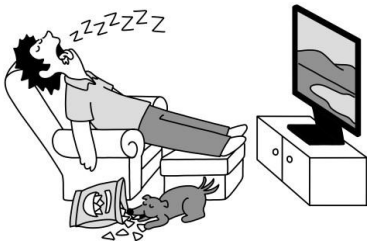
www.mathleague.world

2023-2024 Math League Preliminary Round

(Grade 7)

(Unofficial version, for reference only)

1. Axl watched the 3rd through the 12th episodes of the new show, "The Counters," but fell asleep before he could watch the 13th episode. Axl watched a total of _?_ episodes.



A) 8 B) 9

C) 10 D) 11

2. After I flip a coin _?_ times, the ratio of heads to tails could be 7:11.

A) 35 B) 36 C) 55 D) 77

3. The greatest possible perimeter of a rectangle with area 2024 and integral side-lengths is

A) 1013 B) 2025 C) 2026 D) 4050

4. A bell rang first at 9 AM, then every 15 minutes after that. It rang for the 40th time at _?_ PM.



A) 6:45 B) 7:00

C) 8:45 D) 9:00

5. Four years ago I was able to say, "In 3 years my son will be 2 times as old as he is today." How old is he today?



A) 1 B) 3

C) 7 D) 9

6. What is the product of all the different prime factors of 2024?

A) 8 B) 253 C) 506 D) 2024

7. $3^{2024} - 3^{2023} + 3^{2022} =$

A) 3^{2021} B) 3^{2022} C) 7×3^{2022} D) 13×3^{2022}

8. How many fractions with a value less than 1 have a whole-number numerator and a whole-number denominator that, when multiplied, have a product of 180?

A) 5 B) 9 C) 18 D) 36

9. If 35% of the students in my class are wearing jackets today, which of the following could be the number of students wearing jackets?



A) 7 B) 10

C) 20 D) 32

10. On Sunday I bought an ant farm. By Monday, my ant population had dropped by 50%! On Tuesday, the population somehow went up by 20%. On Wednesday, I saw that the population had dropped by 50% again! What percent of the original population was left?

A) 20% B) 30% C) 40% D) 50%

11. In a vending machine, $\frac{3}{8}$ of the drinks are sodas, $\frac{1}{8}$ of the rest of the drinks are juices, and the remaining drinks are bottles of water. If there are 55 more bottles of water than sodas, how many drinks are in the vending machine?



A) 120 B) 240 C) 320 D) 400

12. A dealer added a 20% charge to the base price of a used car so that the customer paid \$18 000. If instead of adding the charge, the dealer had given a 20% discount on the base price of the car, how much would the customer have paid?

A) \$10 800 B) \$11 520 C) \$12 000 D) \$15 000

13. The least common multiple of 8^4, 9^3, and 10^2 is

A) $2^7 \times 3^5 \times 5^2$ B) $2^9 \times 3^5 \times 5^2$

C) $2^{12} \times 3^6 \times 5^2$ D) $2^{14} \times 3^6 \times 5^2$

14. There are 150 train cars. If 60 of them carry passengers, twice that many carry bags, but only 5 carry passengers and not bags, how many cars have neither bags nor passengers?



A) 10 B) 25 C) 35 D) 40

15. If $a \clubsuit b = 3b + 2a$, then $3 \clubsuit 17 =$

A) 39 B) 43 C) 45 D) 57

16. What is the difference between the sum of all even integers between 199 and 249 and the sum of all even integers between 249 and 299?

A) 1200 B) 1250 C) 2400 D) 2500

17. If 3 apples and 5 bananas cost \$3 and 5 apples and 8 bananas cost \$4.88, how much would 1 apple and 1 banana cost at these prices?

A) \$0.76 B) \$1.00 C) \$1.58 D) \$3.76

18. I divided the number of pennies in my coin jar by the number of quarters and got the quotient 123.45. Ty did the same division and got 123 with a remainder of 36. How many quarters are there?

A) 45 B) 80 C) 81 D) 99

19. How many whole numbers less than 200 are composite but not divisible by 2, 3, 4, 5, 6, 7, 8, or 9?

A) 4 B) 16 C) 20 D) 23

20. How many digits are in the decimal representation of 80^{10}?

A) 19 B) 20 C) 24 D) 27

21. Axl and Belle were collecting seashells. At noon, Axl had 3 times as many as Belle. In the next hour, Belle picked up another dozen shells while Axl dropped 4 of his, so that at 1 PM Axl had 5 shells for every 3 that Belle had. How many shells did Axl have at 1 PM?



A) 18 B) 30 C) 50 D) 54

22. If $5^{40} \times 40^{20} = 10^x$, what is the value of x?

A) 60 B) 100 C) 280 D) 800

23. What is the sum of the reciprocals of two real numbers whose sum is 20 and whose product is 20?

A) $\frac{1}{20}$ B) $\frac{1}{2}$ C) 1 D) 20

24. Candice combines drinks to make new combos. She combines b grams of fruit punch that is 30% sugar, a grams of lemonade that is 20% sugar, and d grams of orange drink that is 10% sugar to get a final mix that is 25% sugar. What is b in terms of a and d?



A) $a + d$ B) $a + 2d$

C) $2a + d$ D) $a + 3d$

25. If x is a positive integer, the sum of all positive integers from $2x + 1$ through $4x$ is

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

26. Tai took 7 tests this term. If the average of Tai's lowest 5 scores is 87 and the average of Tai's top 5 scores is 93, the difference between the sum of his top 2 scores and the sum of his bottom 2 scores is __?__.

A) 18 B) 25 C) 30 D) 44

27. If 36 pavers can pave a 42 km road in 14 days, it would take 21 pavers working at the same rate __?__ days to pave a 63 km road.

A) 12 B) 18 C) 24 D) 36

28. An integer greater than 1 that is both a perfect square and a perfect cube must have at least __?__ factors that are not prime.

A) 3 B) 4 C) 5 D) 6

29. My rectangular garden is $6x$ m long, $5x$ m wide, and lies within my rectangular yard. Each side of my garden is x m from the nearest side of my yard. The area of my yard is 224 m^2. My garden is __?__ wide.

A) 2 m B) 4 m C) 8 m D) 10 m

30. Luc has a box of candies, half of which are chocolate. He starts randomly eating one candy at a time. If the probability that the first 3 candies he eats are all chocolate is $\frac{1}{11}$, there were x candies in the box before he ate the first one, and the sum of the digits of x is __?__.

A) 3 B) 6 C) 8 D) 11

31. A circular carousel has 6 mechanical horses on it, only two of which are identical. In how many clockwise ways can the 6 horses be placed on the circle so that the 2 identical horses are not next to each other?

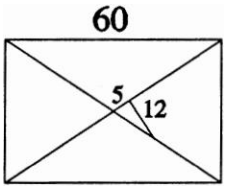


A) 36 B) 40 C) 60 D) 80

32. Four girls take turns flipping a fair coin until a head appears. What is the probability that the first girl is the first to flip a head?



33. From a point on one diagonal of a rectangle of longer dimension 60, a line segment drawn perpendicular to the other diagonal creates a right triangle with leg-lengths 5 and 12, as shown. How long is a shorter side of the rectangle?



34. The sum of 3 consecutive terms of a geometric sequence is 62. If the sum of the common logarithms (*i.e.*, the base ten logarithms) of these 3 terms is 3, what is the value of the greatest of these 3 terms?

35. In acute triangle ABC, altitudes $\overline{BP}$ and $\overline{CQ}$ are drawn. If $AP = x$, $PC = 2x - 6$, $AQ = 8$, and $QB = x - 5$, what is the value of $\cos A$?

Answers										
Question	1	2	3	4	5	6	7	8	9	10
Answer	**C**	**B**	**D**	**A**	**C**	**C**	**C**	**B**	**A**	**B**
Question	11	12	13	14	15	16	17	18	19	20
Answer	**C**	**C**	**C**	**B**	**D**	**B**	**A**	**B**	**A**	**B**
Question	21	22	23	24	25	26	27	28	29	30
Answer	**C**	**A**	**C**	**D**	**B**	**C**	**D**	**D**	**D**	**A**
Question	31	32	33	34	35					
Answer	**A**	$\frac{8}{15}$	**40**	**50**	$\frac{2}{3}$					