

1. When a natural number  $n$  is divided by 4, the remainder is 3. What is the remainder when  $2n$  is divided by 4 ?
  - (a) 1
  - (b) 2
  - (c) 3
  - (d) 6
2. What is the last digit in the expansion of  $(2457)^{754}$  ?
  - (a) 3
  - (b) 7
  - (c) 8
  - (d) 9
3. If  $\log_r 6 = m$  and  $\log_r 3 = n$ , then what is  $\log_r (r/2)$  equal to ?
  - (a)  $m - n + 1$
  - (b)  $m + n - 1$
  - (c)  $1 - m - n$
  - (d)  $1 - m + n$
4. Consider the following statements :  
A number  $a_1 a_2 a_3 a_4 a_5$  is divisible by 9 if
  1.  $a_1 + a_2 + a_3 + a_4 + a_5$  is divisible by 9.
  2.  $a_1 - a_2 + a_3 - a_4 + a_5$  is divisible by 9.
 Which of the above statements is/are correct ?
  - (a) 1 only
  - (b) 2 only
  - (c) Both 1 and 2
  - (d) Neither 1 nor 2
5. What is  $x(y - z)(y + z) + y(z - x)(z + x) + z(x - y)(x + y)$  equal to ?
  - (a)  $(x + y)(y + z)(z + x)$
  - (b)  $(x - y)(x - z)(z - y)$
  - (c)  $(x + y)(z - y)(x - z)$
  - (d)  $(y - x)(z - y)(x - z)$
6. If the remainder of the polynomial  $a_0 + a_1x + a_2x^2 + \dots + a_nx^n$  when divided by  $(x - 1)$  is 1, then which one of the following is correct ?
  - (a)  $a_0 + a_2 + \dots = a_1 + a_3 + \dots$
  - (b)  $a_0 + a_2 + \dots = 1 + a_1 + a_3 + \dots$
  - (c)  $1 + a_0 + a_2 + \dots = -(a_1 + a_3 + \dots)$
  - (d)  $1 - a_0 - a_2 + \dots = a_1 + a_3 + \dots$
7. When  $(x^3 - 2x^2 + px - q)$  is divided by  $(x^2 - 2x - 3)$ , the remainder is  $(x - 6)$ . What are the values of  $p, q$  respectively ?
  - (a)  $-2, -6$
  - (b)  $2, -6$
  - (c)  $-2, 6$
  - (d)  $2, 6$
8. What are the values of  $c$  when the HCF of  $x^3 + cx^2 - x + 2c$  and  $x^2 + cx - 2$  over the rationals is a linear polynomial ?
  - (a)  $\pm 1$
  - (b)  $\pm 2$
  - (c)  $\pm 3$
  - (d)  $\pm 4$
9. If  $(x + 2)$  is the HCF of  $x^2 + ax + b$  and  $x^2 + cx + d$  ( $a \neq c$  and  $b \neq d$ ), then which one of the following is correct ?
  - (a)  $a + c = b + d$
  - (b)  $2a + b = 2c + d$
  - (c)  $b + 2c = 2a + d$
  - (d)  $b - 2c = 2a - d$
10. What is the LCM of  $(x^2 - y^2 - z^2 - 2yz)$ ,  $(x^2 - y^2 + z^2 + 2xz)$  and  $(x^2 + y^2 - z^2 - 2xy)$  ?
  - (a)  $(x + y + z)(x + y - z)(x - y + z)$
  - (b)  $(x + y + z)(x - y - z)(x - y + z)$
  - (c)  $(x + y + z)(x + y - z)(x - y - z)$
  - (d)  $(x + y - z)(x - y - z)(x - y + z)$

11. If  $3^x + 27(3^{-x}) = 12$ , then what is the value of  $x$  ?
- (a) 1 only  
 (b) 2 only  
 (c) 1 or 2  
 (d) 0 or 1
12. If  $x = 1 + \sqrt{2}$ , then what is the value of  $x^4 - 4x^3 + 4x^2$  ?
- (a) -1  
 (b) 0  
 (c) 1  
 (d) 2
13. What is the magnitude of difference of the roots of  $x^2 - ax + b = 0$  ?
- (a)  $\sqrt{a^2 - 4b}$   
 (b)  $\sqrt{b^2 - 4a}$   
 (c)  $2\sqrt{a^2 - 4b}$   
 (d)  $\sqrt{b^2 - 4ab}$
14. What is the solution of the equations  $x - y = 0.9$  and  $11(x + y)^{-1} = 2$  ?
- (a)  $x = 3.2$  and  $y = 2.3$   
 (b)  $x = 1$  and  $y = 0.1$   
 (c)  $x = 2$  and  $y = 1.1$   
 (d)  $x = 1.2$  and  $y = 0.3$
15. Pooja started her job with certain monthly salary and gets a fixed increment every year. If her salary was Rs. 4200 after 3 years and Rs. 6800 after 8 years of service, then what are her initial salary and the annual increment respectively ?
- (a) 2640, 320  
 (b) 2460, 320  
 (c) 2460, 520  
 (d) 2640, 520
16. A person bought 5 tickets from a station P to a station Q and 10 tickets from the station P to a station R. He paid Rs. 350. If the sum of a ticket from P to Q and a ticket from P to R is Rs. 42, then what is the fare from P to Q ?
- (a) 12  
 (b) 14  
 (c) 16  
 (d) 18
17. The product of two alternate odd integers exceeds three times the smaller by 12. What is the larger number ?
- (a) 3  
 (b) 5  
 (c) 7  
 (d) 9
18. If  $a^x = c^q = b$  and  $c^y = a^z = d$  then which one of the following is correct ?
- (a)  $x/y = q/z$   
 (b)  $x + y = q + z$   
 (c)  $xy = qz$   
 (d)  $x^y = q^z$
19. A ball is dropped from a height 64 m above the ground and every time it hits the ground it rises to a height equal to half of the previous. What is the height attained after it hits the ground for the 16<sup>th</sup> time ?
- (a)  $2^{-12}$  m  
 (b)  $2^{-11}$  m  
 (c)  $2^{-10}$  m  
 (d)  $2^{-9}$  m

20. What is the value of  $2 \log(5/8) + \log(128/125) + \log(5/2)$  ?
- (a) 0  
(b) 1  
(c) 2  
(d) 5
21. If  $x \cos 60^\circ + y \cos 0^\circ = 3$  and  $4x \sin 30^\circ - y \cot 45^\circ = 2$ , then what is the value of  $x$  ?
- (a) -1  
(b) 0  
(c) 1  
(d) 2
22. If the unit of weight is  $15/4$  kg, what number will  $3/2$  quintal represent ?
- (a) 25  
(b) 6  
(c)  $1/9$   
(d) None of the above
23. A dishonest dealer professes to sell his goods at cost price, but uses a false weight and thus gains 20%. For a kilogram he uses a weight of
- (a) 700 g  
(b) 750 g  
(c) 800 g  
(d) 850 g
24. If we divide a positive integer by another positive integer, what is the resulting number ?
- (a) It is always a natural number  
(b) It is always an integer  
(c) It is a rational number  
(d) It is an irrational number
25. Nine numbers are written in ascending order. The middle number is the average of the nine numbers. The average of the first five larger numbers is 68 and that of five smaller numbers is 44. What is the sum of all nine numbers ?
- (a) 450  
(b) 501  
(c) 504  
(d) 540
26. What is the value of
- $$\left( \frac{1}{\sqrt{9}-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-\sqrt{4}} \right) ?$$
- (a) 0  
(b)  $1/3$   
(c) 1  
(d) 5
27. Two persons P and Q start at the same time from city A for city B, 60 km away. P travels 4 km/hr slower than Q. Q reaches city B and at once turns back meeting P, 12 km from city B. What is the speed of P ?
- (a) 8 km/hr  
(b) 12 km/hr  
(c) 16 km/hr  
(d) 20 km/hr

28. A boy walks from his house to school at 2.5 km/hr and arrives 12 minutes late. The next day he walks at 4 km/hr and reaches the school 15 minutes earlier. What is the distance from his house to school ?
- (a) 2 km  
(b) 2.5 km  
(c) 3 km  
(d) 3.5 km
29. A and B can do a piece of work in 8 days, B and C can do the same work in 12 days. If A, B and C can complete the same work in 6 days, in how many days can A and C complete the same work ?
- (a) 8  
(b) 10  
(c) 12  
(d) 16
30. The compound interest on a sum for 2 years is Rs. 832 and the simple interest on the same sum at the same rate for the same period is Rs. 800. What is the rate of interest ?
- (a) 6%  
(b) 8%  
(c) 10%  
(d) 12%
31. A person invested part of Rs. 45,000 at 4% and the rest at 6%. If his annual income from both are equal, then what is the average rate of interest ?
- (a) 4.6%  
(b) 4.8%  
(c) 5.0%  
(d) 5.2%
32. What would be the printed price of a watch purchased at Rs. 380, so that after giving 5% discount, there is 25% profit ?
- (a) Rs. 400  
(b) Rs. 450  
(c) Rs. 500  
(d) Rs. 600
33. A person A sells a table costing Rs. 2000 to a person B and earns a profit of 6%. The person B sells it to another person C at a loss of 5%. At what price did B sell the table ?
- (a) Rs. 2054  
(b) Rs. 2050  
(c) Rs. 2024  
(d) Rs. 2014
34. If  $a:b = 1\frac{1}{2} : 2\frac{1}{4}$  and  $b:c = 2 : 3\frac{1}{2}$  then what is  $a : b : c$  equal to ?
- (a) 12 : 8 : 21  
(b) 8 : 21 : 12  
(c) 8 : 12 : 21  
(d) 21 : 8 : 12
35. A bag contains Rs. 114 in the form of 1 rupee, 50 paise and 10 paise coins in the ratio 3 : 4 : 10. What is the number of 50 paise coins ?
- (a) 76  
(b) 72  
(c) 56  
(d) 48

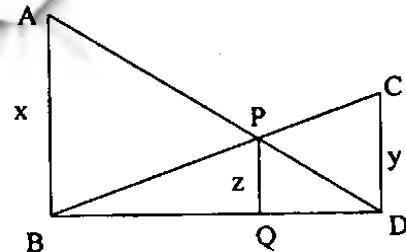
36. Two taps can fill a tub in 5 minutes and 7 minutes respectively. A pipe can empty it in 3 minutes. If all the three are kept open simultaneously, when will the tub be full ?
- (a) 60 min  
(b) 85 min  
(c) 90 min  
(d) 105 min
37. If  $(x/y) = (z/w)$ , then what is  $(xy + zw)^2$  equal to ?
- (a)  $(x^2 + z^2)(y^2 + w^2)$   
(b)  $x^2y^2 + z^2w^2$   
(c)  $x^2w^2 + y^2z^2$   
(d)  $(x^2 + w^2)(y^2 + z^2)$
38. If  $\frac{1}{x+1} + \frac{2}{y+2} + \frac{1009}{z+1009} = 1$ , then what is the value of  $\frac{x}{x+1} + \frac{y}{y+2} + \frac{z}{z+1009}$  ?
- (a) 0  
(b) 2  
(c) 3  
(d) 4
39. Suppose  $y$  is equal to the sum of two quantities of which one varies directly as  $x$  and the other inversely as  $x$ . If  $y = 6$  when  $x = 4$ , and  $y = 10/3$  when  $x = 3$ , then what is the relation between  $x$  and  $y$  ?
- (a)  $y = x + (4/x)$   
(b)  $y = -2x + (4/x)$   
(c)  $y = 2x + (8/x)$   
(d)  $y = 2x - (8/x)$
40. A train of length 150 m takes 10 s to cross another train 100 m long coming from the opposite direction. If the speed of first train is 30 kmph, what is the speed of second train ?
- (a) 72 kmph  
(b) 60 kmph  
(c) 54 kmph  
(d) 48 kmph
41. There are some coins and rings of either gold or silver in a box. 60% of the objects are coins, 40% of the rings are of gold and 30% of the coins are of silver. What is the percentage of gold articles ?
- (a) 16  
(b) 27  
(c) 58  
(d) 70
42. What is the total number of three digit numbers with unit digit 7 and divisible by 11 ?
- (a) 6  
(b) 7  
(c) 8  
(d) 9
43. What is the sum of positive integers less than 100 which leave a remainder 1 when divided by 3 and leave a remainder 2 when divided by 4 ?
- (a) 416  
(b) 620  
(c) 1250  
(d) 1314

44. What is the greatest number which divides 392, 486 and 627 so as to leave the same remainder in each case ?  
(a) 47  
(b) 43  
(c) 37  
(d) 34
45. A man walking at the rate 3 km/hr crosses a square field diagonally in 1 minute. What is the area of the field ?  
(a) 1000 m<sup>2</sup>  
(b) 1250 m<sup>2</sup>  
(c) 2500 m<sup>2</sup>  
(d) 5000 m<sup>2</sup>
46. The difference between the area of a square and that of an equilateral triangle on the same base is  $\frac{1}{4}$  cm<sup>2</sup>. What is the length of side of triangle ?  
(a)  $(4 - \sqrt{3})^{1/2}$  cm  
(b)  $(4 + \sqrt{3})^{1/2}$  cm  
(c)  $(4 - \sqrt{3})^{-1/2}$  cm  
(d)  $(4 + \sqrt{3})^{-1/2}$  cm
47. A horse is tied to a pole fixed at one corner of a 50 m × 50 m square field of grass by means of a 20 m long rope. What is the area of that part of the field which the horse can graze ?  
(a) 1256 m<sup>2</sup>  
(b) 942 m<sup>2</sup>  
(c) 628 m<sup>2</sup>  
(d) 314 m<sup>2</sup>
48. Two sides of a parallelogram are 10 cm and 15 cm. If the altitude corresponding to the side of length 15 cm is 5 cm, then what is the altitude to the side of length 10 cm ?  
(a) 5 cm  
(b) 7.5 cm  
(c) 10 cm  
(d) 15 cm
49. From a rectangular metal sheet of sides 25 cm and 20 cm, a circular sheet as large as possible is cut-off. What is the area of the remaining sheet ?  
(a) 186 cm<sup>2</sup>  
(b) 144 cm<sup>2</sup>  
(c) 93 cm<sup>2</sup>  
(d) 72 cm<sup>2</sup>
50. Three cubes each of side 5 cm are joined end to end. What is the surface area of the resulting cuboid ?  
(a) 300 cm<sup>2</sup>  
(b) 350 cm<sup>2</sup>  
(c) 375 cm<sup>2</sup>  
(d) 400 cm<sup>2</sup>
51. The diameter of the moon is approximately one-fourth of that of the earth. What is the (approximate) ratio of the volume of the moon to that of earth ?  
(a) 1/16  
(b) 1/32  
(c) 1/48  
(d) 1/64

52. What is the area of a right angled isosceles triangle whose hypotenuse is  $6\sqrt{2}$  cm ?
- (a)  $12 \text{ cm}^2$   
 (b)  $18 \text{ cm}^2$   
 (c)  $24 \text{ cm}^2$   
 (d)  $36 \text{ cm}^2$
53. If A is the area of a triangle in  $\text{cm}^2$ , whose sides are 9 cm, 10 cm and 11 cm, then which one of the following is correct ?
- (a)  $A < 40 \text{ cm}^2$   
 (b)  $40 \text{ cm}^2 < A < 45 \text{ cm}^2$   
 (c)  $45 \text{ cm}^2 < A < 50 \text{ cm}^2$   
 (d)  $A > 50 \text{ cm}^2$
54. A roller of diameter 70 cm and length 2 m is rolling on the ground. What is the area covered by the roller in 50 revolutions ?
- (a)  $180 \text{ m}^2$   
 (b)  $200 \text{ m}^2$   
 (c)  $220 \text{ m}^2$   
 (d)  $240 \text{ m}^2$
55. A cylindrical rod of length h is melted and cast into a cone of base radius twice that of the cylinder. What is the height of the cone ?
- (a)  $3h/4$   
 (b)  $4h/3$   
 (c)  $2h$   
 (d)  $h/2$
56. A cylindrical vessel of base radius 14 cm is filled with water to some height. If a rectangular solid of dimensions  $22 \text{ cm} \times 7 \text{ cm} \times 5 \text{ cm}$  is immersed in it, what is the rise in water level ?
- (a) 0.5 cm  
 (b) 1.0 cm  
 (c) 1.25 cm  
 (d) 1.5 cm

57. A lead pencil is in the shape of a cylinder. The pencil is 21 cm long with radius 0.4 cm and its lead is of radius 0.1 cm. What is the volume of wood in the pencil ?
- (a)  $9 \text{ cm}^3$   
 (b)  $9.4 \text{ cm}^3$   
 (c)  $9.9 \text{ cm}^3$   
 (d)  $10.1 \text{ cm}^3$
58. What is the angle (in radian) included between the hands of a clock, when the time is 10 minutes past 5 ?
- (a)  $17\pi/36$   
 (b)  $19\pi/36$   
 (c)  $5\pi/9$   
 (d)  $7\pi/12$

59.



In the figure given above

$$\angle ABD = \angle PQD = \angle CDQ = \frac{\pi}{2}.$$

If  $AB = x$ ,  $PQ = z$  and  $CD = y$ , then which one of the following is correct ?

- (a)  $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$   
 (b)  $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$   
 (c)  $\frac{1}{z} + \frac{1}{y} = \frac{1}{x}$   
 (d)  $\frac{1}{x} + \frac{1}{y} = \frac{2}{z}$

60.  $\Delta PQR$  is right angled at Q,  $PR = 5$  cm and  $QR = 4$  cm. If the lengths of sides of another triangle  $ABC$  are 3 cm, 4 cm and 5 cm, then which one of the following is correct ?

- (a) Area of  $\Delta PQR$  is double that of  $\Delta ABC$
- (b) Area of  $\Delta ABC$  is double that of  $\Delta PQR$

(c)  $\angle B = \frac{\angle Q}{2}$

- (d) Both triangles are congruent

61. Which one of the following figures has only one line of symmetry ?

- (a) Rhombus
- (b) Rectangle
- (c) Isosceles trapezium
- (d) Parallelogram

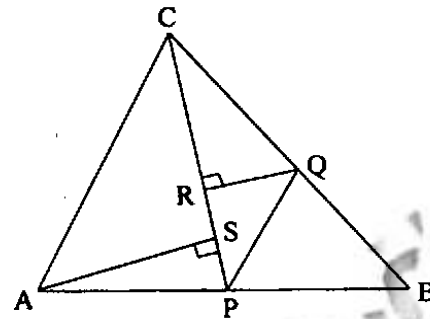
62. A ladder 25 m long is leaning against a wall which is perpendicular to the level ground. The bottom of the ladder is 7 m from the base of the wall. If the top of the ladder slips down 4 m, how much will the bottom of the ladder slip ?

- (a) 7 m
- (b) 8 m
- (c) 10 m
- (d) 15 m

63. If  $C_1$  and  $C_2$  and  $r_1$  and  $r_2$  are respectively the centroids and radii of incircles of two congruent triangles, then which one of the following is correct ?

- (a)  $C_1$  and  $C_2$  are the same point and  $r_1 = r_2$
- (b)  $C_1$  and  $C_2$  are not necessarily the same point and  $r_1 = r_2$
- (c)  $C_1$  and  $C_2$  are the same point and  $r_1$  is not necessarily equal to  $r_2$
- (d)  $C_1$  and  $C_2$  are not necessarily the same point and  $r_1$  is not necessarily equal to  $r_2$

64.



In the figure given above, P is a point on AB and PQ is parallel to AC. What is the number of pairs of distinct similar triangles in the figure ?

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

65. If the medians of two equilateral triangles are in the ratio 3 : 2, then what is the ratio of their sides ?

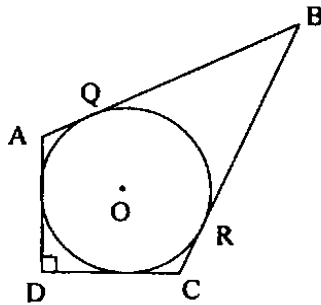
- (a) 1 : 1
- (b) 2 : 3
- (c) 3 : 2
- (d)  $\sqrt{3} : \sqrt{2}$

66. The centroid and the orthocenter are coincident for which one of the following triangles ?

- (a) Scalene triangle
- (b) Isosceles triangle
- (c) Equilateral triangle
- (d) Right angled triangle



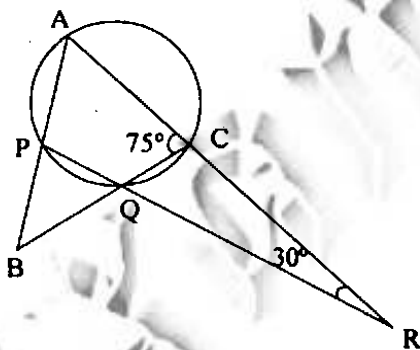
67.



In the figure given above, a circle is inscribed in a quadrilateral ABCD. Given that  $BC = 38$  cm,  $QB = 27$  cm,  $DC = 25$  cm and AD is perpendicular to DC. What is the radius of the circle ?

- (a) 11 cm
- (b) 14 cm
- (c) 15 cm
- (d) 16 cm

68.



In the figure given above, what is  $\angle CBA$  ?

- (a)  $30^\circ$
- (b)  $45^\circ$
- (c)  $50^\circ$
- (d)  $60^\circ$

69. A, B, C, D are four distinct points on a circle whose centre is at O.

If  $\angle OBD - \angle CDB = \angle CBD - \angle ODB$ , then what is  $\angle A$  equal to ?

- (a)  $45^\circ$
- (b)  $60^\circ$
- (c)  $120^\circ$
- (d)  $135^\circ$

70. PQ is a common chord of two circles.

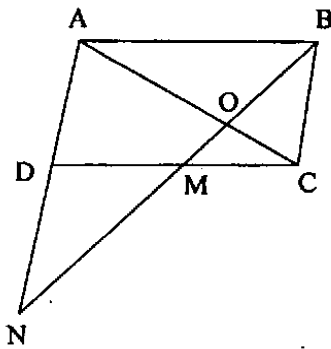
APB is a secant line joining points A and B on the two circles. Two tangents AC and BC are drawn. If  $\angle ACB = 45^\circ$ , then what is  $\angle AQB$  equal to ?

- (a)  $75^\circ$
- (b)  $90^\circ$
- (c)  $120^\circ$
- (d)  $135^\circ$

71. ABCD is a concyclic quadrilateral. The tangents at A and C intersect each other at P. If  $\angle ABC = 100^\circ$ , then what is  $\angle APC$  equal to ?

- (a)  $10^\circ$
- (b)  $20^\circ$
- (c)  $30^\circ$
- (d)  $40^\circ$

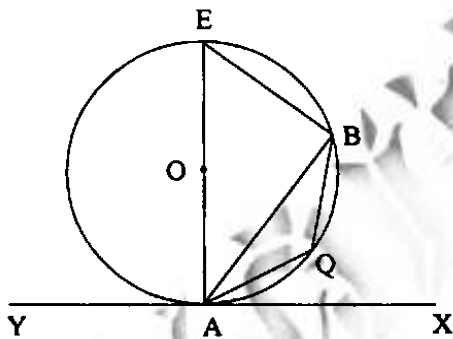
72.



In the figure given above, M is the mid point of the side CD of the parallelogram ABCD. What is  $ON : OB$  ?

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

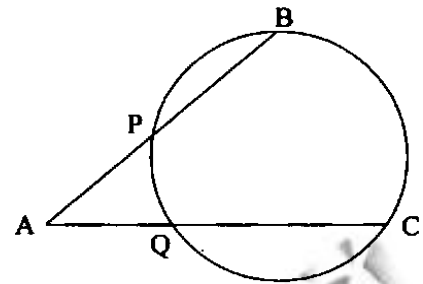
73.



In the figure given above, YAX is a tangent to the circle with centre O. If  $\angle BAX = 70^\circ$  and  $\angle BAQ = 40^\circ$ , then what is  $\angle ABQ$  equal to ?

- (a)  $20^\circ$
- (b)  $30^\circ$
- (c)  $35^\circ$
- (d)  $40^\circ$

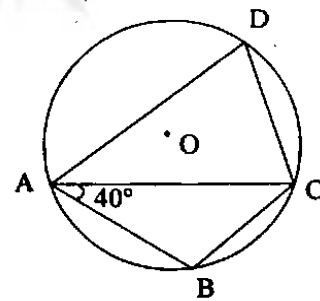
74.



In the figure given above,  $AP = 3$  cm,  $PB = 5$  cm,  $AQ = 2$  cm and  $QC = x$ . What is the value of  $x$  ?

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

75.



In the figure given above, O is the centre of a circle circumscribing a quadrilateral ABCD. If  $AB = BC$  and  $\angle BAC = 40^\circ$ , then what is  $\angle ADC$  equal to ?

- (a)  $50^\circ$
- (b)  $60^\circ$
- (c)  $70^\circ$
- (d)  $80^\circ$

76. Let  $\overline{AB}$  and  $\overline{AC}$  be two rays intersecting at A. Let D, E be the points lying on  $\overline{AB}$ ,  $\overline{AC}$  respectively and P be the point such that P divides the line DE such that  $PD : PE = AD : AE$ . What is the locus of the point P ?
- The angle bisector of angle A
  - The angle trisector of angle A
  - The perpendicular bisector of angle A
  - None of the above
77. What is  $\log (\tan 1^\circ) + \log (\tan 2^\circ) + \log (\tan 3^\circ) + \dots + \log (\tan 89^\circ)$  equal to ?
- 0
  - 1
  - 2
  - 1
78. Consider the following equations :
- $\operatorname{cosec}^2 x + \sec^2 x = \operatorname{cosec}^2 x \sec^2 x$
  - $\sec^2 x + \tan^2 x = \sec^2 x \tan^2 x$
  - $\operatorname{cosec}^2 x + \tan^2 x = \cot^2 x + \sec^2 x$
- Which of the above statements are correct ?
- 1 and 2 only
  - 2 and 3 only
  - 1 and 3 only
  - 1, 2 and 3
79. If  $\cos x + \cos^2 x = 1$ , then what is the value of  $\sin^2 x + \sin^4 x$  ?
- 0
  - 1
  - 2
  - 4
80. If  $\sin x \cos x = 1/2$ , then what is the value of  $\sin x - \cos x$  ?
- 2
  - 1
  - 0
  - 1
81. If  $\tan^2 y \operatorname{cosec}^2 x - 1 = \tan^2 y$ , then which one of the following is correct ?
- $x - y = 0$
  - $x = 2y$
  - $y = 2x$
  - $x - y = 1^\circ$
82. If  $\frac{\cos x}{1 + \operatorname{cosec} x} + \frac{\cos x}{\operatorname{cosec} x - 1} = 2$ , which one of the following is one of the values of x ?
- $\pi/2$
  - $\pi/3$
  - $\pi/4$
  - $\pi/6$
83. If  $x + y = 90^\circ$  and  $\sin x : \sin y = \sqrt{3} : 1$ , then what is  $x : y$  equal to ?
- 1 : 1
  - 1 : 2
  - 2 : 1
  - 3 : 2
84. If  $\frac{\cos x}{\cos y} = n$ ,  $\frac{\sin x}{\sin y} = m$ , then what is  $(m^2 - n^2) \sin^2 y$  equal to ?
- $1 - n^2$
  - $1 + n^2$
  - $m^2$
  - $n^2$

85. If  $0 \leq x \leq \pi/2$ , then which one of the following is always correct ?
- $\sin^2 x < 1/2$  and  $\cos^2 x > 1/2$
  - $\sin^2 x > 1/2$  and  $\cos^2 x < 1/2$
  - $\sin^2 x < 1/2$  and  $\cos^2 x < 1/2$
  - At least one of  $\sin^2 x$ ,  $\cos^2 x$  is less than 1
86. If  $p = \tan^2 x + \cot^2 x$ , then which one of the following is correct ?
- $p \leq 2$
  - $p \geq 2$
  - $p < 2$
  - $p > 2$
87. What is the value of
- $$\frac{5 \sin 75^\circ \sin 77^\circ + 2 \cos 13^\circ \cos 15^\circ}{\cos 15^\circ \sin 77^\circ}$$
- $$\frac{7 \sin 81^\circ}{\cos 9^\circ} ?$$
- 1
  - 0
  - 1
  - 2
88. A radio transmitter antenna of height 100 m stands at the top of a tall building. At a point on the ground, the angle of elevation of bottom of the antenna is  $45^\circ$  and that of top of antenna is  $60^\circ$ . What is the height of the building ?
- 100 m
  - 50 m
  - $50(\sqrt{3} + 1)$  m
  - $50(\sqrt{3} - 1)$  m
89. The angle of elevation of the top of an unfinished pillar at a point 150 m from its base is  $30^\circ$ . If the angle of elevation at the same point is to be  $45^\circ$ , then the pillar has to be raised to a height of how many meters ?
- 59.4 m
  - 61.4 m
  - 62.4 m
  - 63.4 m
90. Which one of the following represents statistical data ?
- The names of all owners of shops located in a shopping complex
  - A list giving the names of all states of India
  - A list of all European countries and their respective capital cities
  - The volume of a rainfall in certain geographical area, recorded every month for 24 consecutive months
91. If  $\sin x + \sin y = a$  and  $\cos x + \cos y = b$ , what is  $\sin x \cdot \sin y + \cos x \cdot \cos y$  equal to ?
- $a + b - ab$
  - $a + b + ab$
  - $a^2 + b^2 - 2$
  - $\left( \frac{a^2 + b^2 - 2}{2} \right)$

92. The arithmetic mean of a set of 10 numbers is 20. If each number is first multiplied by 2 and then increased by 5, then what is the mean of new numbers ?

- (a) 20
- (b) 25
- (c) 40
- (d) 45

93. Consider the following types of data :

1. Marks of students who appeared for a test of 100 marks.
2. Collar sizes of 200 shirts sold in a week.
3. Monthly incomes of 250 employees of a factory.

For which of the above data, mode is a suitable measure of central tendency ?

- (a) 1 and 2 only
- (b) 2 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

94. The mean of 25 observations is 36. The mean of first 13 observations is 32 and that of last 13 observations is 39. What is the value of 13<sup>th</sup> observation ?

- (a) 20
- (b) 23
- (c) 32
- (d) 40

95. Data on percentage distribution of area of land in acres owned by households in two districts of a particular state are as follows :

Land holding	District-A	District-B
0.01—0.99	5.62	13.53
1.0—2.49	18.35	21.84
2.5—7.49	47.12	39.32
7.5—12.49	19.34	12.15
12.5—19.99	7.21	7.43
20.0—29.99	2.36	5.73

What is the appropriate diagram to represent the above data ?

- (a) Pie diagram
- (b) Histogram
- (c) Bar chart
- (d) None of the above

96. If  $\alpha$  is the angle of first quadrant such that  $\operatorname{cosec}^4 \alpha = 17 + \cot^4 \alpha$ , then what is the value of  $\sin \alpha$  ?

- (a)  $1/3$
- (b)  $1/4$
- (c)  $1/9$
- (d)  $1/16$

97. If  $x + (1/x) = 2 \cos \alpha$ , then what is the value of  $x^2 + (1/x^2)$  ?

- (a)  $4 \cos^2 \alpha$
- (b)  $4 \cos^2 \alpha - 1$
- (c)  $2 \cos^2 \alpha - 2 \sin^2 \alpha$
- (d)  $\cos^2 \alpha - \sin^2 \alpha$

**Directions :**

Each of the next **THREE (03)** items consists of two statements, one labelled as the 'Assertion (A)' and the other as 'Reason (R)'. You are to examine these two statements carefully and select the answers to these items using the codes given below :

**Codes :**

- (a) Both A and R are individually true and R is the correct explanation of A
- (b) Both A and R are individually 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

98. Assertion (A) : If two triangles have same perimeter, then they are congruent.

Reason (R) : If under a given correspondence, the three sides of one triangle are equal to the three sides of the other triangle, then the two triangles are congruent.

99. ABC is a triangle. Let D, E denote the mid points of BC, CA respectively. Let AD and BE intersect at G. Let O be a point on AD such that  $AO : OD = 2 : 7$ .

Assertion (A) :  $AO = (2 GD)/3$

Reason (R) :  $OD = (2 AG)/3$

100. ABC is a triangle. AD, BE, CF are altitudes of  $\Delta ABC$ .

Assertion (A) :  $(AB^2 + BC^2 + CA^2) > (AD^2 + BE^2 + CF^2)$

Reason (R) :  $(AE^2 - AF^2) + (BF^2 - BD^2) + (CD^2 - CE^2) = 0$