. x = 1 D. x = 0

2. If λ is an integer and α , β are the roots of $4x^2 - 16x + \frac{\lambda}{4} = 0$ such that $1 < \alpha < 2$ and

 $2 < \beta < 3$, then how many values can λ take?

- A. 3 B. 9 C. 14 D. 15
- 3. What is $\frac{6^2 + 7^2 + 8^2 + 9^2 + 10^2}{\sqrt{7 + 4\sqrt{3}} \sqrt{4 + 2\sqrt{3}}}$ equal to? A. 330 B. 340 C. 355 D. 366
- 4. If $x^2 = y + z$, $y^2 = z + x$ and $z^2 = x + y$, then what is the value of $\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$? A. -1 B. 1 C. 2 D. 4
- 5. What would be the maximum value of Q in the equation 5P9 + 4R7 + 2Q8 = 1114?

A. 9 B. 8 C. 5 D. 4

C. 5 D. 4
A is a set of positive integers such that when divided by 2, 3, 4, 5 and 6 leaves the remainder 1, 2, 3, 4 and 5 respectively. How many integer between 0 and 100 belong to the set A?

A. No integerB. OneC. TwoD. Three

7. In an examination, a student was asked to divide a certain number by 8. By mistake he multiplied it by 8 and got the answer 2016 more than the correct answer, what was the number?

Α.	252	В.	256
C.	258	D.	260

- 8. In the quadratic equation x² + ax + b = 0, a and b can take any value from the set {1, 2, 3, 4}. How many pairs of values of a and b are possible in order that the quadratic equation has real roots?
 - A. 6 B. 7
 - C. 8 D. 16

- 9. The sum of the squares of two positive integers is 208.If the square of the larger number is 18 times the smaller number, then what is the difference of the larger and smaller numbers?
 - A. 2 B. 3 C. 4 D. 6
- 10. Let $A = \{7, 8, 9, 10, 11, 12\}$ and $B = \{7, 10, 14, 15\}$. What is the number of elements in (A B) and (B A)
 - respectively? A. 2 and 4 B. 4 and 2 C. 2 and 2 D. 4 and 4
- A boy saves Rs. 4.65 daily. What is the least number of days in which he will be able to save an exact number of rupees?
 A. 10
 B. 20
 C. 21
 D. 25
- 12. Two men, A and B run a 4 km race on a course 0.25 km round. If their speeds are in the ratio 5 : 4, how often does the winner pass the other ?
 - A. Once B. Twice
 - C. Thrice D. Four times
- 13. Which one of the following rational numbers has non-terminating and repeating decimal expansion?

Δ	15	В	23
А.	1600	Б.	8
C	35	П	17
С.	50	D.	6

14. If α and β are the two zeros of the polynomial $25x^2 - 16x + 2$, then what is a quadratic polynomial whose zeros are $(2\alpha)^{-1}$ and $(2\beta)^{-1}$?

A. $x^2 + 30x + 2$ B. $8x^2 - 30x + 25$

- C. $8x^2 30x$ D. $x^2 + 30x$
- 15. What is the remainder when 2^{100} is divided by 101?

Α.	1	в.	11
C.	99	D.	100

16. In an office, one-third of the workers are women, half of the women are married and one-third of the married women have children. If three-fourth of the men are married and one-third of the married men have children, then what is the ratio of married women to married men?

Α.	1:2	В.	2:1
C.	3:1	D.	1:3

17. A can do 50% more work than B in the same time. B alone can do a piece of work in 30 hours. B starts working and had already worked for 12 hours when A joins him. How many hours should B and A work together to complete the remaining work?

A. 6 hours B. 12 hou

- C. 4.8 hours D. 7.2 hours
- 18. When the speed of a train is increased by 20%, it takes 20 minutes less to cover the same distance. What is the time taken to cover the same distance with the original speed?
 - A. 140 minutes B. 120 minutes

C. 100 minutes D. 80 minutes

19. A candidate scoring x% marks in an examination fails by a marks while another candidate who scores y% marks gets *b* marks more than the minimum required pass marks. What is the maximum marks for the examination?

A.
$$\frac{100(a+b)}{x-y}$$
 B. $\frac{100(a-b)}{x+y}$
C. $\frac{100(a+b)}{y-x}$ D. $\frac{100(a-b)}{x-y}$

20. If *p* and *q* are the roots of $x^2 + px + q = 0$, then which one of the following is correct?

A. p = 0 or 1 B. p = 1 only C. p = -2 or 0 D. p = -2 only

21. The cost of 2.5 kg rice is Rs. 125. The cost of 9 kg rice is equal to that of 4 kg pulses. The cost of 14 kg pulses is equal to that of 1.5 kg tea. The cost of 2 kg tea is equal to that of 5 kg nuts. What is the cost of 11 kg nuts?

Α.	Rs. 2310	В.	Rs. 3190
C.	Rs. 4070	D.	Rs. 4620

- 22. Which one of the following is correct in respect of the number 1729?
 - A. It cannot be written as the sum of the cubes of two positive integers
 - B. It can be written as the sum of the cubes of two positive integers in one way only
 - C. It can be written as the sum of the cubes of two positive integers in two ways only
 - D. It can be written as the sum of the cubes of two positive integers in three ways only

- 23. A shopkeeper increases the cost price of an item by 20% and offers a discount of 10% on this marked price. What is his percentage gain?
 - A. 15% B. 12%
 - C. 10% D. 8%
- 24. There are two numbers P and q such that their HCF is 1. Which of the following statements are correct?
 - 1. Both p and q may be prime.
 - 2. One number may be prime and the other composite.

3. Both the numbers may be composite. Select the correct answer using the code given below :

- A. 1 and 2 only B. 2 and 3 only
- C. 1 and 3 only D. 1, 2 and 3

25. What is
$$\sqrt{1 + \frac{1}{1^2} + \frac{1}{2^2}} + \sqrt{1 + \frac{1}{2^2} + \frac{1}{3^2}} + \dots + \sqrt{1 + \frac{1}{2007^2} + \frac{1}{2008^2}}$$
 equal to?
A. $2008 - \frac{1}{2008}$ B. $2007 - \frac{1}{2007}$
C. $2007 - \frac{1}{2008}$ D. $2008 - \frac{1}{2009}$

- 26. A person can row downstream 20 km in 2 hours and upstream 4 km in 2 hours. What is the speed of the current?
 - A. 2 km/hour B. 2.5 km/hour
 - C. 3 km/hour D. 4 km/hour
- 27. Consider the following statements in respect of positive odd integers x and y ;Which of the above statements is/are correct?
 - 1. $x^2 + y^2$ is even integer.
 - 2. $x^2 + y^2$ is divisible by 4.
 - A. 1 only B. 2 only
 - C. Both 1 and 2 D. Neither 1 nor 2
- 28. What are the roots of the equation 2x+2 $2\frac{x}{x+1}$ 0.2

2^{A+2}.27^{A+1} = 9 ?
A. 2,1 - log
$$\left(\frac{3}{2}\right)$$
 B. 2,1 - log $\left(\frac{2}{3}\right)$
C. -2,1 - $\left(\frac{\log 3}{\log 2}\right)$ D. -2,1 - $\left(\frac{\log 2}{\log 3}\right)$

- 29. There are twelve friends A, B, C, D, E, F, G, H, I, J, K and L who invested money in some business in the ratio of 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 : 11 : 12 and the duration for which they invested the money is in the ratio of 12 : 11 : 10 : 9 : 8 : 7 : 6 : 5 ; 4 : 3 : 2 : 1 respectively. Who will get the maximum profit at the end of the year?
 - A. Fonly
 - B. G only
 - C. Both F and G
 - D. neither F nor G
- 30. $2^{122} + 4^{62} + 8^{42} + 4^{64} + 2^{130}$ is divisible by which one of the following integers?
 - A. 3 B. 5
 - C. 7 D. 11
- 31. If 2p + 3q = 12 and $4p^2 + 4pq 3q^2 = 126$, then what is the value of p + 2q?

Α.	5	В.	21 4
C.	<u>25</u> 4	D.	$\frac{99}{16}$

32. The number of digits in 3^{30} is *n* and it is given that $\log_{10} 3 = 0.4771$. What is the value of n? A. 13 B. 14

C.	15	D.	16

- 33. What is the unit digit of 7¹³⁹?
 A. 9
 B. 7
 C. 6
 D. 3
- 34. If 4x + 3a = 0, then what is the value of $x^2 + ax + a^2$, $x^2 ax + a^2$,

$$\frac{1}{x^{3} - u^{3}} - \frac{1}{x^{3} + a^{3}}?$$
A. $-\frac{4}{7a}$
B. $\frac{7}{a}$
C. $-\frac{32}{7a}$
D. $\frac{24}{7a}$

- 35. Incomes of Mahesh and Kamal are in the ratio 1 : 2 and their expenses are in the ratio 1 : 3. Which one of the following statements is correct ?
 - A. Mahesh saves more than what Kamal saves
 - B. Savings of both of them are equal
 - C. Kamal saves more than what Mahesh saves
 - D. It is not possible to determine who saves more

36. X and Y entered into partnership with Rs. 700 and Rs. 600 respectively. After 3 months X withdrew 2/7 of his stock but after 3 months, he puts back 3/5 of what he had withdrawn. The profit at the end of the year is Rs. 726. How much of this should X receive?

Α.	Rs. 336	В.	Rs. 366
C.	Rs. 633	D.	Rs. 663

37. A tank can be filled by pipe X in 2 hours and pipe Y in 6 hours. At 10 a.m. pipe X was opened. At what time will the tank be filled if pipe Y is opened at 11 a.m.?

A. 12:45 hours B. 5:00 p.m.

- C. 11:45 a.m. D. 11:50 a.m.
- 38. A train is travelling at 48 km/hour completely crosses another train having half its length and travelling in opposite direction at 42 km/hour in 12 s. It also passes a railway platform in 45 s. What is the length of the platform?

39. The speeds of three cars are in the ratio 2 : 3 : 4. What is the ratio between the times taken by these cars to travel the same distance?

Α.	4:3:2	в.	2:3:4
C.	4:3:6	D.	6:4:3

40. If the mean age of combined group of boys and girls is 18 years and the mean of age of boys is 20 and that of girls is 16, then what is the percentage of boys in the group?

41. The area of four walls of a room is 120 m². The length of the room is twice its breadth. If the height of the room is 4 m, what is area of the floor ?

42. If a square of side x and an equilateral triangle of side y are inscribed in a circle, then what is the ratio of x to y?

A.
$$\sqrt{\frac{2}{3}}$$

B. $\sqrt{\frac{3}{2}}$
C. $\frac{3}{\sqrt{2}}$
D. $\frac{\sqrt{2}}{3}$

- 43. The ratio of the curved surface area to the total surface area of a right circular cylinder is 1 : 2, If the total surface area is 616 cm², what is the volume of the cylinder?
 - A. 539 cm³ B. 616 cm³

C. 1078 cm³ D. 1232 cm³

44. A cubic metre of copper weighing 9000 kg is rolled into a square bar 9 m long. An exact cube is cut off from the bar. How much does the cube weigh?

A. 1000 kg B.
$$\frac{1000}{3}$$
 kg
C. 300 kg D. $\frac{500}{3}$ kg

45. Into a conical tent of radius 8.4 m and vertical height 3.5 m, how many full bags of wheat can be emptied, if space required for the wheat in each bag is 1.96 m³?

46. Let ABC be a right angled triangle with BC = 5 cm and AC = 12 cm. Let D be a point on the hypotenuse AB such that $\angle BCD = 30^{\circ}$. What is length of CD?

A.
$$\frac{60}{13}$$
 cm B. $\frac{17}{2}$ cm
C. $\frac{120}{5+12\sqrt{2}}$ cm D. $\frac{120}{5+12\sqrt{3}}$ cm

47. Two circle touch externally and sum of their areas is 130 cm and the distance between their centres is 14 cm. What is the difference in the radii of the circles?

Α.	5 cm	В.	6 cm
C.	7 cm	D.	8 cm

- 48. In a circle of radius 3 units, a diameter AB intersects a chord of length 2 units perpendicularly at P. If AP > BP, then what is the ratio of AP to BP?
 - A. $3 + \sqrt{10} : 3 \sqrt{10}$
 - B. $3 + \sqrt{8} : 3 \sqrt{18}$

C.
$$3 + \sqrt{3} : 3 - \sqrt{3}$$

- D. 3:√3
- 49. What is the number of rounds that a wheel

of diameter $\frac{5}{11}$ m will make in traversing 7 km?

Α.	3300	В.	3500
C.	4400	D.	4900

50. A building is in the form of a cylinder surmounted by a hemispherical done on the diameter of the cylinder. The height of the building is three times the radius of the base of the cylinder. The building contains

 $67\frac{1}{21}$ m³ of air. What is the height of the building?

- A. 6 m
 B. 4 m

 C. 3 m
 D. 2 m
- 51. The radius of the base and the height of a solid right circular cylinder are in the ratio 2 : 3 and its volume is 1617 cm³. What is the total surface area of the cylinder?
 A. 462 cm²
 B. 616 cm²
 C. 770 cm²
 D. 786 cm²
- 52. The cost of painting a spherical vessel of diameter 14 cm is Rs. 8008. What is the cost of painting per square centimeter?
 - A. Rs. 8 B. Rs. 9
 - C. Rs. 13 D. Rs. 14
- 53. If a quadrilateral has an inscribed circle, then the sum of a pair of opposite sides equals
 - A. Half the sum of the diagonals
 - B. Sum of the other pair of opposite sides
 - C. Sum of two adjacent sides
 - D. None of the above
- 54. A circle and a square have the same perimeter. Which one of the following is correct?
 - A. Their areas are equal
 - B. The area of the circle is larger
 - C. The area of the square is $\frac{\pi}{2}$ times area

of circle

- D. The area of the square is π times area of circle
- 55. A drinking glass of height 24 cm is in the shape of frustum of a cone and diameters of its bottom and top circular ends are 4 cm and 18 cm respectively. If we take capacity of the glass as $\pi x \text{ cm}^3$, then what is the value of x?

A. 824 B. 1236

- C. 1628 D. 2472
- 56. In an equilateral triangle another equilateral triangle is drawn inside joining the mid-points of the sides of given equilateral triangle and the process is continued up to 7 times. What is the ratio of area of fourth triangle to that of seventh triangle?

Α.	256:1	в.	128:1
C.	64:1	D.	16:1

- 57. Rain water from a roof $22 \text{ m} \times 20 \text{ m}$ 22 m 20 m drains into a cylindrical vessel having diameter of base 2 m and height 3.5 m. If the vessel is just full, what is the rainfall?
 - A. 3.5 cm B. 3 cm C. 2.5 cm D. 2 cm
- 58. The height of a cone is 60 cm. A small cone is cut off at the top by a plane parallel to the base and its volume is $\frac{1}{64}$ the volume of original cone. What is the height from the base at which the section is made?
 - A. 15 cm B. 20 cm
- C. 30 cm
 D. 45 cm
 59. If two tangents inclined at an angle 60° are drawn to a circle of radius 3 cm, then what is the length of each tangent?
 - A. $3\sqrt{3}$ cm B. $\sqrt{3}$ cm
 - C. 6 cm D. 2√2 cm
- 60. What is the volume of a sphere of radius 3 cm?
 - A. $36\pi \text{ cm}^3$ B. $18\pi \text{ cm}^3$
 - C. $9\pi \text{ cm}^3$ D. $6\pi \text{ cm}^3$
- 61. The sides of a triangle are given by $\sqrt{a^2 + b^2}$, $\sqrt{c^2 + a^2}$ and (b + c) where *a*, *b*, *c* are positive. What is the area of the triangle equal to?

A.
$$\frac{\sqrt{a^{2} + b^{2} + c^{2}}}{2}$$
B.
$$\frac{\sqrt{a^{2}b^{2} + b^{2}c^{2} + c^{2}a^{2}}}{2}$$
C.
$$\frac{a(b+c)}{2}$$

$$\sqrt{3}(a^{2}b^{2} + b^{2}c^{2} + c^{2}a^{2})}$$

- D. $\frac{\sqrt{3(a^{-}b^{-}+b^{-}c^{-}+c^{-}a^{-})}}{2}$
- 62. What is area of largest triangle inscribed in a semi-circle of radius *r* units?
 - A. r^2 square units
 - B. $2r^2$ square units
 - C. $3r^2$ square units
 - D. $4r^2$ square units
- 63. The diameter of the front wheel of an engine is 2x cm and that of rear wheel is 2y cm. To cover the same distance, what is the number of times the rear wheel revolves when the front wheel revolves n times?

A. $\frac{n}{xy}$ B. $\frac{ny}{x}$ C. $\frac{nx}{y}$ D. $\frac{xy}{n}$

For the next three (03) items that follow :

A tent of a circus is made of canvas and is in the form of right circular cylinder and right circular cone above it. The height and diameter of the cylindrical part of the tent are 5 m and 126 m respectively. The total height of the tent is 21 m.

64. What is the slant height of the cone?

Α.	60 m	В.	65 m
C.	68 m	D.	70 m

65. What is the curved surface area of the cylinder?

Α.	1980 m²	в.	2010 m ²
C.	2100 m ²	D.	2240 m ²

- 66. How many square metres of canvas are used?
 - A. 14450B. 14480C. 14580D. 14850
- 67. The wheels of a car are of diameter 80 cm each. The car is travelling at a speed of 66 km/hour. What is the number of complete revolutions each wheel makes in 10 minutes?

- C. 4375 D. 4450
- 68. What is the area of a triangle with sides of length 12 cm, 13 cm and 5 cm?
 - A. 30 cm² B. 35 cm²
 - C. 40 cm² D. 42 cm²
- 69. If the perimeter of a circle is equal to that of a square, then what is the ratio of area of circle to that of square?
 - A. 22:7 B. 14:11
 - C. 7:22 D. 11:14
- 70. ABCDA is a con-cyclic quadrilateral of a circle ABCD with radius r and centre at O. If AB is the diameter and CD is parallel and half of AB and if the circle completes one rotation about the centre O, then the locus of the middle point of CD is a circle of radius

A.
$$\frac{3r}{2}$$

B. $\frac{2r}{3}$
C. $\frac{2\sqrt{3r}}{3}$
D. $\frac{\sqrt{3r}}{2}$

71. If $\sin\theta + \cos\theta = \frac{\sqrt{7}}{2}$, then what is $\sin\theta - \cos\theta$ equal to? $\frac{1}{2}$

A. 0 в. D. √2 C. 1

72. If $\sin x + \sin^2 x = 1$, then what is the value of $\cos^8 x + 2\cos^6 x + \cos^4 x$? A. 0 B. 1 C. 2 D. 4

79.

80.

82.

83.

- A man from the top of a 100 m high tower 73. sees a car moving towards the tower at an angle of depression 30 After some time, the angle of depression becomes 60°. What is the distance travelled by the car during this time?
 - A. $100\sqrt{3}$ m B. $\frac{200\sqrt{3}}{3}$ m C. $\frac{100\sqrt{3}}{3}$ m D. $200\sqrt{3}$ m
- Two men on either side of a tower 75 m 74. high observe the angle of elevation of the top of the tower to be 30° and 60° What is the distance between the two men?

A. 100√3 m B.
$$\frac{100√3}{3}$$
 m

75. What is the value of $cosec^{2}68^{\circ} + sec^{2}56^{\circ} - cot^{2}34^{\circ} - tan^{2}22^{\circ}?$

A. 0 B.
$$\frac{1}{2}$$

- C. 1 D. 2 76. If $2y \cos \theta = x \sin \theta$ and $2x \sec \theta - y \csc \theta = 3$, then what is $x^2 + 4y^2$ equal to ? A. 1 B. 2 C. 4 D. 8
- 77. If $\sin\theta + \cos\theta = \frac{1+\sqrt{3}}{2}$ where $0 < \theta < \frac{\pi}{2}$, then what is $tan \theta + \cot \theta$ equal to?

A.
$$\frac{\sqrt{3}}{4}$$
 B. $\frac{1}{\sqrt{3}}$
C. $\sqrt{3}$ D. $\frac{4}{\sqrt{3}}$

78. If
$$A = \sin^2 \theta + \cos^4 \theta$$
 where $0 \le \theta < \frac{\pi}{2}$, then which one of the following is correct?

A. $1 \le A \le 2$ B. $\frac{3}{4} \le A \le 1$ C. $\frac{13}{16} \le A \le 2$ D. $\frac{3}{4} \le A \le \frac{13}{16}$ What is $\frac{\cot A + \csc A - 1}{\cot A - \csc A + 1}$ equal to? B. $\frac{1-\cos A}{\sin A}$ $1 + \cos A$ Α. sin A C. $\frac{1+\sin A}{2}$ D. $\frac{1-\sin A}{\sin A}$ cos A cos A Consider the following 1. $\sin 1^{\circ} > \sin 1^{\circ}$ 2. $\cos 1^{\circ} < \cos 1^{\circ}$ 3. $\tan 1^{\circ} > \tan 1^{\circ}$ Which of the above are not correct? A. 1 and 2 only B. 2 and 3 only C. 1 and 3 only D. 1, 2 and 3 If $\tan^2 x + \frac{1}{\tan^2 x} = 2$ and $0^\circ < x < 90^\circ$, 81. then what is the value of X? A. 15° B. 30° C. 45° D. 60° If the length of the shadow of a tower is equal to its height, then what is the Sun's altitude at that time? A. 15° B. 30° C. 45° D. 60° Consider the following : $\frac{\cos 75^{\circ}}{\sin 15^{\circ}} + \frac{\sin 12^{\circ}}{\cos 78^{\circ}} - \frac{\cos 18^{\circ}}{\sin 72^{\circ}} = 1$ 1. $\frac{\cos 35^{\circ}}{\sin 55^{\circ}} - \frac{\sin 11^{\circ}}{\cos 79^{\circ}} + \cos 28^{\circ} \csc 62^{\circ} = 1$ 2. $\frac{\sin 80^{\circ}}{\cos 10^{\circ}} - \sin 59^{\circ} \sec 31^{\circ} = 0$ 3. Which of the above are correct? A. 1 and 2 only B. 2 and 3 only D. 1, 2 and 3 C. 1 and 3 only 84. A pole stands vertically inside a triangular park ABC. If the angle of elevation of the top of the pole from each corner of the park is same, then in the triangle ABC, the

	foot of the pole is at the					
	Α.	Centro	id	в.	Circumference	
	C.	Incenti	re	D.	Orthocentre	
85.	Wh	at	is	the	value	of
	tar	n 1º tan 2	2º tan 3º	tan 4	°tan 89°?	
	Α.	0		в.	1	
	C.	2		D.	√3	

- 86. The average score of class X is 83. The average score of class Y is 76 The average score of class Z is 85 The average score of class X and Y is 79 And average score of class Y and Z is 81. What is the average score of X, Y and Z? A. 81.5 B. 80.5 D. 78.0 C. 79.0
- For x > 0, if a variable takes discrete 87. x + 4, x - 3.5, x - 2.5, x - 3, x - 2,values x + 0.5, x - 0.5, x + 5, then what is the median? A. x - 1.25 B. x - 0.5

C. x + 0.5 D. x + 1.25

- 88. set of 9 The median of distinct observations is 20.5. If each of the largest 4 observation of the set is increased by 2, then the median of the new set
 - A. is increased by 2
 - B. is decreased by 2
 - C. is two times the original median
 - D. remains the same as that of original set
- A cricketer has a certain average of 10 89. innings. In the eleventh inning he scored 108 runs, thereby increasing his average by 6 runs. What is his new average?

Α.	42	В.	47
C.	48	D.	60

- The mean of 20 observations is 17. On 90. checking it was found that the two observation were wrongly copied as 3 and 6. If wrong observation are replaced by correct values 8 and 9, then what is the correct mean?
 - A. 17.4 B. 16.6

C. 15.8 D. 14.2

- 91. Number of credit cards held by an individual can be treated as
 - A. Qualitative data
 - B. Discrete data
 - C. Categorical data
 - D. None of the above
- In a class of 100 students, there are 70 92. boys whose average marks in a subject are 75. If the average marks of the complete class is 72, then what is the average marks of the girls?

A.	64		в.	65

C.	68		D.	74
C.	00		υ.	74

- 93. A pie chart depicts the classification of total funds of an organization according to different sources of funds. A particular sector of pie chart for corporate tax has 108 angle at the centre. What is the percentage of income from corporate tax to total funds?
- A. 20% B. 25% C. 30% D. 35% 94. Consider the following statements : 1. The classes of type 15-19, 20-24, 25-29 etc. are exclusive classes. The classes of type 15-20, 20-25, 25-30 etc. are inclusive classes. Which of the above statements is/are correct? A. 1 only B. 2 only D. Neither 1 nor 2 C. Both 1 and 2 95. Suppose the class interval 10-15 has frequency 30, then what is the frequency density of this class interval? A. 2 B. 3 C. 5 D. 6
- 96. Let S be a set of first ten natural numbers. What is the possible number of pairs (a, b) where $a, b \in S$ such $a \neq b$ that the product

ab(>12) leaves remainder 4 when divided hv 12?

<i>b</i> , <u>+</u> .				
A. 4			в.	6
C. 8			D.	10
	• -	1 L		

97. remainder when What the is $13^5 + 14^5 + 15^5 + 16^5$ is divided by 29?

Α.	8	В.	5	
C.	3	D.	0	

- 98. What is the difference between the sum of the cubes and that of squares of first ten natural numbers?
 - A. 2280 B. 2640 C. 3820 D. 4130
- 99. A motorist travels to a place 150 km away at an average speed of 50 km/hour and returns at 30 km/hour. What is the average speed for the whole journey?
 - A. 35 km/hour
 C. 37.5 km/hour B. 37 km/hourD. 40 km/hour
- 100. If $x + \frac{1}{1 + \frac{1}{2 + \frac{1}{3}}} = 2$, then what is equal to?

 - 7 13 Β. 10 10 17 C. D. 10 10

Solution

1. Ans. A. As, $log_{10}^{\left[1-\left\{1-\left(1-x^{2}\right)^{-1}\right]^{-1}\right]^{-\frac{1}{2}}}$ = $log_{10}^{\left[1-\left\{1-\frac{1}{1-x^{2}}\right\}^{-1}\right]^{-\frac{1}{2}}}$ = $log_{10}^{\left[1-\left\{\frac{1-x^{2}-1}{1-x^{2}}\right\}^{-1}\right]^{-\frac{1}{2}}}$ = $log_{10}^{\left[1-\left\{-\frac{x^{2}}{1-x^{2}}\right\}^{-1}\right]^{-\frac{1}{2}}}$ $= log_{10}^{\left[1 + \frac{1 - x^2}{x^2}\right]^{\frac{1}{2}}}$ $= log_{10}^{\left[\frac{1}{x^2}\right]^{-\frac{1}{2}}}$ $= log_{10}^{x^2 \times \frac{1}{2}}$ $= log_{10}^{x}$ According to question $log_{10}^{x} = 1$ $=x = 10^1 = 10$ Hence option (b) 2. Ans. D. As, $4x^2 - 16x + \frac{\lambda}{4} = 0$ $=x^{2}-4x+\frac{\lambda}{16}=0$ Sum of roots $(\alpha + \beta) = 4$ Product of roots $(\alpha\beta) = \frac{\lambda}{16}$ As 1 < *α* < 2..... (i) $2 < \beta < 3$ (ii) From (i) and (ii) $2 < \alpha\beta < 6$ $1 < \alpha\beta < 3$ [It is not possible because $\alpha + \beta = 4$] So, $1 \times 3 < \alpha\beta < 2 \times 2$ $3 < \alpha\beta < 4$ $\Rightarrow 3 < \frac{\lambda}{16} < 4$ Hence total value of would be 15. Hence option (d) 3. Ans. A. As, $6^2 + 7^2 + 8^2 + 9^2 + 10^2$ $\sqrt{7+4\sqrt{3}}-\sqrt{4+2\sqrt{3}}$ 36+49+64+81+100 $\frac{\frac{33113101101100}{\sqrt{4+3+4\sqrt{3}}-\sqrt{1+3+2\sqrt{3}}}{330}}{\sqrt{2^2+(\sqrt{3})^2+2\times2\times\sqrt{3}}-\sqrt{1^2+(\sqrt{3})^2+2\times1\times\sqrt{3}}}$

 $-\frac{330}{\sqrt{(2+\sqrt{3})^2-\sqrt{(1+\sqrt{3})^2}}}$ $=\frac{1}{2+\sqrt{3}-1-\sqrt{3}}$ $=\frac{330}{1}=330$ Hence option (a) 4. Ans. B. As, $x^2 = y + z$ Then $x^2 + x = x + y + z$ $\Rightarrow x(1+x) = x + y + z$ $\Rightarrow \frac{1}{1+x} = \frac{x}{x+y+z}$ Similarly, $\frac{\frac{1}{1+y} = \frac{y}{x+y+z}}{\frac{1}{1+z} = \frac{z}{x+y+z}}$ So, $\frac{\frac{1}{x+1}}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$ x+y+z= 1 Hence option (b) 5. Ans. A. As, 5p9 + 3R7 + 2Q8 = 1114(i) According to concept of addition 9 + 7 + 8 = 24 (ii) 5 + 3 + 2 = 10 (iii) From (i), (ii) and (iii) We can simply say that 2 + P + R + Q = 11 (iv) Q would be maximum when P and R will be minimum. So. P = R = 0From (iv) 2 + 0 + 0 + Q = 11 $\Rightarrow Q = 11 - 2$ $\Rightarrow Q = 9$ Hence option (a) 6. Ans. B. As, Number = LCM of (2, 3, 4, 5, 6) – (Difference of divisors and remainder) = 60 - Differences of divisors and remainder.....(i)

As number when divided by 2, 3, 4, 5, 6 gives remainder 1, 2, 3, 4,5 respectively Then, 2 - 1 = 13 - 2 = 14 - 3 = 15 - 4 = 16 - 5 = 1From (i) Number = 60 - 1 = 59Other number = $59 \times 2 = 118$ Clearly, there is one number of set A which is below 100 Hence option (b) 7. Ans. B. Let the number be x According to question, $8x - \frac{x}{8} = 2016$ $\Rightarrow \frac{64x - x}{8} = 2016$ $\Rightarrow 63x = 2016 \times 8$ $\Rightarrow x = \frac{2016 \times 8}{63} = 256$ Hence option (b) 8. Ans. B. As we know that for real roots of quadratic equation, Discriminant ≥ 0 $\Rightarrow a^2 - 4b \ge 0$ $\Rightarrow a^2 \ge 4b$ (i) The pairs which follows the condition will be (2, 1), (3,1), (3,2), (4,1), (4,2), (4,3), (4,4) Hence total number of pairs = 7Hence option (b) 9. Ans. C. Let two positive integers be x and y such that x > yAccording to question, $x^2 + y^2 = 208$ (i) $x^2 = 18y$ (ii) From (i) and (ii) $y^2 + 18y - 208 = 0$ $\Rightarrow (y+26)(y-8) = 0$ \Rightarrow y = -26 or y = 8As, $x^2 = 18y$ If y = -26Then $x^2 = 18 \times (-26)$ [Not possible] If y = 8Then $x^2 = 18 \times 8 = 144$ $\Rightarrow x = 12$

Then x - y = 12 - 8 = 4Hence option (c) 10. Ans. B. As $A = \{7, 8, 9, 10, 11, 12\}$ $B = \{7, 10, 14, 15\}$ $A - B = [x: x \in A \text{ and } x \notin B]$ So, $A - B = \{8, 9, 11, 12\}$ Number of elements in (A - B) = 4Also, $B - A = [x: x \in R \text{ and } x \notin A]$ So, $B - A = \{14, 15\}$ Number of elements in (B - A) = 2Hence option (b) 11. Ans. B. As, a boy saves Rs. 4.65 daily.

Daily saving	Number of	Total savings
(in Rs.)	days	(in Rs.)
4.65	10	46.5
4.65	20	93
4.65	21	97.65
4.65	25	116.25

From the table, Clearly, in 20 days the boy will be able to save an exact number of rupees. Hence option (b) 12. Ans. C. Total number of rounds $= \frac{Total \ distance}{Distance \ per \ round}$ $=\frac{4}{0.25}=16$ Speed of A : Speed of B = 5:4As we know that time $\alpha \frac{1}{speed}$ So, time taken by A : time taken by B = 4:5LCM of (4, 5) = 20Number of Rounds completed by $A = \frac{20}{4} = 5$ Number of Rounds Completed by $B = \frac{20}{5} = 4$ When A will complete 5 rounds then B will complete 4 round and they meet at a point. i.e. If A will complete 5×3 i.e. 15 rounds Then he will meet to B. Hence A will trice pass the B. Hence option (c) 13. Ans. D. Option (a):

 $\frac{15}{1600} = 0.009375$ [Terminating decimal] Option (b): $\frac{23}{8} = 2.875$ [Terminating decimal] Option (c): $\frac{35}{50} = 0.7$ [Terminating decimal] Option (d): $\frac{17}{6} = 2.83333 \dots \dots = 2.83333$ [Non-Terminating repeating decimal] Hence option (d) 14. Ans. B. As, $25x^2 - 15x + 2 = 0$ (i) If α and β are the roots of (i) Then $\alpha + \beta = -\frac{(-15)}{25} = \frac{3}{5}$ $\alpha\beta = \frac{2}{25}$ If $(2\alpha)^{-1}$ and $(2\beta)^{-1}$ would be roots then Sum of roots $=\frac{1}{2\alpha} \times \frac{1}{2\beta}$ $=\frac{\alpha+\beta}{2\alpha\beta}$ $= \frac{\frac{5}{2 \times \frac{2}{25}}}{= \frac{3}{5} \times \frac{25}{4} = \frac{15}{4}}$ Product of roots $=\frac{1}{2\alpha} \times \frac{1}{2\beta}$ $= \frac{1}{4\alpha\beta}$ $= \frac{1\times25}{4\times2}$ $= \frac{25}{8}$ Quadratic equation be $x^{2} - (Sum \ of \ roots)x + Product \ of \ roots = 0$ $\Rightarrow x^2 - \frac{15}{4}x + \frac{25}{8} = 0$ $\Rightarrow 8x^2 - 30x + 25 = 0$ Hence quadratic polynomial be $8x^2 - 30x + 25$ Hence option (b) 15. Ans. A. If any number in the term $\frac{a^{p-1}}{p}$ where p = prime number a & p are co-prime then remainder will be 1. Given, p = 101 and a = 2 As, $\frac{2^{101-1}}{101}$ (i) Equation (i) satisfies the standard form so, required remainder will be 1 Hence option (a)

16. Ans. D. Let k be total number of worker According to question, Women worker = $\frac{1}{3} \times k$ Married women worker = $\frac{1}{3} \times k \times \frac{1}{2}$ $=\frac{1}{6} \times k$ Men Worker = $\left(1 - \frac{1}{3}\right) \times k$ $=\frac{2}{3} \times k$ Married Men worker = $\frac{2}{3} \times k \times \frac{3}{4}$ $=\frac{1}{2} \times k$ $\frac{Married \ women}{Married \ men} = \frac{\frac{1}{6} \times k}{\frac{1}{2} \times k}$ $=\frac{k}{6}\times\frac{2}{k}=\frac{1}{3}$ Hence, Married Women: Married man = 1:3Hence option (d) 17. Ans. D. Let efficiency of B be 100 So, efficiency of A be 150 $\frac{efficiency of A}{efficiency of B} = \frac{150}{100} = \frac{3}{2}$ According to question, work completed by A = 2 $\frac{work \ completed \ by \ B}{\Rightarrow} = \frac{3}{3}$ $\Rightarrow \frac{work \ completed \ by \ A}{30}$ \Rightarrow work completed by A = 20Now, Let A and B completed the work in x hours $\frac{x}{\underset{x}{\text{work completed by } A}} + \frac{12}{\underset{x}{\text{work completed by } B}} +$ $\frac{x}{work \ completed \ by \ B} = 1$ $\Rightarrow \ x \left[\frac{1}{20} + \frac{1}{30}\right] = 1 - \frac{12}{30}$ $\Rightarrow \ x \times \frac{5}{60} = \frac{18}{30}$ $\Rightarrow \ x = \frac{18}{30} \times \frac{60}{5} = 7.2 \ hrs$ Hence the required hours be 7.2 hrs Hence option (d) 18. Ans. B. Let original speed be 100 then increased speed be 120 time taken in original speed be t Then time taken in increase speed be (t - 20)As, distance in the both cases will be same So, 100t = 120(t - 20) \Rightarrow 5t = 6(t - 20) $\Rightarrow 5t = 6t - 120$ $\Rightarrow 6t - 5t = 120$ \Rightarrow t = 120 minutes

19. Ans. C. Let maximum marks be p Marks obtained by A = $\frac{xp}{100}$ Minimum passing marks for $A = \frac{xp}{100} + a$ (i) Marks obtained by $B = \frac{yp}{100}$ Minimum passing marks for $B = \frac{yp}{100} - b$ (ii) As (i) and (ii), we get $\frac{xp}{100} + a = \frac{yp}{100} - b$ $\frac{xp}{100} - \frac{yp}{100} = -a - b$ $\Rightarrow \frac{p}{100}(x - y) = -(a + b)$ (a+b)×100 $\Rightarrow p = -\frac{(a+b)\times 100}{x-y}$ $\Rightarrow p = \frac{100(a+b)}{y-x}$ Hence option (c) 20. Ans. A. As p and q are the roots of $x^2 + px + q = 0$ Then sum of roots = p + q = -p $\Rightarrow 2p + q = 0$ (i) Also, product of roots = pq = q $\Rightarrow pq - q = 0$ $\Rightarrow q(p-1) = 0$ $\Rightarrow p = 1 \text{ or } q = 0$ If q = 0 from (i) p + q = -p $\Rightarrow 2p + q = 0$ $\Rightarrow 2p + 0 = 0$ $\Rightarrow p = 0$ Hence p = 0 or 1Hence option (a) 21. Ans. D. Given, cost of 2.5 kg rice = Rs. 125Cost of 9 kg rice = $Rs.\frac{125}{25} \times 9$ = cost of 4 kg pulse Cost of 14 kg pulses = $\frac{125 \times 5}{2.5 \times 4} \times 14 = \text{cost of}$ 1.5 kg tea Cost of 2 kg tea = $\frac{125 \times 9 \times 14 \times 2}{2.5 \times 4 \times 1.5}$ = cost of 5 kg nuts Cost of 11 kg nuts = $Rs.\frac{125 \times 9 \times 14 \times 2 \times 11}{2.5 \times 4 \times 1.5 \times 5}$ $=\frac{125 \times 9 \times 14 \times 2 \times 11}{25 \times 4 \times 15 \times 5} \times 100$ = 4620Hence required cost be Rs. 4620 Hence option (d)

22. Ans. C. Given, number be 1729 $1729 = 12^3 + 1^3$ and $1729 = 10^3 + 9^3$ i.e. 1729 can be written as the sum of the cubes of two positive integers in two ways only. Hence option (c) 23. Ans. D. Let cost price = Rs.100Market price = $100 + \frac{100 \times 20}{100}$ = Rs. 120Selling price after distance = $120 - \frac{120 \times 10}{100}$ = 120 - 12 = Rs. 108Profit = $\frac{108 - 100}{100} \times 100$ = 8%Hence option (d) 24. Ans. D. Statement 1: If we take two prime numbers viz 2 and 3 then HCF be 1 Statement 2: If 7 and 25 be the prime and composite numbers respectively Then the HCF of 7 and 25 be 1 Statement 3: If 25 and 16 be the two composite numbers Then their HCF be also 1 Hence all the three statements are correct. Hence option (d) 25. Ans. A. Given. $\sqrt{1 + \frac{1}{1^2} + \frac{1}{2^2}} + \sqrt{1 + \frac{1}{2^2} + \frac{1}{3^2}} +$ $\cdots \dots + \sqrt{1 + \frac{1}{2007^2} + \frac{1}{2008^2}}$ $= \sqrt{\left(\frac{3}{2}\right)^2} + \sqrt{\left(\frac{7}{6}\right)^2} + \dots + \sqrt{\frac{(2007 \times 2008 + 1)^2}{2007^2 \times 2008^2}}$ = $\frac{3}{2} + \frac{7}{6} + \frac{13}{12} + \dots + \frac{2007 \times 2008 + 1}{2007 \times 2008}$ = $1 + \frac{1}{1 \times 2} + 1 + \frac{1}{2 \times 3} + 1 + \frac{1}{3 \times 4} + \dots + 1 + \frac{1}{3 \times 4}$ 2007×2008 $= 2007 + 1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \frac{1}{2007} - \frac{1}{2008}$ $= 2008 - \frac{1}{2008}$ Hence option (a)

26. Ans. D. Let speed of boat and current be x and y. According to question, $x + y = \frac{20}{2} = 10$ (i) $x - y = \frac{4}{2} = 2$ (ii) Adding (i) and (ii) we get 2x = 12 $\Rightarrow x = 6$ From (i) y = 10 - x = 10 - 6 = 4Thus speed of current be 4 km/hr Hence option (d) 27. Ans. A. Let x and y be 2n + 1 and 2n + 3 respectively. Then. $x^{2} + y^{2} = (2n + 1)^{2} + (2n + 3)^{2}$ $= 8n^2 + 16n + 10$ $= 8n^2 + 16n + 8 + 2$ $= 4[2n^2 + 4n + 2] + 2$ i.e. $x^2 + y^2$ is an odd number but not necessarily a multiple of 4 Hence only statement 1 is correct. Hence option (a) 28. Ans. C. As, $2^{x+2}27^{\frac{x}{x-1}} = 3^2$ $\Rightarrow 2^{x+2} = \frac{3^2}{\frac{3x}{3x-1}} = 3^{2-\frac{3x}{x-1}}$ $\Rightarrow 2^{x+2} = 3^{\frac{-x-2}{x-1}}$ Taking log both sides $(x+2) \log \log 2 = -\frac{(x+2)}{(x-1)} \log \log 3$ $(x+2)(x-1) = -(x+2)\frac{\log\log 3}{\log\log 2}$ $(x+2)(x-1) + (x+2)\frac{\log \log 3}{\log \log 2} = 0$ $(x+2)\left[x-1+\frac{\log\log 3}{\log\log 2}\right]=0$ Either x + 2 = 0 $\Rightarrow x = -2$ $\Rightarrow x = -2$ Or $x - 1 + \frac{\log \log 3}{\log \log 2} = 0$ $\Rightarrow x = 1 - \frac{\log \log 3}{\log \log 2}$ Hence option (c) 29. Ans. C. As ratio of investment of *A*: *B*: *C*: *D*: *E*: *F*: *G*: *H*: *I*: *J*: *K*: *L*be 1: 2: 3: 4: 5: 6: 7: 8: 9: 10: 11: 12 Duration of investment of

A: *B*: *C*: *D*: *E*: *F*: *G*: *H*: *I*: *J*: *K*: *L*be 12: 11: 10: 9: 8: 7: 6: 5: 4: 3: 2: 1 Multiplying ratio of investment and time we get ratio 12: 22: 30: 36: 40: 42: 42: 40: 36: 30: 22: 12 (i) i.e. F and G equal maximum profit [From (i)] Hence option (c) 30. Ans. D. As, $2^{122} + 4^{62} + 8^{42} + 4^{64} + 2^{130}$ $= 2^{122} + 2^{2 \times 62} + 2^{3 \times 42} + 2^{2 \times 64} + 2^{130}$ $= 2^{122} + 2^{124} + 2^{126} + 2^{128} + 2^{130}$ $= 2^{122}(1 + 2^2 + 2^4 + 2^6 + 2^8)$ $= 2^{122}(1 + 4 + 16 + 64 + 256)$ $= 2^{122} \times 341$ Here 341 is divisible by 11. Hence $2^{122} + 4^{62} + 8^{42} + 4^{64} + 2^{130}$ will be divisible by 11 Hence option (d) 31. Ans. D. As, 2p + 3q = 12(i) And $4p^2 + 4pq - 3q^2 = 126$ $\Rightarrow (2p)^2 + 2 \times 2p \times q + q^2 - 4q^2 = 126$ $\Rightarrow (2p+q)^2 - (2q)^2 = 126$ $\Rightarrow (2p+q+2q)(2p+q-2q) = 126$ $\Rightarrow (2p + q + 2q)(2p + q - 2q)$ $\Rightarrow 12 \times (2p - q) = 126$ $\Rightarrow 2p - q = \frac{126}{12} = \frac{21}{2}$(ii) From (i) and (ii) [From (i)] $4p = 12 - \frac{21}{2} = \frac{3}{2}$ $\Rightarrow q = \frac{3}{8}$ Putting the value of q in (i) $2p = 12 - 3q = 12 - 3 \times \frac{3}{8}$ $\Rightarrow 2p = \frac{96 - 9}{8} = \frac{87}{8}$ $\Rightarrow p = \frac{87}{16}$ Now, $p + 2q = \frac{87}{16} + 2 \times \frac{3}{8}$ $= \frac{87 + 12}{16} = \frac{99}{16}$ Hence option (d) 32. Ans. C. Let $x = 3^{30}$ Taking log both sides $log_{10}^{x} = log_{10}^{3^{30}}$ $\Rightarrow log_{10}^{x} = 30log_{10}^{3} = 3 \times 0.4711$ $\Rightarrow log_{10}^{x} = 14.3130$

Now, taking antilog both sides, x =Antilog of 14.313 Hence number of digits (n) = 14 + 1 = 15Hence option (c) 33. Ans. D. As we know that unit digit in 7^4 will be 1 Now, $139 = 4 \times 34 + 3$ $7^{139} = 7^{4 \times 34 + 3}$ $= 7^{4 \times 34} \times 7^{3}$ $= (7^4)^{34} \times (7 \times 7 \times 7)$ (i) The unit digit in $(7^4)^{34}$ will be 1 and the unit digit in $7 \times 7 \times 7$ will be 3. Thus, unit digit of $(7^4)^{34} \times (7 \times 7 \times 7)$ will be (1×3) Hence unit digit of 7^{139} will be 3 Hence option (d) 34. Ans. C. As, 4x + 3a = 0 $\Rightarrow x = -\frac{3a}{4}$(i) Also, $x^3 - a^3 = (x - a)(x^2 + ax + a^2)$ $\therefore \frac{1}{x-a} = \frac{x^2 + ax + a^2}{x^3 - a^3} \dots \dots (ii)$ And $x^3 + a^3 = (x+a)(x^2 - ax + a^2)$ $\Rightarrow \frac{x^2 - ax + a^2}{x^3 + a^3} = \frac{1}{x + a}$ (iii) Subtract (iii) from (ii) $\frac{x^{2}+ax+a^{2}}{x^{3}-a^{3}} - \frac{x^{2}-ax+a^{2}}{x^{3}+a^{3}}$ $= \frac{1}{2} - \frac{1}{2}$ x-a x+a $=\frac{x+a-x+a}{x^2-a^2}=\frac{2a}{x^2-a^3}$ (iv) From (i) and (iv) $\frac{x^2+ax+a^2}{a} - \frac{x^2-ax+a^2}{a}$ $x^{3}-a^{3}$ 2a $x^{3}+a^{3}$ $=\frac{\frac{9a^2}{9a^2}-a^2}{\frac{2a}{2a}}$ = $\frac{}{9a^2 - 16a^2}$ $=\frac{\overline{\frac{2a\times16}{2a\times16}}}{-7a^2}=\frac{-32}{7a}$ Hence option (c) 35. Ans. D. We can solve this question in different cases. Case 1: Let income of Mahesh = 2kIncome of Kamal = 3k Expanses of Mahesh = k Expanses of Kamal = 3k Saving of Mahesh = 2k - k = k

Saving of Kamal = 4k - 3k = ki.e. saving of Mahesh = saving of Kamal case 2: Let income of Mahesh = 3kIncome of Kamal = 6k Expanses of Mahesh = k Expanses of Kamal = 3kSaving of Mahesh = 3k - k = 2kSaving of Kamal = 6k - 3k = 3ki.e. saving of Mahesh is less than saving of Kamal. Case 3: Let income of Mahesh = 5kIncome of Kamal = 10k Expanses of Mahesh = 3kExpanses of Kamal = 9kSaving of Mahesh = 5k - 3k = 2kSaving of Kamal = 10k - 9k = ki.e. saving of Mahesh is more than saving of Kamal. Clearly, it is not possible to determine who saves more. Hence option (d) 36. Ans. B. In case of x: Investment in $1^{st} 3$ months = 700 Again investment in next 3 months = 700 - $700 \times \frac{2}{7}$ = 700 - 200 = 500Investment in next 6 months = $200 \times \frac{3}{5} + 500$ = 120 + 500= 620Total investment in 1 year by $x = 700 \times 3 +$ $500 \times 3 + 620 \times 3 = 7320$ Total investment in 1 year by $y = 600 \times 12 =$ 7200 Required amount received by x = $\frac{7320+7200}{7320+7200} \times 726$ = $\frac{7320}{14520} \times 726$ = 266= 366Hence x will receive Rs. 366 Hence option (b) 37. Ans. C. Total work = LCM of 2 and 3 X will perform $=\frac{6}{2}=3$ unit/hr Y will perform $=\frac{6}{6}=1$ unit/hr

X perform between 10:00 AM to 11:00 AM = 6-3 = 3 unit. Now, x and y together will perform = 3 + 1 = 4unit. Time taken for remaining work = $\frac{3}{4} \times 60$ min. = 45min. Hence tank be filled at 11:45 AM Hence option (c) 38. Ans. B. Speed of Train A = $48 \times \frac{5}{18} = \frac{40}{3} m/s$ Speed of Train B = $42 \times \frac{5}{18} = \frac{35}{3} m/s$ Let length of Train A = 2x mLength of Train B = x mTotal length = 2x + x = 3x mCombined speed = $\frac{40}{3} + \frac{35}{3} = \frac{75}{3} = 25 m/s$ As, distance = speed \times time \Rightarrow 3*x* = 25 × 12 $\Rightarrow x = \frac{25 \times 12}{3} = 100 m$ Let length of platform = y m According to question, $y + 200 = \frac{40}{3} \times 45$ $\Rightarrow y = 600 - 200 = 400 m$ Hence option (b) 39. Ans. D. As speed $\propto \frac{1}{time}$ Ratio of time be $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$ $=\frac{1}{2} \times 12: \frac{1}{3} \times 12: \frac{1}{4} \times 12$ = 6:4:3Hence option (d) 40. Ans. B. According to concept of mixture and allegation Girls

Thus, Percentage of Boys in the group $=\frac{2}{2+2} \times 100$ $=\frac{2}{4} \times 100$ = 50 %Hence option (b) 41. Ans. B. Let breadth of room (b) = x m. Length of room (l) = 2x m. Given, height of room = 4 m. According to question, 2h(l + b) = 120 $\Rightarrow 2 \times 4(2x + x) = 120$ $\Rightarrow 3x = \frac{120}{2\times 4} = 15$ $\Rightarrow x = \frac{15}{3} = 5 m.$ So, length of room = 5 × 2 = 10 m. Breadth of room = 5 m. Area of the floor = $l \times b$ = 10 × 5 = 50 m² Hence option (b) 42. Ans. A.



As
$$x = \sqrt{2r}$$



As, $\cos \cos 30^{0} = \frac{z}{r}$ $\Rightarrow z = r \cos \cos 30^{0}$ $\Rightarrow z = \frac{\sqrt{3}}{2}r$ Also, y = 2z $\Rightarrow y = 2 \times \frac{\sqrt{3}}{2}r = \sqrt{3}r$ Then $\frac{x}{y} = \frac{\sqrt{2}r}{\sqrt{3}r} = \frac{\sqrt{2}}{\sqrt{3}} = \sqrt{\frac{2}{3}}$ Hence option (a) 43. Ans. C. Let radius and height of right circular cone be r and h respectively. According to question,

$$\frac{2\pi rh}{2\pi r^{2}+2\pi rh} = \frac{1}{2}$$

$$\Rightarrow \frac{2\pi rh}{2\pi r(1+h)} = \frac{1}{2}$$

$$\Rightarrow \frac{h}{r+h} = \frac{1}{2}$$

$$\Rightarrow 2h = r + h$$

$$\Rightarrow r = h \dots (i)$$
Total surface area = 616 cm²

$$\Rightarrow 2\pi r(r+h) = 616$$

$$\Rightarrow 2 \times \frac{22}{7} \times r \times (r+r) = 616$$

$$\Rightarrow r \times 2r = \frac{616 \times 7}{2 \times 22}$$

$$\Rightarrow r^{2} = \frac{616 \times 7}{2 \times 22}$$

$$\Rightarrow r^{2} = \frac{616 \times 7}{4 \times 22} = 7 cm$$
Volume of cylinder = $\pi r^{2}h$

$$= \frac{22}{7} \times 7 \times 7 \times 7$$
[r = h]
= 22 × 7 × 7
= 1078 cm³
Hence option (c)
44. Ans. B.



Weight of cube = 9000 kg



Volume of cube = Volume of square bar $\Rightarrow 1 \times 1 \times 1 = x \times x \times 9$ $\Rightarrow x^2 = \frac{1}{9}$ $\Rightarrow x = \frac{1}{3}m$ Now, no of cube cut off × volume of cube of length $\frac{1}{3}$ m = volume of cube of length 1 m $\Rightarrow n \times (\frac{1}{3})^3 = (1)^3$ $\Rightarrow n = 1 \times 27 = 27$ Weight of one cube $= \frac{9000}{27} = \frac{1000}{3}kg$

Hence option (b) 45. Ans. C. Given radius of cone = 8.4 mVertical height of cone = 3.5 m

Number of bag = $\frac{Volume \ of \ conical \ tent}{Volume \ of \ each \ bag}$ $=\frac{\frac{1}{3}\pi r^2h}{2}$ 1.96 1×22×8.4×8.4×3.5 3×7×1.96 $= 22 \times 6 = 132$ Hence option (c) 46. Ans. C. Figure 1: 13 cm D 12 cm 5 cm Figure 2: $\sin \sin \theta = \frac{h}{b}$ \Rightarrow $h = b \sin \sin \theta$ Area of triangle = $\frac{1}{2} \times a \times b \sin \sin \theta$ $=\frac{1}{2}ab\sin\theta$ Now, From Figure (i) Area of $\triangle BCD$ + Area of $\triangle ACD$ = Area of ΔACD $\Rightarrow \frac{1}{2} \times 5 \times x \times sin \sin 30^{\circ} + \frac{1}{2} \times 12 \times x \times sin \sin 30^{\circ} + \frac{1}{2} \times x \times sin \sin 30^{\circ} + \frac{1}{2}$ $sin sin 60^0 = \frac{1}{2} \times 12 \times 5$ $\Rightarrow 5x \times \frac{1}{2} + 12x \times \frac{\sqrt{3}}{2} = 12 \times 5$ $\Rightarrow x\left(\frac{5}{2} + \frac{12\sqrt{3}}{\frac{2}{2}}\right) = 12 \times 5$ $\Rightarrow x\left(\frac{5+12\sqrt{2}}{2}\right) = 12 \times 5$ $\Rightarrow x = \frac{120}{120}$ $\Rightarrow x = \frac{120}{5+12\sqrt{2}}$ Hence length of CD = x $=\frac{120}{5+12\sqrt{2}}$ cm Hence option (c)

47. Ans. D.



Given, $R + r = 14 \ cm$ (i) And $\pi R^2 + \pi r^2 = 130\pi$ $\Rightarrow R^2 + r^2 = 130$ (ii) $(R + r)^2 = R^2 + r^2 + 2Rr$ $\Rightarrow (14)^2 = 130 + 2 \ Rr$ $\Rightarrow 2Rr = 196 - 130 = 66$ $\Rightarrow Rr = 33$ (iii) Also, $(R + r)^2 = (R + r)^2 - 4Rr$ $\Rightarrow (R - r)^2 = (14)^2 - 4 \times 33$ $\Rightarrow (R - r)^2 = 196 - 132 = 64$ $\Rightarrow (R - r) = \sqrt{64} = 8 \ cm$ Hence option (d) 48. Ans. B.



From Pythagoras theorem, $x = \sqrt{3^2 - 1^2} = \sqrt{8}$ Now, $Ap = 3 + x = 3 + \sqrt{8}$ $BP = 3 - x = 3 - \sqrt{8}$ Then $\frac{AP}{BP} = \frac{3 + \sqrt{8}}{3 - \sqrt{8}}$ $\therefore AP: BP = 3 + \sqrt{8}: 3 - \sqrt{8}$ Hence option (b) 49. Ans. D. Diameter of Wheel = πD $= \frac{22}{7} \times \frac{5}{11}$ $= \frac{10}{7}m$ Number of rounds = $\frac{Toatl \, distance \, travelled}{Circumference \, of \, wheel}$ $= \frac{7 \times 1000 \times 7}{10} = 4900$ Hence option (d) 50. Ans. A.



Volume of $I = \frac{2}{3}\pi r^3$ [r = radius] Volume of $II = \pi r^2 (2r) = 2\pi r^3$ [As h=2r]Volume of building = $\frac{2}{3}\pi r^3 + 2\pi r^3$ $=\frac{8}{3}\pi r^3$ According to question: $\frac{\frac{8}{3}\pi r^{3} = 67\frac{1}{21} = \frac{1408}{21}$ $\Rightarrow r^{3} = \frac{1408 \times 3}{21 \times 8 \times \pi}$ $\Rightarrow r^{3} = \frac{1408 \times 3 \times 7}{21 \times 8 \times 22} = 8$ $\Rightarrow r^{3} = 2^{3}$ $\Rightarrow r = 2$ Hence, height of building = $3r = 3 \times 2 = 6 m$ Hence option (a) 51. Ans. C. Let radius and height of base of solid circular cylinder be r and h respectively. Given, $\frac{r}{h} = \frac{2}{3}$ $r = \frac{2h}{3}$(i) Volume of cylinder = $πr^2h$ ⇒ 1617 = $\frac{22}{7} × \left(\frac{2h}{3}\right)^2 × h$ $\Rightarrow \frac{1617 \times 7}{22} = \frac{4h^2}{9} \times h$ $\Rightarrow h^3 = \frac{9 \times 1617 \times 7}{22 \times 4}$ $\Rightarrow h^3 = 1157.625$ \Rightarrow $h^3 = (10.5)^3$ \Rightarrow h = 10.5 cmso, $r = \frac{2 \times 10.5}{3}$ [From (i)] \Rightarrow r = 7Total surface Area of cylinder = $2\pi r^2 + 2\pi rh$ $= 2\pi r(r+h)$ $= 2 \times \frac{22}{7} \times 7 \times (7+10.5)$

= 770 cm²
Hence option (c)
52. Ans. C.
As surface Area of spherical vessel
=
$$4\pi (radius)^2$$

= $4 \times \frac{22}{7} \times \left(\frac{14}{2}\right)^2$
= $4 \times \frac{22}{7} \times 7 \times 7$
= $616cm^2$
Cost of painting per square centimeter =
 $Rs. \frac{8008}{616} = Rs. 13$
Hence option (c)
53. Ans. B.
7 cm
5 cm
9 cm

As DX and DP are pair of tangent from D to circle and we know that length of pair of tangent be same in this case. So, Let DX = DP = 5 cmSimilarly, Let CX = CY = 8 cmBY = BZ = 9 cmAP = AZ = 7 cmNow, According to question BD = 9 + 8 = 17 cmAC = 7 + 5 = 12 cmAC + BD = 17 + 12 = 29 cmAlso, AB + CD = 29 cmHence the sum of a pair of opposite side equals to sum of the other pairs of opposite sides. Hence option (b) 54. Ans. B. Let side of square be x then perimeter of square = 4xPerimeter of circle having radius $r = 2\pi r$ According to question $2\pi r = 4x$ $\Rightarrow r = \frac{4x}{2\pi} = \frac{2x}{\pi}$ Area of square = x^2

Area of circle = $\pi \left(\frac{2x}{\pi}\right)^2$ $= \frac{4x^2}{\pi}$ $= \frac{4\times7}{22}x^2$ $= \frac{14}{11}x^2$ Here, $\frac{14}{11}x^2 > x^2$ Hence Area of circle is greater than area of square. Hence option (b) 55. Ans. A. Given, height (h) = 24 cmRadius of bottom circle (r)= $\frac{18}{2}$ = 9*cm* Also, given capacity of glass i.e. volume of glass is in shape of frustum be πx (i) As, volume of frustum = $\frac{\pi h}{3} [r^2 + R^2 + rR]$ $= \pi \times \frac{24}{3} [2^2 + 9^2 + 2 \times 9]$ $= \pi \times 8[4 + 81 + 18]$ $= \pi \times 824$ (ii) After comparing (i) and (ii), we get x = 824Hence option (a) 56. Ans. C.



Here all triangles are equilateral triangle and formed after taking the mid-point of sides. Let Area of $\triangle ABC$ be A then Area of nth

triangle $(A_n) = \left(\frac{1}{4}\right)^n A$ (i) According to question, $\frac{A_4}{A_7} = \frac{\left(\frac{1}{4}\right)^4 A}{\left(\frac{1}{4}\right)^7 A} = \frac{4^7}{4^4} = \frac{64}{1}$ Hence, $A_4: A_7 = 64: 1$ Hence option (c) 57. Ans. C. Given diameter of base and height of cylinder vessel be 2 m and 3.5 m respectively. Then radius of base (r) $= \frac{2}{2} = 1 m$ h = 3.5 m

Let height of roof be H m Then volume of roof = $22 \times 20 \times H$ (i) Volume of cylindrical vessel = $\pi r^2 h$ $=\frac{22}{7} \times 1^2 \times 3.5$ (ii) As (i) = (ii)Then, $22 \times 20 \times H = \frac{22}{7} \times 1 \times 3.5$ $\Rightarrow H = \frac{22 \times 3.5}{7 \times 22 \times 20}$ \Rightarrow H = 0.025 \Rightarrow $H = 0.025 \times 100 \ cm$ \Rightarrow H = 2.5 cmHence option (c) 58. Ans. D. 60 Given, $\frac{V_I}{V_{original}} = \frac{1}{64}$ (i) As, $\triangle ABC \sim \triangle ADE$ So, $\frac{r}{R} = \frac{h}{60} \dots (i)$ From (i) $\frac{\frac{1}{3}\pi r^2 h}{\frac{1}{2}\pi R^2 \times 60} = \frac{1}{64}$ $\Rightarrow \left(\frac{r}{R}\right)^2 \times \frac{h}{60} = \frac{1}{64}$ $\Rightarrow \left(\frac{h}{60}\right)^2 \times \frac{h}{60} = \frac{1}{64}$ $\Rightarrow h^3 = \frac{60 \times 60 \times 60}{64}$ $\Rightarrow h^3 = \left(\frac{60}{4}\right)^3 = 15^3$ \Rightarrow h = 15 cmHence height from the base at which the section is made = 60 - h= 60 - 15= 45 cmHence option (d) 59. Ans. A. В



As, $\angle OAB = 30^{\circ}$

[Because both triangle is congruent] In right angled triangle OAB: $\tan \tan 30^{\circ} = \frac{OB}{AB}$ $\Rightarrow AB = \frac{OB}{\tan \tan 30^{\circ}}$ $\Rightarrow l = \frac{3}{\left(\frac{1}{\sqrt{3}}\right)} = 3\sqrt{3}$ Hence option (a) 60. Ans. A. Given radius of sphere (r) be 3 cm As, volume of sphere = $\frac{4\pi r^3}{3}$ $=\frac{4\pi}{3}\times(3)^{3}$ $=\frac{4\pi}{3}\times3\times3\times3$ $= 36\pi \ cm^{3}$ Hence option (a) 61. Ans. C. We can solve this question by hit and trial method. Let a = b = c = 1 cmThen sides of triangle be $\sqrt{a^2 + b^2} = \sqrt{1^2 + 1^2} = \sqrt{2}$ $\sqrt{c^2 + a^2} = \sqrt{1^2 + 1^2} = \sqrt{2}$ (b + c) = 1 + 1 = 2 $\sqrt{2}$ √2 Area of $\triangle ABC = \frac{1}{2} \times \sqrt{2} \times \sqrt{2}$ $= 1 cm^{2}$ Option (a): Area = $\frac{\sqrt{a^2+b^2+c^2}}{2}$ = $\frac{\sqrt{1^2+1^2+1^2}}{2} = \frac{\sqrt{3}}{2}cm^2$ Option (b): Area = $\frac{\sqrt{a^2b^2 + b^2c^2 + c^2a^2}}{a^2}$ $\frac{\sqrt{1^2 \times 1^2 + 1^2 \times 1^2 + 1^2 \times 1^2}}{2}$ $=\frac{\sqrt{1+1+1}}{2}$ $=\frac{\sqrt{3}}{2}cm^2$ Option (c):



Hence option (b) 65. Ans. A. Radius of cylinder (r) = 63 mHeight of cylinder (H) = 5 mCurved surface area of cylinder = $2\pi rh$ $= 2 \times \frac{22}{7} \times 63 \times 5$ = 1980 m² Hence option (a) 66. Ans. D. Canvas used = Curved surface Area of cylinder + Curved surface Area of cone $= 1980 + \pi rl$ $= 1980 + \frac{22}{7} \times 63 \times 65$ $= 1980 + \frac{90090}{7}$ $= 14850 m^2$ Hence option (d) 67. Ans. C. Given diameter of wheel be 80 cm. So, radius (r) of wheel $=\frac{80}{2}=40$ cm Speed of car = $66 \times \frac{5}{18} m/sec$ $=\frac{11\times5}{3}=\frac{55}{3}m/sec$ Time = 10 minutes. $= 10 \times 60 = 600 \, sec$ Distance covered by car = *speed* × *time* $=\frac{55}{3}\times 600$ = 11000 m $= 1100000 \ cm$ Number of revolution of wheel = Distance covered Circumference of wheel 1100000 $\frac{2\pi r}{1100000}$ $\frac{2\pi^2}{2\times\frac{22}{7}\times40}$ = 4375Hence option (c) 68. Ans. A. 13 cm 5 cm 12 cm Area of right-angled triangle ABC =

 $\frac{1}{2} \times AB \times BC$

 $= \frac{1}{2} \times 12 \times 5$ = 30 cm² Hence option (a) 69. Ans. B. Perimeter of circle when radius r = Perimeter of square with side a =>2 $\pi r = 4a$ => $a = \frac{2\pi r}{4} = \frac{\pi r}{2}$(i) $\frac{Area of circle}{Area of square} = \frac{\pi r^2}{a^2} = \frac{\pi r^2}{\left(\frac{\pi r}{2}\right)^2}$ = $\frac{\pi r^2}{\pi \times \pi \times r^2} \times 2^2$ = $\frac{4}{\pi}$ = $\frac{4}{22} \times 7 = \frac{14}{11}$ Hence option (b) 70. Ans. D.

Here OCD be an equilateral triangle. In right angled triangle OCM $OC^2 = CM^2 + OM^2$

$$\Rightarrow r^{2} = \left(\frac{r}{2}\right)^{2} + h^{2}$$
$$\Rightarrow h^{2} = r^{2} - \frac{r^{2}}{4}$$
$$\Rightarrow h^{2} = \frac{3r^{2}}{4}$$
$$\Rightarrow h = \frac{\sqrt{3}r}{2}$$

Here, required radius of circle be $\frac{\sqrt{3}r}{2}$ Hence option (d) 71. Ans. B. As, $\sin \sin \theta + \cos \cos \theta = \frac{\sqrt{7}}{2}$ Let $\sin \sin \theta - \cos \cos \theta = a$ As we know that $(x + y)^2 + (x - y)^2 = 2(x^2 + y^2)$ Then, $(\sin \sin \theta + \cos \cos \theta)^2 + (\sin \sin \theta - \cos \cos \theta)^2 = 2(\theta + \theta)$ $\Rightarrow \left(\frac{\sqrt{7}}{2}\right)^2 + a^2 = 2 \times 1$ $\Rightarrow a^{2} = 2 - \frac{7}{4} = \frac{8-7}{4}$ $\Rightarrow a^{2} = \frac{1}{4}$ $\Rightarrow a = \frac{1}{2}$ Hence sin sin θ -cos cos θ = $\frac{1}{2}$ Hence option (b) 72. Ans. B. As,sin sin x + x = 1 =>sin sin x = 1 - x =>sin sin x = x (i) Now, $x + 2x + x = (x)^{2} + 2x \cdot x + (x)^{2}$ $= (x + x)^{2}$ [As, x = sin sin x] $= (1)^{2} = 1$ Hence option (b) 73. Ans. B.



As angle of elevation = angle of depression In triangle ABC:

$$\tan \tan 30^{0} = \frac{BC}{AB}$$

$$\Rightarrow AB = \frac{BC}{\tan \tan 30^{0}} = \frac{100}{\left(\frac{1}{\sqrt{3}}\right)}$$

$$\Rightarrow AB = 100\sqrt{3}......(i)$$
In triangle BCD:

$$\tan \tan 60^{0} = \frac{BC}{BD}$$

$$\Rightarrow BD = \frac{100}{\tan \tan 60^{0}} = \frac{100}{\sqrt{3}}$$

$$\Rightarrow BD = \frac{100}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{100\sqrt{3}}{3}(ii)$$
From (i) and (ii)

$$AD = AB - BD$$

$$= 100\sqrt{3} - \frac{100\sqrt{3}}{3}$$

$$= \left(\frac{3-1}{3}\right)100\sqrt{3}$$

$$= \frac{200\sqrt{3}}{3}$$
Hence distance travelled by car during time
be $\frac{200\sqrt{3}}{3} m$
Hence option (b)



In Triangle ACD: $\tan \tan 30^{\circ} = \frac{CD}{AC}$ $\Rightarrow AC = \frac{CD}{\tan \tan 30^{\circ}} = \frac{75}{\left(\frac{1}{\sqrt{2}}\right)}$ $\Rightarrow AC = 75\sqrt{3}$ In Triangle BCD: $\tan \tan 60^{\circ} = \frac{CD}{BC}$ $\Rightarrow BC = \frac{CD}{\tan \tan 60^{\circ}}$ $\Rightarrow BC = \frac{75}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ $\Rightarrow BC = \frac{75\sqrt{3}}{3}$ $\Rightarrow BC = 25\sqrt{3}$ Then. AB = AC + BC $\Rightarrow AB = 75\sqrt{3} + 25\sqrt{3}$ $\Rightarrow AB = 100\sqrt{3}$ Hence required distance be $100\sqrt{3}$ m Hence option (a) 75. Ans. D. As, $\theta = 1 + \theta$ $\Rightarrow \theta = 1 - \theta \dots (i)$ Also, $cosec^2\theta - \theta = 1$ (*ii*) As, $cosec^2 68^0 + 56^0 - 34^0 - 22^0$ $= (90^{\circ} - 68^{\circ}) - 22^{\circ} + cosec^{2}(90^{\circ} - 56^{\circ}) 34^{0}$ $= (22^{0} - 22^{0}) + (cosec^{2}34^{0} - 34^{0})$ = 1 + 1 = 2Hence option (d) 76. Ans. C. As, $2y \cos \cos \theta = x \sin \sin \theta$ => $x = \frac{2y \cos \cos \theta}{\sin \sin \theta}$ $=>x = 2y \cos \cos \theta \cdot \csc \theta \dots$ (i) Also, $2x \sec \sec \theta - y \csc \theta = 3$

 $\Rightarrow 2(2y\cos\cos\theta \cdot \csc\theta) \times \frac{1}{\cos\cos\theta} - \frac{1}{\cos^2\theta} - \frac{1}{\cos^2\theta} + \frac{1}{\cos^2\theta} +$ $y \operatorname{cosec} \theta = 3$ $\Rightarrow \frac{4y\cos cos \theta - 3}{\cos cos \theta - 3} - y \csc \theta = 3$ $\Rightarrow 3y \csc \theta = 3$ $\Rightarrow y = \frac{3}{3 \csc \theta} = \sin \sin \theta$ $x = 2 \times \sin \sin \theta . \cos \cos \theta . \cos \epsilon \theta$ [From (i)] $\Rightarrow x = \frac{2 \sin \sin \theta \cdot \cos \cos \theta}{\sin \sin \theta} = 2 \cos \cos \theta$ Now, $x^2 + 4y^2$ $=4\theta + 4\theta$ $=4(\theta + \theta) = 4 \times 1 = 1$ Hence option (c) 77. Ans. D. As, $\sin \sin \theta + \cos \cos \theta = \frac{1+\sqrt{3}}{2}$, $0 < \theta < \frac{\pi}{2}$ \Rightarrow sin sin θ +cos cos $\theta = \frac{1}{2} + \frac{\sqrt{3}}{2}$ \Rightarrow sin sin θ +cos cos θ =sin sin 30⁰ + $cos cos 30^{\circ}$ After comparing, we get $\theta = 30^{\circ}$ Now, $tan tan \theta + cot cot \theta = tan tan 30^{0} +$ $cot \ cot \ 30^{0}$ $=\frac{1}{\sqrt{3}}+\sqrt{3}$ $=\frac{1+\sqrt{3}}{\sqrt{3}}=\frac{4}{\sqrt{3}}$ Hence option (d) 78. Ans. B. As, $A = \theta + \theta$, $0 < \theta < \frac{\pi}{2}$ $\Rightarrow A = 1 - \theta + \theta$ $\Rightarrow A = (\theta)^2 - 2 \times \theta \times \frac{1}{2} + \left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right)^2 + 1$ $\Rightarrow A = \left(\theta - \frac{1}{2}\right)^2 - \frac{1}{4} + 1$ $\Rightarrow A = \left(\theta - \frac{1}{2}\right)^2 + \frac{3}{4} \dots$ (i) A will be minimum when $\theta - \frac{1}{2} = 0$ Then $A_{min} = \frac{3}{4}$ [From (i)] For A_{max} : $\theta = 1$ [As, $0 \le \theta \le 1$] Then $A_{max} = \left(1 - \frac{1}{2}\right)^2 + \frac{3}{4}$

 $= \left(\frac{1}{2}\right)^2 + \frac{3}{4}$ $= \frac{1}{4} + \frac{3}{4} = 1$ Hence $\frac{3}{4} \le A \le 1$ Hence option (b) 79. Ans. A. As we know that $1 + A = cosec^2 A$ $=>cosec^2A - A = 1$ =>(cosec A - cot cot A)(cosec A +cot cot A) = 1(i) As, cotcot A+cosec A-1 cotcot A-cosec A+1 (cotcot A+cosec A)-(cosec A-cotcot A)(cosec A+cotcot A) (cotcot A-cosec A)+1[From (i)] $= \frac{(\cot \cot A + \csc A)(1 - \csc A + \cot \cot A)}{(1 - \csc A + \cot \cot A)}$ (cotcot A-cosec A+1) $= \frac{(\cot \cot A + \csc A)(\cot \cot A - \csc A + 1)}{(\cot \cot A - \csc A + 1)}$ (cotcot A-cosec A+1) = cot cot A + cosec A $=\frac{\cos\cos A}{1+\frac{1}{2}}$ 1 sinsin A sinsin A coscos A+1 sinsin A 1+coscos A sinsin A Hence option (a) 80. Ans. D. As we know that $1^{c} = 57^{0}16'22''$ Statement 1: y = sinx° 0 1º 1c 90 270° 360 450° 540° Clearly, $sin sin 1^c > sin sin 1^0$ Hence statement 1 is incorrect. Statement 2: v = cosx180 360 -90 0 10 10 90 170 410 540 Clearly, $cos cos 1^0 > cos cos 1^c$ Hence statement 2 is incorrect. Statement 3:



Clearly, $tan tan 1^0 < tan tan 1^c$ Hence statement 3 is incorrect. Hence option (d) 81. Ans. C. As, $x + \frac{1}{x} = 2$ (i) $0^0 < x < 90^0$ As, $a^2 + \frac{1}{a^2} = 2$ $\Rightarrow a = 1$(ii) Comparing (i) and (ii) we can conclude tan tan x = 1 \Rightarrow tan tan x = tan tan 45^o $\Rightarrow x = 45^{\circ}$ Hence option (c) 82. Ans. C. Height of Tower h Length of Shadow of Tower = h As, $\tan \tan \theta = \frac{h}{h} = 1$ $\Rightarrow \tan \tan \theta = \tan \tan 45^{\circ}$ $\Rightarrow \theta = 45^{\circ}$ Hence altitude of sun be 45⁰ Hence option (c) 83. Ans. D. Statement 1: As $\sin \sin \theta = \cos(90^{0} - \theta)$ And $\cos \cos \theta = \sin \sin (90^0 - \theta)$ $\frac{\cos\cos 75^{\circ}}{\sin\sin 15^{\circ}} + \frac{\sin\sin 12^{\circ}}{\cos\cos 78^{\circ}} - \frac{\cos\cos 18^{\circ}}{\sin\sin 72^{\circ}}$ $\frac{1}{n \cdot 15^{\circ}} + \frac{1}{\cos \cos 5^{\circ}} - \frac{\cos \cos 18^{\circ}}{\sin \sin 72^{\circ}}$ $\frac{\cos \cos 75^{\circ}}{\sin \sin 75^{\circ}} - \frac{\sin \sin 72^{\circ}}{\sin \sin 75^{\circ}}$ sinsin 15⁰ $+\frac{sinsin(90^{0}-78^{0})}{sinsin(90^{0}-78^{0})}$ $sinsin (90^{0} - 75^{0})$ coscos 78⁰ coscos 18⁰

sinsin (90⁰-18⁰)

 $=\frac{\cos\cos 75^{\circ}}{\cos\cos 75^{\circ}}+\frac{\cos\cos 78^{\circ}}{\cos\cos 78^{\circ}}$ coscos 18⁰ coscos 18⁰ = 1 + 1 - 1 = 1Hence statement 1 is correct. Statement 2: $\frac{\cos\cos 35^{\circ}}{\sin\sin 55^{\circ}} - \frac{\sin\sin 11^{\circ}}{\cos\cos 79^{\circ}} + \cos\cos 28^{\circ} \cdot \csc 62^{\circ}$ $\frac{\cos\cos 35^0}{\sin\sin (90^0 - 79^0)}$ sinsin (90⁰-35⁰) coscos 79⁰ $\frac{\cos\cos 35^{0}}{\sin\sin (90^{0}-35^{0})} - \frac{\sin\sin (90^{0}-79^{0})}{\cos\cos 79^{0}} + \frac{\cos\cos 28^{0}}{\sin\sin 62^{0}}$ $\frac{\cos\cos 35^{\circ}}{\cos\cos 35^{\circ}} - \frac{\cos\cos 79^{\circ}}{\cos\cos 79^{\circ}} + \frac{\cos\cos 28^{\circ}}{\sin\sin(90^{\circ}-28^{\circ})^{\circ}}$ $sinsin (90^{0} - 28^{0})$ $= 1 - 1 + \frac{\cos\cos 28^{\circ}}{\cos\cos 28^{\circ}}$ = 1Hence statement 2 is correct. Statement 3: sinsin 80⁰ –sin sin 59⁰.sec sec 31⁰ coscos 10⁰ $=\frac{sinsin(90^{0}-10^{0})}{sinsin59^{0}}$ coscos 10⁰ *coscos* 31⁰ $=\frac{\cos\cos^2 1}{\cos\cos 10^0}$ - sinsin (90⁰-31⁰) $coscos 10^{\circ} coscos 31^{\circ}$ $= 1 - \frac{coscos 31^{\circ}}{coscos 31^{\circ}} = 1 - 1 = 0$ Hence Hence statement 3 is correct. Hence option (d) 84.





Here, $\triangle POA \cong \triangle POB$ (BY AAS) then AO = BO $\triangle POB \cong \triangle POC$ (BY AAS) then BO = CO i.e. AO = BO = CO (Distance of sides from vertex are equal)

AS, we know that, distance between the circumcenter and vertices are equal. Hence, P must be circumcenter. Hence option (b)

85. Ans. B. As, tan1^o tan2^o tan3^otan87^o tan88^o tan890 $= \tan(90^{\circ} - 89^{\circ})\tan(90^{\circ} - 88^{\circ})\dots\tan(90^{\circ} - 88^{\circ})$ tan890 = cot89⁰ cot88⁰tan88⁰ tan89⁰ $=\frac{1}{tan89^{0}}\times\frac{1}{tan88^{0}}\times\dots\dots tan88^{0}tan89^{0}$ $= 1 \times 1 \times 1 \dots \dots \times 1 \times 1$ =1 Hence option (b) 86. Ans. A. Total score of class X = 83xTotal score of class Y = 76yTotal score of class Z = 85z According to question, $\frac{83x+76y}{2} = 79$ x+y=>83x + 76y = 79x + 79y=>4x = 3y.....(i) Also, $\frac{76y+85z}{2} = 81$ y+z=>76y + 85z = 81y + 81z=>4z = 5y....(ii)From equation (i) and (ii), we get $\frac{x}{3} = \frac{y}{4} = \frac{z}{5} = t \text{ (say)}$ Then, x = 3t, y = 4t, z = 5t Now, $\frac{83x + 76y + 85z}{83x + 76x + 85x + 5t} = \frac{83 \times 3t + 76 \times 4t + 85 \times 5t}{83x + 76x + 85x + 5t}$ $=\frac{x+y+z}{249t+304t+425t} = \frac{3t+4t+5t}{978} = 81.5$ Hence average score of x, y and z be 81.5 Hence option (a) 87. Ans. A. Data in ascending order be x -3.5, x-3, x-2.5, x-2, x-0.5, x+0.5, x+4, x+5 Here number of term is even. Median = $\frac{(\frac{n}{2})^{th} term + (\frac{n}{2}+1)^{th} term}{2}$ = $\frac{x-2+x-0.5}{2} = \frac{2x-2.5}{2} = x - 1.25$ Hence option (a) 88. Ans. D. Let data be p, q, r, s, 20.5, t, u, v, w After increasing the largest four number by 2 then new data be p, q, r, s, 20.5, t + 2, u + 2, v + 2, w + 2(i) Clearly, from (i), Median remains same. Hence option (d)

89. Ans. C. Let the cricketer's average be x run per match According to question, $\frac{10x+108}{11} = x + 6$ =>11x + 66 = 10x + 108 => x = 42New average = 42 + 6 = 48Hence option (c) 90. Ans. A. As mean of 20 observation = 17 Then, sum of 20 observations = $17 \times 20 = 340$ According to question, $\frac{340-3-6+8+9}{20} = \frac{348}{20} = 17.4$ Hence option (a) 91. Ans. B. Discrete data is information that can be categorized into a classification. Discrete data is based on counts. Only a finite number of values is possible, and the values cannot be subdivided meaningfully. Hence number of credit card held by an individual can be treated as discrete data. Hence option (b) 92. Ans. B. Number of total students = 100Number of boys = 70Number of girls = 30Average of boys = 75Total marks of boys = $75 \times 70 = 5250$ Average of class = 72Total marks of class = $72 \times 100 = 7200$ Average marks of girls = $\frac{7200-5250}{30} = \frac{1950}{30} =$ 65 Hence option (b) 93. Ans. C. As a particular sector of pie chart for corporate tax be 108° at the center Then, percentage of income from corporate tax to total funds = $\frac{108^{\circ}}{360^{\circ}} \times 100 = 30\%$ Hence option (c) 94. Ans. D. When the lower and the upper class limit is included, then it is an inclusive class interval. For example - 220 - 234, 235 - 249 etc. are inclusive type of class intervals. When the lower limit is included, but the upper limit is excluded, then it is an **exclusive** class interval. For example - 150 - 153, 153 -

156.....etc are exclusive type of class intervals.e.g. 15-20, 20-25 etc Hence both the statements are incorrect. Hence option (d) 95. Ans. D. Given, class interval be 10-15 Frequency be 30 Frequency density = $\frac{frequency}{upper limit-lower limit}$ =

 $\frac{30}{15-10} = \frac{30}{5} = 6$ Hence option (d) 96. Ans. C. As, s = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} According to question,

Number	Pairs(a, b) when, ab>12
	and a ≠b
12×1+4 = 16	(8,2) and (2,8)
12×2+4 = 28	(4,7) and (7,4)
$12 \times 3 + 4 = 40$	(10,4), (4,10), (5,8) and
	(8,5)
12×4+4 = 52	Not possible pairs
$12 \times 5 + 4 = 64$	Not possible pairs
$12 \times 6 + 4 = 76$	Not possible pairs
$12 \times 7 + 4 = 88$	Not possible pairs

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Hence possible number of pairs = 8
Hence option (c)
97. Ans. D.
As we know that
(x^n + y^n) is divided by (x + y)
If n be odd, then remainder be zero.
From question,
(13^5 + 16^5) + (14^5 + 15^5)
As, (13^5 + 16^5) is divided by 29 so, remainder
be zero.
Also, (14^5 + 15^5) is divided by 29 so,
remainder be zero.
Hence, 13<sup>5</sup> + 14<sup>5</sup> + 15<sup>5</sup> + 16<sup>5</sup> is divided by 29
then remainder will be zero.
Hence option (d)
98. Ans. B.
As we know that, \sum n^2 = \frac{n(n+1)(2n+1)}{6}
And, \sum n^3 = \left(\frac{n(n+1)}{2}\right)^2
\sum_{n=1}^{10} n^2 = \frac{10 \times 11 \times 21}{6} = 385
\sum_{n=1}^{10} \quad n^3 = \left(\frac{10 \times 11}{2}\right)^2 = 3025
Required difference = 3025 - 385 = 2640
```

Hence option (b) 99. Ans. C. Since distance is same in both ride. Then, the average speed $=\frac{2xy}{x+y} = \frac{2 \times 50 \times 30}{50+30} = \frac{3000}{80} = 37.5 \ km/hr$ Hence option (c) 100. Ans. B. As, $x + \frac{1}{1+\frac{1}{2+\frac{1}{3}}} = 2$ $=> x + \frac{1}{1+\frac{1}{\frac{6+1}{3}}} = 2$ $=> x + \frac{1}{\frac{1+\frac{3}{7}}{10}} = 2$ $=> x + \frac{1}{\frac{10}{7}} = 2$ $=> x + \frac{20-7}{10} = \frac{13}{10}$ Hence option (b)