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2025-2026 Math League Preliminary Round

(Grades 8-9)

(Unofficial version, for reference only)

1. If the average of v, w, x, y, and z is 48 and the average of v, w, and x is 54, what is the average of y and z?

   A) 39 B) 40 C) 42 D) 44

2. A line perpendicular to the line defined by $3x - y = 18$, and with the same y-intercept as that line, has an x-intercept of

   A) -54 B) -6 C) 6 D) 54

3. The sum of the solutions to $3x^2 + 12x = 15$ is

   A) -4 B) -2 C) 4 D) 36

4. The area of my rectangle is 480. If my rectangle's length is 14 greater than its width, then its perimeter is

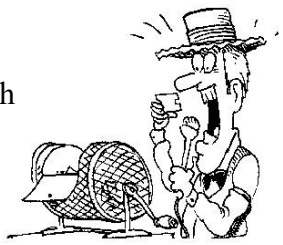
   A) 88 B) 92 C) 116 D) 172

5. $\frac{x^2 + ☼ + 1}{x + y}$ is equal to $x - y + \frac{1}{x + y}$ whenever ☼ =

   A) $-y^2$ B) xy C) y^2 D) $-xy$

6. In the sequence 4, 8, 64, ..., each term after the first is the product of all the positive integer factors of the previous term. What is the fourth term of this sequence?

   A) 2^{36} B) 2^{21} C) 2^{12} D) 2^{11}



7. Any x which satisfies ? also satisfies $1 - |x + 1| < 0$.

   A) $x < -2$ B) $x > -1$ C) $x < 0$ D) $x < 1$

8. What is the ones digit in the decimal representation of s if $r = 123^{124}$ and $s = r^{456}$?

A) 1 B) 3 C) 7 D) 9

9. If $5^n + 5^n + 5^n + 5^n + 5^n = 5^{50}$, then $n =$

A) 10 B) 21 C) 38 D) 49

10. If $50g + 60h = 70h$, then $h - g =$

A) $0.5g$ B) $4g$ C) $5g$ D) $10g$

11. If $t^{-111} > t^{-222}$, then t could equal

A) -2 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 2

12. If $3x + 4y = 21$ and $5x + 9y = 1$, then $x - y =$

A) 4 B) 11 C) 22 D) 41

13. If x is an integer, what is the least possible value of $|18 - 5x|$?

A) 2 B) 3 C) 4 D) 5

14. If $x \blacklozenge y = (x - y)^2 + 2y$, then what is the value of $20 \blacklozenge 23$?

A) 31 B) 37 C) 49 D) 55

15. $(x - 1)(x - 2)(x + 3)(x + 4) = (x^2 + 3x - 4) \times (\underline{\ ?\ })$

A) $x^2 + x - 1$ B) $x^2 + x - 6$ C) $x^2 - x + 1$ D) $x^2 - x + 6$

16. If $4^{20x} \times 8^{24x} = 16^{1456}$, then $x =$

A) 20 B) 28 C) 32 D) 52

17. $|2x| + |-3x| =$

A) $|-x|$ B) $-|x|$ C) $-|5x|$ D) $5|x|$

18. How many different ordered pairs of positive integers (a, b) satisfy $(ab)^2 = 2025$?

A) 3 B) 6 C) 12 D) 24

19. There are exactly 26 positive integer divisors of 2^{25}, but there are smaller positive integers with exactly 26 positive integer divisors. What is the least positive integer with exactly 26 positive integer divisors?

A) 7776 B) 12 288 C) 73 728 D) 1 062 882

20. If n is a positive integer, then $n!$ is the product of the first n positive integers. What is the only integer $n > 0$ satisfying $n! + n! = (2n)!$?

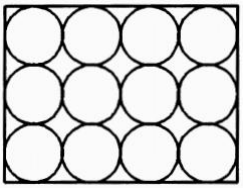
21. For what integer n does $(x + 1)(x + n) = x^2 + 2025x + n$ for all x?

22. What is the sum of all real values of x that satisfy $x^{2025} = x^{-2025}$?

23. An array has 6 rows and 4 columns. Each of the 24 cells contains a positive integer. The sum of the integers in each row is 12. What is the average sum of the integers in a column?

24. When the lengths of the diagonals of a rhombus are squared and added, the sum is 100. What is the perimeter of the rhombus?

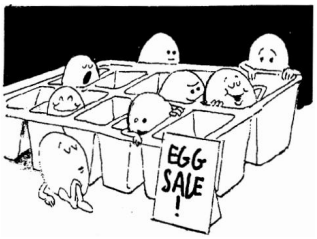
25. If 12 circles are tangent as shown, and each has an area of π, what is the length of one diagonal of the rectangle which just surrounds them, as shown?



26. For all real numbers x and y, define $x \oplus y = x + y + 3xy$. For example, $1 \oplus 4 = 1 + 4 + 3(1)(4) = 17$. What is the value of $1 \oplus 1 \oplus 1 \oplus 1 \oplus 1$?

27. If $[x]$ denotes the greatest integer $\leq x$, what is the least positive integer n for which $\left[\frac{n^2}{100}\right] < \left[\frac{(n+1)^2}{100}\right] < \left[\frac{(n+2)^2}{100}\right]$?

28. What is the only $x > 0$ for which the statement below could be true?
If eggs cost $x¢$ a dozen less, then it would cost $1¢$ less for $(x + 1)$ eggs than if eggs were $x¢$ a dozen more.



29. What is the least value of n such that every collection of n points in the coordinate plane, all with integer coordinates, must contain at least two points for which the line segment connecting the two points contains a point (other than an endpoint) with integer coordinates?

30. Each of 100 light bulbs is powered by its own button, numbered 1 to 100. Pressing a button reverses the bulb's on-off state. At the start, with every bulb on, Jack pressed every button whose number was even. Then, Jill pressed every button whose number was a multiple of 5 (including 5). At that point, how many of the 100 bulbs were on?



Answers										
Question	1	2	3	4	5	6	7	8	9	10
Answers	**A**	**A**	**A**	**B**	**A**	**B**	**A**	**A**	**D**	**B**
Question	11	12	13	14	15	16	17	18	19	20
Answers	**D**	**D**	**A**	**D**	**B**	**D**	**D**	**B**	**B**	**1**
Question	21	22	23	24	25	26	27	28	29	30
Answers	**2024**	**0**	**18**	**20**	**10**	**341**	**28**	**2**	**5**	**50**