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2024-2025 Math League Preliminary Round

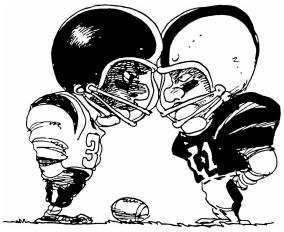
(Grade 7)

(Unofficial version, for reference only)

1. On July 1, Harry sold \$7 worth of lemonade. On July 2, he sold \$10 worth. Each day after that he sold \$3 more than he sold the day before. When did he first sell \$100 worth in a single day?

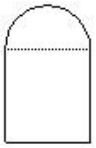
   A) July 30 B) July 31 C) August 1 D) August 2

2. There are 6 more football players wearing dark helmets than wearing light ones. The ratio of dark helmets to light is 2:1. The number of light helmets is



   A) 2 B) 3 C) 6 D) 12

3. A *Norman Window* is in the shape of a rectangle topped by a semicircle. If the shorter side of the rectangle is 6 and its longer side is 8, the perimeter of the window is



   A) $22 + 18\pi$ B) $22 + 9\pi$ C) $22 + 6\pi$ D) $22 + 3\pi$

4. If #*F* means the number of sides of polygon *F*, which of the following products is largest?

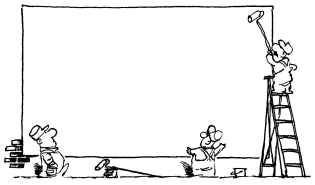
   A) #hexagon × #rhombus B) #pentagon × #triangle

   C) #square × #trapezoid D) #parallelogram × #rectangle

5. Find the value of $(-1)^{1979}$.

   A) -1 B) 1 C) 1979 D) -1979

6. The side-lengths of quadrilateral *Q* are consecutive integers. If *Q*'s perimeter is 8014, how long is *Q*'s longest side?



   A) 2002 B) 2003 C) 2004 D) 2005

7. If $n < 0$ and $p > 0$, which inequality is always true?

A) $n > p$ B) $-n > p$ C) $\frac{1}{n} > \frac{1}{p}$ D) $\frac{1}{n} < \frac{1}{p}$

8. There is a pair of whole numbers a and b, each greater than 1 and less than 10, for which $a^b = b^a + 1$. Find the value of $(a + b)^2$.

A) 9 B) 25 C) 36 D) 49

9. What percent of $0.5p$ is p?

A) $\left(\frac{1}{2}\right)\%$ B) 20% C) 50% D) 200%

10. If a and b are the two roots of $x^2 - 5x + 3 = 0$, then $(a + b)(ab) =$

A) -20 B) 15 C) 20 D) 40

11. If $x > 0$ and $x^2 + x^2 + x^2 + x^2 = x^4$, then $x^4 + x^4 + x^4 + x^4$ must equal

A) x^8 B) $4x^6$ C) $6x^4$ D) $8x^3$

12. On a flat surface, my duck Fred walks due north at 1 km per hour for 1 minute, then walks due east at 0.75 km per hour for 1 minute. Fred is then how many km from his starting point?



A) $\frac{1}{100}$ B) $\frac{1}{70}$ C) $\frac{1}{48}$ D) $\frac{1}{20}$

13. To form a certain sequence, the rules are:
    - If a number is even, divide by 2 to get the next number;
    - If a number is odd, multiply by 3, then add 1 to get the next number.

    Starting with 12, the first few terms are 12, 6, 3, 10, 5, 16, ... In *this* particular sequence, the 1000^{th} term is

A) 1 B) 2 C) 3 D) 4

14. How many integers greater than 1 million and less than 4 million are squares of integers?

A) 998 B) 999 C) 1000 D) 1998

15. $(101\ 010\ 101)^2$ has _?_ non-zero digits.

A) 5 B) 6 C) 9 D) 18

16. No whole-number power of 3 has units digit

A) 1 B) 3 C) 6 D) 9

17. Five cars (each of the same length) plus eight trucks (each of the same length) take up the same room in a warehouse as 11 trucks. How many cars can fit into a warehouse which can hold 30 trucks?

A) 18 B) 30 C) 50 D) 80

18. $\dfrac{1}{2+\dfrac{3}{4+\dfrac{5}{6}}}$ is equivalent to

A) $\dfrac{29}{76}$ B) $\dfrac{76}{29}$ C) $\dfrac{20}{29}$ D) $\dfrac{29}{20}$

19. What is the product of the greatest and least integer solutions to $|13x - 7| < 21$?

A) -4 B) -2 C) -1 D) 2

20. After being painted, a solid wooden cube whose edge is 3 cm is cut into 27 small 1-cm cubes. How many of these small cubes have exactly two painted faces?

A) 18 B) 12 C) 9 D) 8

21. There are 120 windows in my school building, 80 of which we have decorated. If we have opened exactly 20% of the windows, and exactly 75% of the open windows are ones we decorated, how many undecorated windows have we not opened?

A) 14 B) 34 C) 36 D) 40

22. Of the following, which is closest to 1?

A) $0.99 \times 0.01 \times 1.01 \times 0.1$ B) $0.99 \times 0.01 \times 1.01 \times 1$

C) $0.99 \times 0.01 \times 1.01 \times 10$ D) $0.99 \times 0.01 \times 1.01 \times 100$

23. Which of the following numbers is *not* a solution of $(x - 1)(x - 2)(x - 3) + (x - 1)(x - 2)(x - 4) + (x - 1)(x - 2)(x + 10) = 0$?

A) -1 B) 1 C) 2 D) 3

24. If $|x| = -y$, then it is *always* true that $|y| =$

A) x B) $-x$ C) y D) $-y$

25. What is the least positive integer whose square is divisible by 4^{144}?

A) 4^{12} B) 4^{72} C) 4^{144} D) 4^{288}

26. $(x + 1) + (x – 2) + (x + 3) + (x – 4) + \ldots + (x + 99) + (x – 100) =$

A) $100x – 1$ B) $100x – 25$

C) $100x – 50$ D) $100x – 100$

27. $\sqrt{16^{16}} =$

A) 16^8 B) 16^4 C) 4^8 D) 4^4

28. If an *equithagorean* triangle is an equilateral triangle in which the sum of the cubes of two sides is equal to the square of the third side, what is the perimeter of an *equithagorean* triangle?

A) 0.5 B) 1.5 C) 4.5 D) 6

29. Which *cannot* be written as a sum of the squares of two integers?

A) 17 B) 18 C) 19 D) 20

30. Robin computed the product $2 \times 2 \times 2 \times 2 \times 3 \times 4 \times 5 \times 5 \times 5 \times 5 \times 7$. What was the left-most digit of Robin's answer?

A) 8 B) 4 C) 2 D) 1

31. What is the least positive integer $n > 1$ for which the expression $\sqrt{1+2+3+\ldots+n}$ simplifies to an integer?

A) less than 10 B) between 10 and 20, inclusive

C) between 21 and 30, inclusive D) greater than 30

32. The roots of $x^2 – 3x – 3 = 0$ are r and s. What is the value of $r + s – 3rs$?

A) less than 10 B) between 10 and 20, inclusive

C) between 21 and 30, inclusive D) greater than 30

33. What are the only 3 positive integers that cannot be the length of the shortest side of a right triangle whose sides all have integral lengths?

Note: Please enter the sum of the 3 positive integers.

A) less than 10 B) between 10 and 20, inclusive

C) between 21 and 30, inclusive D) greater than 30

34. If m and n are different positive integers, and if $\dfrac{\frac{1}{m}-\frac{1}{n}}{1-\frac{1}{mn}} = 1$, what is the value of m?

A) less than 5 B) between 5 and 10, inclusive

C) between 11 and 20, inclusive D) greater than 20

35. What is the ordered pair of real numbers (x, y) which does satisfy $y = 5x - 15$, but which does *not* satisfy $\dfrac{y}{x-3} = 5$?

Note: Please enter the value of $x + y$ as your answer.

A) less than 5 B) between 5 and 10, inclusive

C) between 11 and 20, inclusive D) greater than 20

Answers										
Question	1	2	3	4	5	6	7	8	9	10
Answer	**C**	**C**	**D**	**A**	**A**	**D**	**D**	**B**	**D**	**B**
Question	11	12	13	14	15	16	17	18	19	20
Answer	**D**	**C**	**A**	**B**	**C**	**C**	**C**	**A**	**B**	**B**
Question	21	22	23	24	25	26	27	28	29	30
Answer	**B**	**D**	**D**	**D**	**B**	**C**	**A**	**B**	**C**	**A**
Question	31	32	33	34	35					
Answer	**A**	**B**	**A**	**A**	**A**					