

Speed Math

Directions: This is the speed math test. You will have 15 minutes to complete 25 questions. You may show any work necessary to get your answer. Please write legibly, if your answer cannot be read it will be marked incorrect. You will receive time warnings at 5 minutes remaining and one minute remaining. Unless otherwise specified, numerical answers should be in one of the following forms: improper fraction, mixed number, simplest radical form, exact form, in terms of pi (no approximations). All fractions must be fully reduced; if the answer is $\frac{1}{2}$ and you answer $\frac{2}{4}$ you will be marked off. Decimal representations of fractions are okay but it must be exact and any repeating digits must be clearly marked with an over-bar. Units are assumed unless specifically asked for.

Name: _____

School: _____

Division (Circle One): Elementary / Middle

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Total Correct: _____

- _____ 1. Evaluate $1 + 2(1 + 2(1 + 2(1 + 2(1 + 2(1 + 2))))).$
- _____ 2. How many zeroes are at the end of 64% of 6,250,000?
- _____ 3. What is the number of distinguishable permutations of *KINGJAMES*?
- _____ 4. Let \mathcal{X} be the smallest positive integer such that there exists a polygon with an interior angle sum of $\mathcal{X}!$ degrees. What is \mathcal{X} ?
- _____ 5. The fraudulent basketball player Joel Embiid is practicing shooting free throws. He has already attempted 2024 free throws and made 1600 of them. How many does he now have to make in a row to raise his success rate to 90%?
- _____ 6. What positive integer is closest to 2% of 16% of 1% of 8% of 4% of one billion (1,000,000,000)?
- _____ 7. Given reals x, y satisfying $3x + 8y = 20$ and $2x + 7y = 24$, compute $x + 2y$.
- _____ 8. Shaoyang and Lily are on opposite sides of a field. They begin running back and forth across the field at the same time. If it takes Shaoyang and Lily 20 and 24 minutes to run the length of the field, respectively, after how many minutes will they be at opposite ends of the field again?
- _____ 9. Find the number of two-digit positive integers factors of 5!.
- _____ 10. What is the units digit of $2 \cdot 202^4$?
- _____ 11. Compute
$$42 + \frac{43}{42 + \frac{43}{42 + \dots}}.$$
- _____ 12. What is 101101000101_2 in base 4? Do not include the base 4 subscript in your answer.
- _____ 13. There are five little monkeys jumping on the bed. At the end of every minute, if there are n monkeys remaining on the bed, there is a $\frac{1}{n+1}$ chance that exactly one monkey will fall off the bed, and $\frac{n}{n+1}$ chance that no monkeys fall off. What is the probability that all the monkeys will fall off the bed after 5 minutes?
- _____ 14. What is the area of the quadrilateral with vertices $(20, 24)$, $(-20, 24)$, $(2, 2)$, and $(20, 2)$?
- _____ 15. Linsey takes a nap at 3 : 17 and sleeps for 4 hours and 44 minutes. What time does she wake up?
- _____ 16. What is
$$\sqrt{1} + \sqrt{3} + \sqrt{9} + \sqrt{27} + \sqrt{81} + \sqrt{243} + \sqrt{729}$$
 expressed in simplest radical form?
- _____ 17. How many triangles can be formed from the vertices of a regular hexagon?
- _____ 18. Aaron is playing with three rhesus monkeys and four barbary apes. How many ways can all 8 of them stand in a line given that animals of the same species are indistinguishable?
- _____ 19. Let $a \star b = ab - a - b + 100$. Compute $1 \star (2 \star (3 \star (4 \star 5)))$.
- _____ 20. Using the notation from the previous problem, evaluate $p \star q$, where p and q are the roots of $x^2 - 44x + 480$.
- _____ 21. Nima has a 20 liter solution that is 40% acid and 60% water. How many liters of acid does he need to add to his solution to make it 60% acid?
- _____ 22. Yimo is deciding on what to wear for the day. He has 6 shirts, 5 pairs of pants, and 10 pairs of socks to choose from. Given that his outfit consists of one shirt, one pair of pants, and one pair of socks, how many different outfits can he choose?
- _____ 23. Evaluate the expression
$$\frac{3 + \frac{3}{4}}{4 + \frac{4}{3}}.$$
- _____ 24. David can take a picture every 40 seconds. If Nonoko joins David, they can take a picture every 15 seconds. If both David and Nonoko take pictures at a constant rate, how many seconds does it take Nonoko to take a picture if she works alone?
- _____ 25. Compute $(6 \times 8 - 4/2)(2^2 + 4 \times 6 - 8)$.