

Set III

1. A total of 28 handshakes were exchanged at the conclusion of a party. Assuming that each participant was equally polite toward all the other, the number of people present was :
- (a) 14 (b) 28
(c) 56 (d) 8
2. In the set of equations $z^x = y^{2x}$, $2^z = 2 \cdot 4^x$, $x + y + z = 16$, the integral roots in the order x, y, z are :
- (a) 3, 4, 9 (b) 9, -5, 12
(c) 12, -5, 9 (d) 4, 3, 9
3. Let D represent a repeating decimal. If P denotes the r figures of D which do not repeat themselves, and Q denotes the s figures which do repeat themselves, then the incorrect expression is :
- (a) $D = .PQQQ \dots$ (b) $10^r D = P.QQQ \dots$
(c) $10^{r+s} D = PQ.QQQ \dots$ (d) $10^r (10^s - 1) D = Q(P - 1)$
4. A and B together can do a job in 2 days; B and C can do it four days; and A and C in $\frac{2}{5}$ days. The number of days required for A to do the job alone is :
- (a) 1 (b) 3
(c) 6 (d) 12

Space for Rough Work

5. Two candles of the same height are lighted at the same time. The first is consumed in 4 hours and the second in 3 hours. Assuming that each candle burns at a constant rate, in how many hours after being lighted was the first candle twice the height of the second?
- (a) $\frac{3}{4}$ hr. (b) $1\frac{1}{2}$ hr.
(c) 2 hr. (d) $2\frac{2}{5}$ hr.
6. The points of intersection of $xy = 12$ and $x^2 + y^2 = 25$ are joined in succession. The resulting figure is :
- (a) a straight line (b) an equilateral triangle
(c) a parallelogram (d) a rectangle
7. A regular octagon is to be formed by cutting equal isosceles right triangles from the corners of a square. If the square has sides of one unit, the leg of each of the triangles has length:
- (a) $\frac{2 + \sqrt{2}}{3}$ (b) $\frac{2 - \sqrt{2}}{2}$
(c) $\frac{1 - \sqrt{2}}{2}$ (d) $\frac{1 + \sqrt{2}}{3}$

Space for Rough Work

8. If a and b are two unequal positive numbers; then :

(a) $\frac{2ab}{a+b} > \sqrt{ab} > \frac{a+b}{2}$

(b) $\frac{a+b}{2} > \sqrt{ab} > \frac{2ab}{a+b}$

(c) $\frac{2ab}{a+b} > \frac{a+b}{2} > \sqrt{ab}$

(d) $\frac{a+b}{2} > \frac{2ab}{a+b} > \sqrt{ab}$

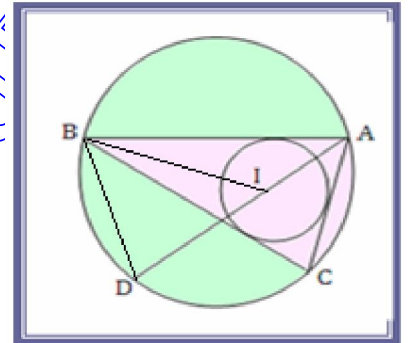
9. In the given Figure "I" is the Incentre of $\triangle ABC$. AI when produced meets the circumcircle of $\triangle ABC$ in D. If $\angle BAC = 66^\circ$ and $\angle ACB = 80^\circ$, then $\angle DBC$, $\angle IBC$ & $\angle BID$ respectively:

(a) $17^\circ, 33^\circ$ & 50°

(b) $33^\circ, 50^\circ$ & 17°

(c) $33^\circ, 17^\circ$ & 50°

(d) $50^\circ, 33^\circ$ & 17°



10. You are given a sequence of 58 terms; each term has the form $P + n$ where P stands for the product $2 \cdot 3 \cdot 5 \dots 61$ of all prime numbers (a prime number is a number divisible only 1 and itself) less than or equal to 61 and n takes successively the value 2, 3, 4, ..., 59. Let N be the number of primes appearing in this sequence. Then N is :

(a) 0

(b) 16

(c) 17

(d) 57

11. The sides of a regular polygon of n sides, $n > 4$, are extended to form a star. The number of degrees at each point of the star is :

(a) $\frac{360}{n}$

(b) $\frac{(n-4)180}{n}$

(c) $\frac{(n-2)180}{n}$

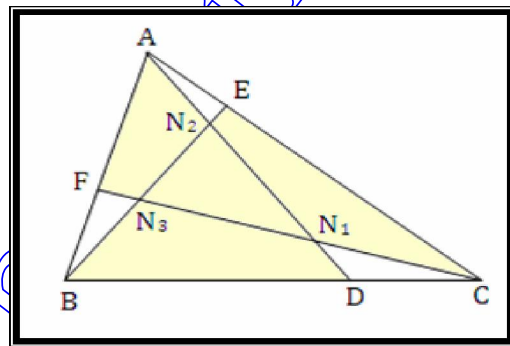
(d) $180 - \frac{90}{n}$

12. Two equal parallel chords are drawn 8 inches apart in a circle of radius 8 inches. The area of that part of the circle that lies between the chords is:

- (a) $21\frac{1}{3}\pi - 32\sqrt{3}$ (b) $32\sqrt{3} + 21\frac{1}{3}\pi$
 (c) $32\sqrt{3} + 42\frac{2}{3}\pi$ (d) $16\sqrt{3} + 42\frac{2}{3}\pi$

13. In the figure, \overline{CD} , \overline{AE} and \overline{BF} are one-third of their respective sides, It follows that $\overline{AN_2} : \overline{N_2N_1} : \overline{N_1D} = 3:3:1$, and similarly for lines BE and CF. Then the area of triangle $N_1N_2N_3$ is :

- (a) $\frac{1}{10} \Delta ABC$ (b) $\frac{1}{9} \Delta ABC$
 (c) $\frac{1}{7} \Delta ABC$ (d) $\frac{1}{6} \Delta ABC$



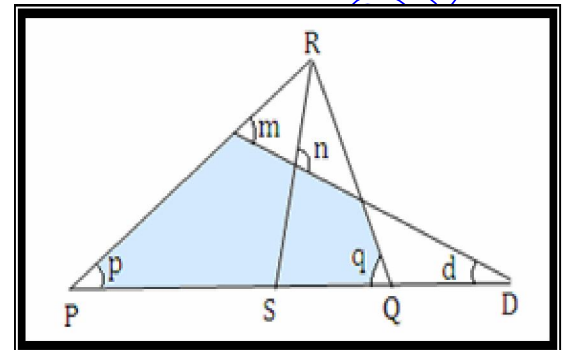
14. A circular piece of metal of maximum size is cut out of a square piece and then a square piece of maximum size is cut out of the circular piece. The total amount of metal wasted is :

- (a) $\frac{1}{4}$ the area of the original square (b) $\frac{1}{2}$ the area of the original square
 (c) $\frac{1}{2}$ the area of the circular piece (d) $\frac{1}{4}$ the area of the circular piece

Space for Rough Work

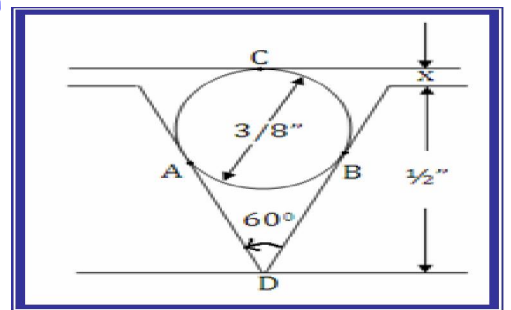
15. Given triangle PQR with RS bisecting angle R, PQ extended to D and angle 'n' a right angle, then :

- (a) $\angle m = \frac{1}{2}(\angle p - \angle q)$
- (b) $\angle m = \frac{1}{2}(\angle p + \angle q)$
- (c) $\angle d = \frac{1}{2}(\angle q + \angle p)$
- (d) $\angle d = \frac{1}{2} \angle m$



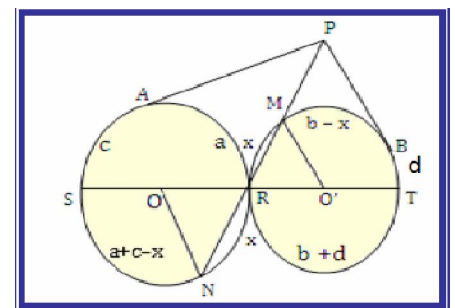
16. In the diagram if points A, B, C are points of tangency, then x equals :

- (a) $\frac{3''}{16}$
- (b) $\frac{1''}{8}$
- (c) $\frac{1''}{16}$
- (d) $\frac{3''}{32}$



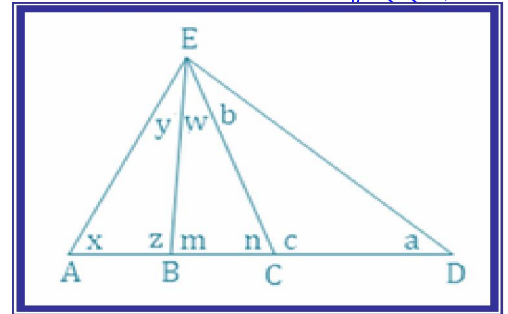
17. In the figure PA is tangent to semicircle SAR; PB is tangent to semicircle RBT; SRT is a straight line; the arcs are indicated in the figure. Angle APB is measured by :

- (a) $\frac{1}{2}(a - b)$
- (b) $(a + b)$
- (c) $(c - a)$
- (d) $a - b$



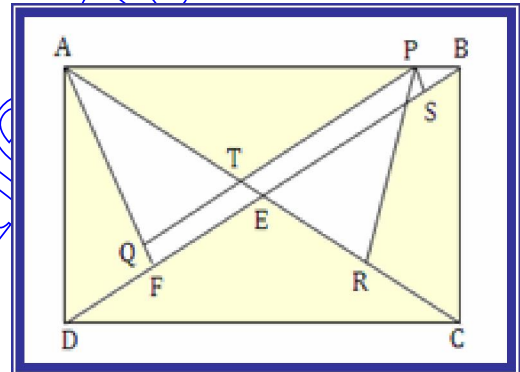
18. In a general triangle ADE (as shown) lines EB and EC are drawn. Which of the following angle relation is true ?

- (a) $x + z = a + b$ (b) $y + z = a + b$
 (c) $m + x = w + n$ (d) $x + y + n = a + b + m$



19. ABCD is a rectangle (see the diagram) with P any point on AB. $PS \perp BD$, $PR \perp AC$, $AF \perp BD$ and $PQ \perp AF$. Then $PR + PS$ is equal to :

- (a) \overline{PQ} (b) \overline{AE}
 (c) $\overline{PT} + \overline{AT}$ (d) \overline{AF}

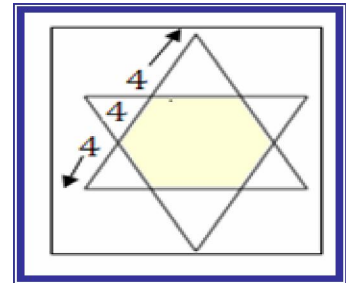


20. The length of a triangle is of length b, and the altitude is of length h, A rectangle of height x is inscribed in the triangle with the base of the rectangle in the base of the triangle. The area of the rectangle is:

- (a) $\frac{bx}{h}(h-x)$ (b) $\frac{hx}{b}(b-x)$
 (c) $\frac{bx}{h}(h-2x)$ (d) $x(b-x)$

Space for Rough Work

21. Compute $1^2 - 2^2 + 3^2 - 4^2 + \dots - 1998^2 + 1999^2$.
- (a) 1,999,000 (b) 1,888,000
(c) 1,999,999 (d) 2,999,999
22. What remainder are obtained when the number consisting of 1001 sevens is divided by the number 1001 ?
- (a) 777 (b) 707
(c) 700 (d) 770
23. Compute the unique positive integer n such that
- $$2.2^2 + 3.2^3 + 4.2^4 + 5.2^5 + \dots + n.2^n = 2^{(n+10)}$$
- (a) 403 (b) 513
(c) 413 (d) 503
24. Two equilateral triangle measures 12 cm on each side. They are positioned to form a regular six-pointed star. What is the area of the overlapping figure?
- (a) $48\sqrt{3} \text{ cm}^2$ (b) $24\sqrt{3} \text{ cm}^2$
(c) $36\sqrt{3} \text{ cm}^2$ (d) $12\sqrt{3} \text{ cm}^2$



Space for Rough Work

25. A digital clock displays the correct time on 1 January 2012. If the clock loses 15 minutes per day, what will be the next date when the clock displays the correct time? (a) 7th april (b) 17th feb
(c) 6th april (d) 18th feb
26. Sachin Verma said: "The day before yesterday I was 10, but I will turn(?).....yrs in the next year" {maximum possible answer is}
(a) 12 (b) 13
(c) 11 (d) 14
27. The remainder when 7^{84} is divided by 342 is
(a) 0 (b) 1
(c) 49 (d) 341
28. $\sqrt{6+2\sqrt{2}+2\sqrt{3}+2\sqrt{6}} - \frac{1}{\sqrt{5-2\sqrt{6}}}$ is Equal to
(a) 1 (b) $\sqrt{2}$
(c) $6\sqrt{2}$ (d) $2\sqrt{6}$

Space for Rough Work

29. If $f(x) + f(1 - x) = 1$. Then

$$f\left(\frac{1}{1997}\right) + f\left(\frac{2}{1997}\right) + \dots + f\left(\frac{1996}{1997}\right) = ?$$

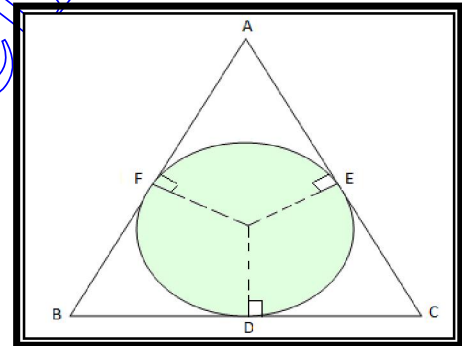
- (a) 999 (b) 998
(c) 919 (d) 918

30. $32^{32^{32}}$ when divided by 7 leaves remainder

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

31. In triangle ABC, the incircle touches the sides, BC, CA and AB at D, E, F respectively. If radius of incircle is 4 units and BD, CE, AF be consecutive integers, find the sides of triangle ABC.

- (a) 9, 10, 11 (b) 13, 14, 15
(c) 14, 15, 16 (d) None of these

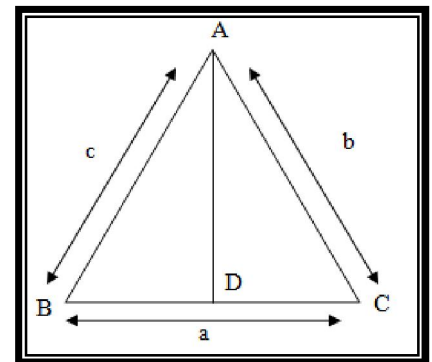


32. The interior angle of a regular polygon exceeds the exterior angle by 132° . The number of sides in the polygon is.....

- (a) 7 (b) 8
(c) 12 (d) 15

33. Given the sides of a triangle (a, b and c). then the median m_a drawn to the side 'a' can be GIVEN by the formula

- (a) $m_a = \frac{1}{2}\sqrt{2b^2 - c^2 + 2a^2}$ (b) $m_a = \frac{1}{2}\sqrt{2c^2 + 2a^2 - b^2}$
(c) $m_a = \frac{1}{2}\sqrt{b^2 + c^2 + a^2}$ (d) $m_a = \frac{1}{2}\sqrt{2b^2 + 2c^2 - a^2}$



34. Pedal triangle is a triangle formed by joining the foot of the altitudes in a triangle, then the orthocentre of a triangle is theof the pedal triangle.
(a) circumcentre (b) Incentre
(c) Centroid (d) orthocentre
35. Find the highest power of 3 contained in 1000!
(a) 499 (b) 498
(c) 496 (d) 497
36. Find the remainder when $2^{100} + 3^{100} + 4^{100} + 5^{100}$ is divided by 7
(a) 2 (b) 5
(c) 6 (d) 3
37. If α, β, γ be the roots of $x^3 + 2x^2 - 3x - 1 = 0$. Find the value of $\frac{1}{\alpha^3} + \frac{1}{\beta^3} + \frac{1}{\gamma^3}$.
(a) -40 (b) -41
(c) -42 (d) None of these

38. If we Solve the system

$$\frac{b(x+y)}{x+y+cxy} + \frac{c(z+x)}{x+z+bxz} = a$$

$$\frac{c(y+z)}{y+z+ayz} + \frac{a(x+y)}{x+y+cxy} = b$$

$$\frac{a(x+z)}{x+z+bxz} + \frac{b(y+z)}{y+z+ayz} = c.$$

then the value of x=

(a) $= \frac{a}{a+b+c}.$

(c) $= \frac{a}{a-b-c}.$

(b) $= -\frac{a}{a+b+c}.$

(d) None of these

39. Which of the following TRUE

(a) $(31)^{12} > (17)^{17}$

(c) $7^{92} > 8^{91}$

(b) $(30)^{100} > (2)^{567}$

(d) $(150)^{300} > (20000)^{100} \times (100)^{100}$

40. If P, Q, R, S are the sides of a quadrilateral. Find the minimum value of

$$\frac{p^2 + q^2 + r^2}{s^2}$$

(a) $1/2$

(c) $2/3$

(b) $1/3$

(d) $3/2$

Space for Rough Work

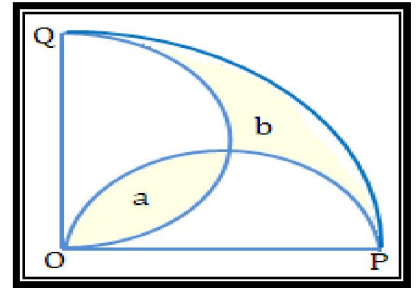
41. A student on vacation for D days observed that
- (i) it rained 7 times morning or afternoon
 - (ii) when it rained in the afternoon it was clear in the morning
 - (iii) there were 5 clear afternoons, and
 - (iv) there were 6 clear mornings.

Find D .

- (a) 9 (b) 7
(c) 10 (d) 5

42. OPQ is a quadrant of a circle and semicircles are drawn on OP and OQ . Then

- (a) $a > b$ (b) $a < b$
(c) $a = b$ (d) can't be determined



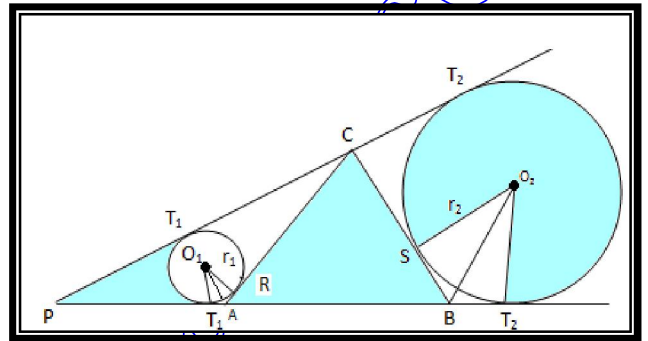
43. Let ΔABC be equilateral. On side AB produced, we choose a point P such that A lies between P and B . We now denote a as the length of sides of ΔABC ; r_1 as the radius of incircle of ΔPAC ; and r_2 as the exradius of ΔPBC with respect to side BC . Determine the sum $r_1 + r_2$ as a function of 'a' alone.

(a) $\frac{a\sqrt{3}}{2}$

(b) $\frac{a\sqrt{2}}{3}$

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

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



44. The sum of n term of the series

$$\frac{1}{\sqrt{3}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{9}} + \dots \text{ is}$$

(a) $\sqrt{2n+3}$

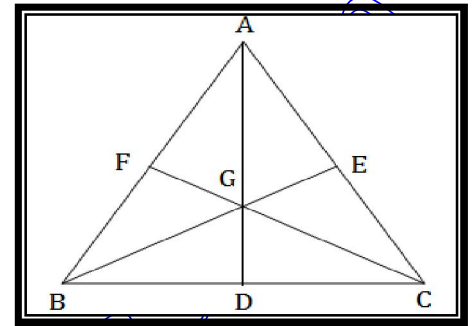
(b) $\frac{\sqrt{2n+3}}{2}$

(c) $\sqrt{2n+3}-\sqrt{3}$

(d) $\frac{\sqrt{2n+3}-\sqrt{3}}{2}$

45. In $\triangle ABC$, the medians AD , BE and CF meet at G , then

- (a) $4(AD + BE + CF) > 3(AB + BC + AC)$
- (b) $3(AD + BE + CF) > 2(AB + BC + AC)$
- (c) $3(AD + BE + CF) > 4(AB + BC + AC)$
- (d) $2(AD + BE + CF) > 3(AB + BC + AC)$



46. The point of concurrency of the perpendicular bisectors of a triangle is called

- (a) Incentre
- (b) Orthocentre
- (c) Circumcentre
- (d) Centroid

47. Some friends are sitting on a bench. Vijay is sitting next to Anita and Sanjay is next to Geeta. Geeta is not sitting with Ajay. Ajay is on the left end of the bench and Sanjay is in second position from right hand side. Vijay is on the right side of Anita and to the right side of Ajay, Vijay and Sanjay are sitting together. Who is sitting in the centre?

- (a) Ajay
- (b) Vijay
- (c) Geeta
- (d) Sanjay

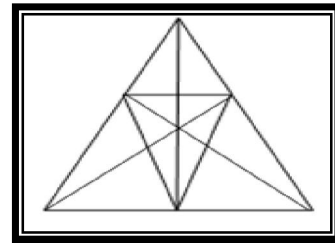
48. If $x - k$ divides $x^3 - 6x^2 + 11x - 6 = 0$, then k can't be equal to

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

49. A convex polygon has 44 diagonals. The number of its sides is

- (a) 10
- (b) 11
- (c) 12
- (d) 13

50. Roman numeral for the greatest three digit number is
(a) IXIXIX (b) CMXCIX
(c) CMIXIX (d) CMIIC
51. In the new budget, the price of a petrol rose by 10%, the percent by which one must reduce the consumption so that the expenditure does not increase is :
(a) $6\frac{1}{9}\%$ (b) $6\frac{1}{4}\%$
(c) $9\frac{1}{11}\%$ (d) 10%
52. Like dozen is 12 articles ,What is “score” equals to
(a) 20 (b) 30
(c) 24 (d) 36
53. Three traffic lights at three different road crossing change after 48 seconds, 72 seconds and 100 seconds respectively, If they all change simultaneously at 8 a. m., at what time will they again change simultaneously?
(a) 10 a.m. (b) 9 a.m.
(c) 11 a.m. (d) 10.30 a.m.
54. Tell the number of triangles in the following figures
(a) 40 (b) 45
(c) 47 (d) 50



55. A school bus travels from Delhi to Chandigarh. There are 4 children, 1 teacher and 1 driver in the bus. Each child has 4 backpacks with him. There are 4 dogs sitting in each backpack and every dog has 4 puppies. What is the total number of eyes in the bus.
(a) 256 (b) 128
(c) 657 (d) 652

56. Ravi is not wearing white and Ajay is not wearing blue. Ravi and sohan wear different colour. Sachin alone wear red. What is sohan colured, if all four them are wearing different colour.
- (a) red (b) blue
(c) white (d) can't say
57. Who is the father of Geometry ?
- (a) Pythagoras (b) Thales
(c) Archimedes (d) Euclid.
58. Which of the following correctly shows 185367249 according to International place value chart ?
- (a) 1, 853, 672, 49 (b) 18,536, 724, 9
(c) 185, 367, 249 (d) None of these
59. $(x\% \text{ of } y + y\% \text{ of } x) =$
- (a) $x\% \text{ of } y$ (b) $y\% \text{ of } x$
(c) $2\% \text{ of } xy$ (d) $x\% \text{ of } xy$
60. A conical vessel of radius 6 cm and height 8 cm is completely filled with water. A sphere is lowered into the water and its size is such that when it touches the sides, it is just immersed. What fraction of the water overflows?
- (a) $\frac{2}{5}$ (b) $\frac{3}{8}$
(c) $\frac{3}{5}$ (d) $\frac{3}{4}$

