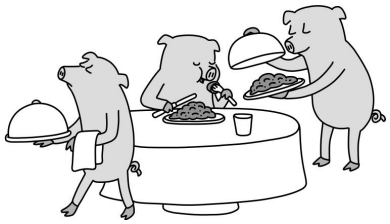
www.mathleague.world

2025-2026 Math League Preliminary Round

(Grades 10-12)

(Unofficial version, for reference only)

1. Sam's swine swallows 30 kg of food in 5 minutes. How many grams of food does it swallow every second?



A) 1 B) 20 C) 100 D) 200

2. If $r \blacklozenge s = rs(2r - s)$, what is the value of $(1 \blacklozenge 2) \blacklozenge (3 \blacklozenge 4)$?

A) 0 B) 2 C) 5 D) 10

3. What is the positive value of x that satisfies $x^{600} = 8^{1000}$?

A) 12 B) 15 C) 16 D) 32

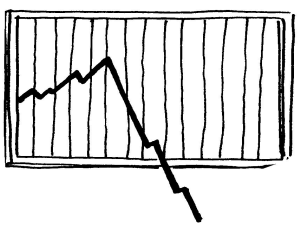
4. If $x^2 = 0.1$, then $x^{-6} =$

A) -0.001 B) 0.0003 C) 1000 D) 10 000

5. If $A = bc^2$, when the value of b is increased by 50% while the value of c is decreased by 20%, the value of A is decreased by

A) 2% B) 4% C) 5% D) 10%

6. If line l has slope $\dfrac{1}{1+\dfrac{1}{x}}$, what is the slope of any line that is perpendicular to line l ?



A) $-x$ B) $-\dfrac{x}{x+1}$ C) $-\dfrac{x+1}{x}$ D) $-\dfrac{1}{x+1}$

7. The graph of ? crosses the x-axis in 2 different points.

A) $y = x^2 - 64$ B) $y = x^2$

C) $y = x^2 + 10x + 25$ D) $y = x^2 - 24x + 144$

8. 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

9. 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

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

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

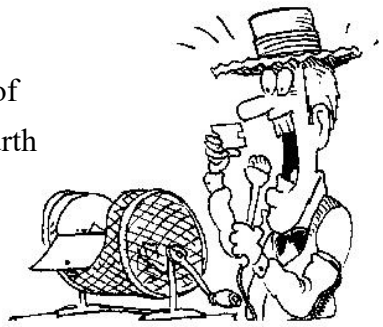
11. The area of my rectangle is 480. If my rectangle's length is 14 greater than its width, then its perimeter is

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

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

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

13. 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}

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

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

15. 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

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

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

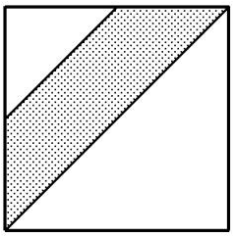
17. How many 10-digit numbers both begin and end with the 4-digit sequence "2025"?

18. How many different integers n satisfy $10\pi < n < 30\pi$?

19. If the circumference of a circle is an integral multiple of π, what is the least possible length of this circle's radius?

20. What is the greatest possible value of the larger of two positive integers whose average is 2026?

21. In the isosceles trapezoid (shown shaded), the longer base is a diagonal of a square, and the shorter base of the trapezoid is a line segment that connects the midpoints of two consecutive sides of the square. If the area of the square is 100, what is the area of the trapezoid?



22. The decimal expansion of $\frac{10}{81}$ begins 0.123456790 . . . . Notice that the expansion is missing the digit 8. To "correct" this, we can subtract 10^{-k} from $\frac{10}{81}$. For what integer k does the decimal expansion of $\frac{10}{81} - 10^{-k}$ begin 0.123456789 . . . ?

23. What is the only integer n for which $\left(\sqrt{2}+\sqrt{n}\right)\left(\sqrt{2}-\sqrt{n}\right) = 1$?

24. What is the area of the triangle bounded by the lines through the origin with slopes 1 and $\frac{3}{2}$ and the line whose equation is $x = 8$?

25. If the roots of $ax^2 + bx - 2025 = 0$ are reciprocals, what is the value of a?

26. Merlin's hat doubles any money put into it. Merlin let me use the hat, but he would take \$16 from the hat after each doubling. I put money into Merlin's empty hat. Each time Merlin took his \$16, the amount of money remaining in the hat doubled. After the fourth doubling, when Merlin took his share, the hat was emptied. How many dollars did I put into Merlin's empty hat at the start?

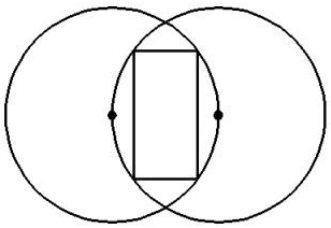


27. Two non-congruent triangles have 5 parts (sides and/or angles) of one congruent to 5 parts of the other. The smaller triangle's shortest side has length 8, and the larger triangle's longest side has length 32. What is the product of the smaller triangle's side-lengths?

28. A fair coin is flipped repeatedly until the coin either gets 3 heads in a row (HHH) or gets a tail immediately followed by 2 heads in a row (THH). What is the probability that the coin lands HHH before it lands THH?



29. Each of two congruent circles passes through the center of the other. A 3 × 6 rectangle, oriented as shown, is inscribed in the region common to the two circles. How long is a radius of each circle?



30. For what integer k does $(\sqrt{2}-1)^n = -239 + k\sqrt{2}$ for some positive integer n?

Answers										
Question	1	2	3	4	5	6	7	8	9	10
Answers	**C**	**A**	**D**	**C**	**B**	**C**	**A**	**A**	**A**	**A**
Question	11	12	13	14	15	16	17	18	19	20
Answers	**B**	**A**	**B**	**A**	**A**	**D**	**100**	**63**	$\frac{1}{2}$	**4051**
Question	21	22	23	24	25	26	27	28	29	30
Answers	$37\frac{1}{2}$	**9**	**1**	**16**	**-2025**	**15**	**2048**	$\frac{1}{8}$	**5**	**169**