

Name: \_\_\_\_\_

School: \_\_\_\_\_

1. \_\_\_\_\_ What is the sum of the first 15 perfect squares?
2. \_\_\_\_\_  $A = \begin{bmatrix} 2 & 6 \\ -5 & 5 \end{bmatrix}$ , and  $B = \begin{bmatrix} -3 & -2 \\ -5 & 0 \end{bmatrix}$ . Find the determinant of  $A + B$ .
3. \_\_\_\_\_ What type of curve is defined by  $(x^2 + 4x + 5) - (y^2 - 6y + 2) = 1$ ?
4. \_\_\_\_\_ Evaluate  $(2 \log_2 25)(\log_5 32)$ .
5. \_\_\_\_\_ 35 is what percent of 84, to the nearest percent?
6. \_\_\_\_\_ What is the smallest taxicab number? A taxicab number is a number that can be expressed as a sum of two perfect cubes in two different ways.
7. \_\_\_\_\_ What is the units digit of  $377^{2049}$ ?
8. \_\_\_\_\_  $A = \langle 3, -4, 5 \rangle$ ,  $B = \langle 2, -4, 1 \rangle$ . Find  $A \times B$ .
9. \_\_\_\_\_ For the function  $y = 2x^3 + x^2 - 6x - 3$ , let  $a$  be the sum of the roots and let  $b$  be the product of the roots. Find  $\frac{a}{b}$ .
10. \_\_\_\_\_ Given that a number is prime, what is the probability that it is less than 10 when rolling a fair, 18-sided die?
11. \_\_\_\_\_ Solve for  $x$ :  $5^{3+2x} + 25^x = 378$ . Express your answer in terms of  $\log_5$ .
12. \_\_\_\_\_ What is the largest negative integer  $n$  for which  $3n^2 + 4 > n^2 - n + 6$ ?
13. \_\_\_\_\_ What is the probability of obtaining a sum of 4, 7, 8, or 9 when rolling 2 fair, 6-sided dice?
14. \_\_\_\_\_ A square is inscribed in a circle of radius 6. A smaller circle is inscribed in the square. What is the area inside the square but outside the smaller circle?
15. \_\_\_\_\_  $394 \times 515 =$
16. \_\_\_\_\_ Find the geometric mean of the data set:  $\{12, 18, 27\}$
17. \_\_\_\_\_ Find the area of the scalene triangle with side lengths 5, 7, and 10.
18. \_\_\_\_\_ Madison makes 80% of all free throws. What is the probability that she makes at least 3 out of 4 free throws, assuming that all free throws are independent of each other? Round to the nearest percent.
19. \_\_\_\_\_ Let  $f(x) = \sqrt{x+4}$ ,  $g(x) = 3x + 5$ , and  $h(x) = x^2 - 1$ . Find  $g(f(h(x)))$ .
20. \_\_\_\_\_  $\cot \frac{5\pi}{6} =$