Speed Math

CHILES MINI MU

2022-2023

1. Find the remainder when 123456789 is divided by 99.

2. Shaoyang can buy dog treats in groups of 20 treats, 23 treats, or 2023 treats. What is the largest amount of dog treats that he cannot buy?

3. Find the sum of all prime numbers less than 23.

4. Nelson is taking turns shooting free throws with LeBron James, star of the popular movie Space Jam: A New Legacy. Nelson has a $\frac{1}{10}$ chance of making a free throw, and LeBron has a $\frac{3}{4}$ chance of making a free throw. Given that Nelson goes first, what is the probability that he makes a free throw before LeBron does?

5. What is the smallest possible value of $x^2 + 6x + 24$ for real x?

6. Compute $12 \times 13 - 20 + 3(5 + 36 \div 4)$.

7. The four digit number $\overline{202A}$ is divisible by 23. What is the remainder when this number is divided by 22?

8. Compute $214 \cdot 226$.

9. Given that a cylinder with radius 4 has equal volume and surface area, what is its height?

10. Let $f(x) = x^2 - 20x + 23$. Compute $f(19) + f(50)$.

11. Khawla and Linda are playing a game. Khawla starts with a positive integer, doubles it, and then passes it to Linda. Linda adds 3 to the number and passes it back to Khawla. Khawla doubles it again, passes it to Linda, who again adds 3 to it and passes it back, and so on. Find the sum of all possible starting numbers given that the number equals 69 at some point.

12. Compute the number of distinguishable permutations of $ROBSNOW$.

13. Given that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots = \frac{\pi^2}{6}$, compute $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \dots$, where the terms in the sum are the reciprocals of the odd perfect squares.

14. Find the side length of the equilateral triangle that has equal area and perimeter.

15. Right before Linsey goes to sleep, she looks at a clock which reads $2 : 49$. She wakes up in the middle of the night and looks at the clock again, and surprisingly, the product of the digits shown on the clock are the same as they were right before she went to sleep. What is the least amount of sleep she could have possibly gotten (in minutes)?

16. Find the units digit of $20^{23} + 23^{20} + 2023^{2023}$.

17. Wesley flips 6 fair coins and then rolls a fair die. What is the probability that the number he rolls on the die equals the number of coins that turn up heads?

18. Find the number of ordered pairs (a, b) of positive integers satisfying $a^2 + b^2 = 699$.

19. Cyrus, Yimo, and Jiayi are swimming around a circular pool. It takes them 289 seconds, 170 seconds, and 119 seconds, respectively, to travel one time around the pool. Given that they start at the same point and travel in the same direction, what is the least amount of time (in seconds) until all three of them are at the same point again?

20. Evaluate $20(2 + 3(2 + 0(2 + 3) + 20 + 23))$.

21. Find the area of the triangle with vertices at $(2, 2), (2, 3)$, and $(20, 23)$.

22. James falsely believes that adding 8 to any odd composite number will yield a prime number. Find the smallest possible odd composite number which is a counterexample to James's belief.

23. Find the smallest positive integer n such that the sum of the angles in an $n-$gon is greater than $2023°$.

24. Ryan gets 7 nickels for every math problem he solves correctly. If Ryan gets \$1337 from only these nickels, how many math problems did he solve correctly?

25. Simplify $\sqrt{1!} + \sqrt{2!} + \sqrt{3!} + \sqrt{4!} + \sqrt{5!}$.