



Kathmandu, Nepal
imonepal22@gmail.com

District Level Mathematical Olympiad [DMO]

Sample Questions

Time: 100 minutes

Total No. of Question: 50

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- What is the greatest value among i) $\sqrt{2}$, ii) $\sqrt[3]{3}$, iii) $\sqrt[6]{6}$, iv) $\sqrt[5]{5}$?
a) $\sqrt{2}$ b) $\sqrt[3]{3}$ c) $\sqrt[6]{6}$ d) $\sqrt[5]{5}$
- The vertices of a triangle are (3,1), (8,1) and (8,3). What is the area of triangle?
a) 5 b) 10 c) 20 d) 12
- The standard deviation of data set 6, 6, 6, 6, 6, 6, 6, 6, 6, 6 is ?
a) 6 b) 0 c) 0.5 d) 1
- Which of the following is the n^{th} term of the sequence 2, 3, 6, 11, 18, 27, ... ?
a) $n^2 - 3n + 1$ b) $n^2 - 2n + 1$ c) $n^2 - 4n + 3$ d) $n^2 - 2n + 3$
- If the arithmetic mean of 3, 8 and w is greater than or equal to w and smaller than or equal to $3w$, how many integer values of w exist?
a) Five b) Four c) Three d) Two
- If $x + y + z = 2$ and $x + 2y + 3z = 6$ and $y \neq 0$, then what is the value of $\frac{x}{y}$?
a) $\frac{-1}{2}$ b) $\frac{-1}{3}$ c) $\frac{-1}{6}$ d) $\frac{1}{2}$
- If the radius of the circle is 2 units and the area of the sector containing the angle p° is $\frac{\pi}{2}$, the value of p in degree is ?
a) 15° b) 30° c) 45° d) 60°
- The ratio of the marbles with Jack and Dave was 13:9. Now, they each have 10 more marbles. Which of the following can not be the ratio of their marbles now?
a) 7:4 b) 7:5 c) 15:11 d) 31:23
- In a race of 1 km among 3 persons A, B and C; if A beats B by 80m and B beats C by 90m. By what distance in meter is C beaten by A?
a) 170 b) 85 c) 172.8 d) 162.8
- A total of \$450 was donated to charity by 25 employees. If 15 employees donated at least \$12 but less than \$19 and 9 employees donated at least \$19, what is the maximum amount, in dollars, that the last employees could have donated?
a) \$51 b) \$99 c) \$109 d) \$89
- A sum of money will be 1.331 times of itself at 10% p.a compounded annually in ?
a) 5 years b) 4 years c) 2 years d) 3 years
- $\frac{4}{5}$ of the women and $\frac{3}{4}$ of the men in a group speak Spanish. If there are 40% as many men as women in the group, what fraction of the group speaks Spanish?
a) $\frac{14}{11}$ b) $\frac{11}{14}$ c) $\frac{3}{5}$ d) $\frac{7}{11}$

13. A chemist is mixing a solution of acetone and water. She currently has 30 ounces mixed, 10 of which are acetone. How many ounces of acetone should she add to current mixture to attain 50\50 mixture acetone and water if no extra water is added?
a) 5 b) 15 c) 20 d) 10
14. Three points A(1, -2), B(3,4) and C(4,7) forms?
a) Straight line b) Right angled triangle c) Equilateral triangle d) None
15. Ramon wants to cut a rectangular board into identical square pieces. If the board is 18 inches by 30 inches, what is the least number of square pieces he can cut without wasting any of the board?
a) 6 b) 9 c) 12 d) 15
16. If $125^{14}48^8$ were expressed as an integer, how many consecutive zeros would that integer have immediately to the left of its decimal point?
a) 22 b) 32 c) 42 d) 50
17. The quadratic equation $x^2 + fx + g = 0$ has roots twice those of $x^2 + hx + f = 0$ where f, g and h are non-zero numbers. What is the value of $\frac{g}{h}$?
a) 1 b) 2 c) 4 d) 8
18. A 80m long train is travelling at the speed of 72 km.ph. How long will it take to cross a bridge of length 220m?
a) 11 sec b) 13 sec c) 14 sec d) 15 sec
19. If the price of petrol is increased by 20% and then decreased by 20%, what is the equivalent change in percentage?
a) 0% b) 1% increased c) 4% decreased d) None
20. If 3 is related to 22, 4 is related to 29, 5 is related to 36, and so on then which number is related to 64?
a) 449 b) 9 c) 10 d) 8
21. How many natural numbers between 1713 and 99999 are divisible by 17?
a) 4781 b) 5781 c) 5782 d) 5882
22. In a parallelogram ABCD, OA and OB are the bisectors of the angles A and B respectively at O, then an angle AOB equal to ?
a) 60^0 b) 75^0 c) 90^0 d) 120^0
23. If a, b and c are in AP, then straight line $ax + by + c = 0$ will always pass through ?
a) (2 ,-1) b) (1 ,-2) c) (2, -5) d) (-1, 2)
24. If $|x + 1| = 2|x - 1|$, what is the value of $\left|x - \frac{5}{3}\right|$?
a) $\frac{1}{3}$ b) 3 c) $\frac{4}{3}$ d) $\frac{7}{3}$
25. If $4x < x < x^3 < x^2$, which of the following is possible value of x ?
a) $-\sqrt{3}$ b) $-\frac{3}{2}$ c) -1 d) $-\frac{2}{3}$
26. In the XY-plane, what is the area of the triangle formed by the line $3y - 4x = 24$ and the X-axis and Y- axis?
a) 6 b)14 c) 24 d) 36

27. If the number 0, 2, 3 and 7 are inserted randomly to complete the number $1_52_3_32_296$, what is the probability that the resultant number will be divisible by 72?
 a) 0.5 b) 0.75 c) 0.25 d) 1
28. Auto lot has 2:1 ratio of blue cars to red cars and 6:1 ratio of red cars to orange cars on the lot. What could be the total number numbers of blue, red and orange cars on the lot?
 a) 37 b) 38 c) 39 d) 40
29. Each of 5 people had a blank card on which they wrote a positive integer. If the average (Arithmetic mean) of these integers is 15, what is the greatest possible that could be on one of the cards?
 a) 70 b) 71 c) 72 d) 65
30. Which of the following choices of 'a' will results in a system of equations $9x - 14y = -27$, $2x - ay = -6$ with infinitely many solution?
 a) $-\frac{9}{14}$ b) $-\frac{28}{9}$ c) $\frac{9}{14}$ d) $\frac{28}{9}$
31. The original price of an article was reduced by 20%. During a special sale, the new price was decreased by 10%. The price of an article now has to bring back to the original price by 2 successive mark ups. If the second mark up is 25%, what is the first mark up approximately?
 a) 5% b) 16.67% c) 11.11% d) 12.5%
32. If 8 points (A, B, C, D, E, F, G, H) lies on the line L and 4 points (P, Q, R, S) lies on the line K. Line L and line K are parallel. How many different possible triangles can be connecting any three points?
 a) 155 b) 158 c) 160 d) 162
33. What is the minimum y value of the function $y = x^2 - 6x + 13$ in the real domain?
 a) 3 b) 5 c) 6 d) 4
34. If P is a perimeter of a triangle with one side of 3 and another side of 7, what is the range of possible values for P?
 a) $2 < P < 16$ b) $3 < P < 17$ c) $14 < P < 20$ d) $18 < P < 25$
35. A sector of a circle has a radius of 10 and an area 20π . What is the arc length of a sector?
 a) π b) 2π c) 4π d) 5π
36. How many liters of pure Alcohol must be added to a 90 liters solution that is 20% Alcohol in order to produce a solution that is at least 25% Alcohol?
 a) 4.5 b) 5 c) 5.5 d) 6.5
37. Seven students went for a tour and they entered into a bus. There were only 4 seats vacant. In how many ways could the bus helper seat these 7 students on 4 seats?
 a) 420 b) 210 c) 840 d) 1680
38. Kabir's college is 12 miles from his hostel. He travels 6 miles from the college to basketball practice, and then 4 miles to a computer class. If he is D miles from home, what is the range of possible values for D?
 a) $12 \leq D \leq 10$ b) $2 \leq D \leq 16$ c) $10 \leq D \leq 22$ d) $2 \leq D \leq 22$

39. How many diagonals can be drawn in a decagon (polygon having ten sides)?
 a) 10 b) 20 c) 35 d) 45
40. Seven consecutive numbers are selected from the integers 1 to 100, and each number is divided by 7. What is the sum of remainder obtained?
 a) 21 b) 20 c) 22 d) 19
41. ABCD is a rectangle. Points P, Q, R, S and T cut side AB of the rectangle such that AD=9, AB=15, AP=3, PQ=QR=RS=ST=1. E is a point on AD such that AE=3. Which of the following segments is parallel to the diagonal BD of the rectangle?
 a) EQ b) ER c) ES d) ET
42. Running on a 10-mile loop in a same direction, Sue ran at a constant rate of 8 miles per hour and Rob ran at a constant rate of 6 miles per hour. If they began running at same point on loop. How many hours takes did Sue complete 1 more loop than Rob?
 a) 3 b) 4 c) 5 d) 6
43. The center of a circle is (10, -3). The point (10, 9) is outside the circle and the point (6, -3) is inside the circle; neither point is on the circumference. If the radius r is an integer, how many possible values are there for r?
 a) Seven b) Eight c) Nine d) Ten
44. A man travels 21 km north from a point. Then he turns east and travels 56 km again he turns north and travels 21km. At last, how far was he from the starting point?
 a) 98 b) 56 c) 70 d) 42
45. When 3^{99} is divided by 13, then the remainder will be ?
 a) 1 b) 3 c) 7 d) 12
46. In the sequence of nonzero numbers $t_1, t_2, t_3, \dots, t_n, \dots$ the value of $t_{n+1} = \frac{t_n}{2}$ for all positive integers n. If $t_1 - t_5 = \frac{15}{16}$, what is the value of t_5 ?
 a) $\frac{1}{16}$ b) $\frac{1}{32}$ c) $\frac{1}{8}$ d) $\frac{1}{4}$
47. A rectangular floor having perimeter 16 meters is to be covered with square carpets that measure 1 meter by 1 meter each and cost Rs 6 per piece. What is the maximum possible cost for the number of square carpets needed to cover the rectangular floor if the sides of the floor are integers?
 a) Rs 42 b) Rs 72 c) Rs 90 d) Rs 96
48. What is the difference between maximum and minimum value of $\frac{x}{y}$ for which $(x - 2)^2 = 9$ and $(y - 3)^2 = 25$?
 a) $-\frac{15}{8}$ b) $\frac{19}{8}$ c) $\frac{25}{8}$ d) $\frac{9}{8}$
49. The product of 99 integers is 99. Which could be the sum of these integers?
 a) 999 b) 197 c) 997 d) 199
50. There are 8 people in the village. They consume 8 coconuts altogether. Each man consumes 2 coconuts, each women half coconut and a child consumes a quarter coconut. What is the number of men there?
 a) 3 b) 2 c) 1 d) 4