

Mental Math

Name: _____

School: _____

Division (Circle One): Elementary / Middle

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Total Correct: _____

- _____ 1. Compute the sum of the first 20 natural numbers.
- _____ 2. Given positive integers a, b, c that satisfy $29a + 30b + 31c = 366$, compute $a + b + c$.
- _____ 3. What is 12% of $3/4$ ths of 600?
- _____ 4. Given that 6 second-round picks are equal to 1 role player, 3 first-round picks are equal to 1 star player, and 2 first-round picks are equal to 3 role players, how many second-round picks are equal to one star player?
- _____ 5. Aaron has a zoo that only has monkeys, which have 2 legs, and bears, which have 4 legs. If his zoo has 40 animals that have a total of 100 legs, how many monkeys are in his zoo?
- _____ 6. Compute the minimum possible value of $2x^2 + 4x + 7$ over reals x .
- _____ 7. What is the slope of the line that passes through $(24, 7)$ and the vertex of the parabola in the above question?
- _____ 8. Compute the sum of the first 24 whole numbers.
- _____ 9. What is the ratio of the volume of a cylinder with radius 50 and height 125 to the volume of a cylinder with radius 100 and height 25 expressed as a common fraction?
- _____ 10. Linsey goes to sleep at 3 : 17 PM and sets her alarm to wake her up at 6 : 00 PM. How many minutes does she sleep for?
- _____ 11. What is the number of the distinct prime factors of $5^3(5^3 - 1)$?
- _____ 12. How many ways are there to label the vertices of a hexagon with A, B, C, D, F, F if configurations that are rotations of each other are considered to be the same?
- _____ 13. Compute 88×99 .
- _____ 14. What is the area of the triangle with side lengths 20, 21, and 29?
- _____ 15. Shaoyang gives his dog 3 treats if he rolls over and 5 treats if he does a flip. If his dog rolls over 17 times and does 38 flips, how many treats will Shaoyang give him?
- _____ 16. What is the total number of sides in a pentagon, hexagon, and octagon?
- _____ 17. Compute the sum of all distinct possible areas of a square that has two vertices at $(20, 24)$ and $(24, 20)$.
- _____ 18. Find the positive integer solution to $x^2 = 7225$.
- _____ 19. Compute the product of all integers from -20 to 24 inclusive.
- _____ 20. Yimo has 2 cards labeled 2, 3 cards labeled 3, 4 cards labeled 4, and so on until 10 cards labeled 10. He shuffles the cards and begins randomly drawing them one by one. What is the smallest amount of cards Yimo needs to draw to guarantee that he will have at least one card of every label?
- _____ 21. What is the remainder when $17 \cdot 23$ is divided by 40?
- _____ 22. Compute $1 - 2 + 3 - 4 + \cdots - 2022 + 2023$.
- _____ 23. In chess, pawns are worth 1 point, knights and bishops are worth 3 points, rooks are worth 5 points, and queens are worth 9 points. How many total points are 4 pawns, 3 knights, 3 bishops, 3 rooks, and 2 queen worth?
- _____ 24. What is the number of distinguishable permutations of *IRVING*?
- _____ 25. Hadriel randomly chooses a factor of 60. What is the probability that he chooses a composite number?
- _____ 26. What is the fifth prime number?
- _____ 27. Today is December 9, 2023, which is a Saturday. Find x , where December x , 2024 is the first Saturday in December of 2024.
- _____ 28. What is the smallest positive integer such that when multiplied by 2023 it is a perfect square?
- _____ 29. Compute $77^2 - 23^2$.
- _____ 30. Nonoko has \$2024 in the form of \$1 and \$2 bills. If she has at least one kind of each bill, then what are the number of possible distinguishable combinations of bills Nonoko could have?
- _____ 31. How many ways are there to choose a committee of 2 men and 5 women from a group of 6 men and 6 women?

- _____ 32. Aaron, Bob, Charley, Darius, and Eddie sit in a row of 5 seats in a movie theater. How many ways can they sit if Darius is allergic to Aaron and refuses to sit next to him?
- _____ 33. Let $x \star y = x^y + y^x + xy$. Compute $2 \star 3$.
- _____ 34. Using the notation from the previous question, compute $0 \star (1 \star (2 \star \dots (9 \star 10) \dots))$.
- _____ 35. David has 5 fair coins each with a 1 on one side and a 0 on the other side. He flips these coins and then rolls a fair six-sided die with faces labeled 1 through 6. What is the probability that the sum of the numbers that turn up on the coins and the die is 6?
- _____ 36. How many three-digit positive integers exist where all their digits are divisible by 3?
- _____ 37. What is the length of the longest chord of integer length that can be drawn in the circle that circumscribes a square with side length 8?
- _____ 38. Compute the sum of all integers from -20 to 24 inclusive.
- _____ 39. What is the slope of the line $20x + 24y = 2024$?
- _____ 40. While practicing chemistry, Nima learns that Avogadro's number is approximately $n = 6 \times 10^{23}$. How many positive integer factors does n have?