

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

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

Score: \_\_\_\_\_

1. \_\_\_\_\_ What is the product of the first 25 whole numbers?
2. \_\_\_\_\_ Find the sum of the magnitudes of the roots of  $x^5 + x^4 + x^3 + x^2 + x + 1$ .
3. \_\_\_\_\_ Evaluate  $112^3 - 88^3$ .
4. \_\_\_\_\_ Rewrite the decimal  $0.\overline{145}$  as a simplified fraction.
5. \_\_\_\_\_ Find the volume of a tetrahedron with side length of 12.
6. \_\_\_\_\_ Evaluate the sum of  $111_{17} + 111_3 + 111_{24}$  in base 14. Do not write the base 14 subscript in your answer.
7. \_\_\_\_\_ How many ways can you permute the letters in INVITATIONAL?
8. \_\_\_\_\_ Nitish's alarm started functioning in an interesting way: every day, the volume of the alarm (in decibels) squares. If it has a volume of 3 on the 3rd day, what will the volume be on the 7th day?
9. \_\_\_\_\_ What is the length of the longest line that can be drawn in a box with sides of 11, 12, and 13?
10. \_\_\_\_\_ Evaluate 8.1% of 437 (as a decimal).
11. \_\_\_\_\_ Compute  $\sqrt{27 \cdot 407 \cdot 91 + 1}$ .
12. \_\_\_\_\_ Find the length of the third side of a triangle with sides 12 and 17, with the angle in between the two sides being  $60^\circ$ .
13. \_\_\_\_\_ Find the sum of the first 10 prime numbers.
14. \_\_\_\_\_ Find the sum of the mean, median, range, and interquartile range of the following set: the positive, integer factors of 256.
15. \_\_\_\_\_ Find the sum of the digits of the determinant of the matrix: 
$$\begin{bmatrix} 4 & 8 & 6 \\ 3 & 2 & 9 \\ 5 & 7 & 0 \end{bmatrix}$$
16. \_\_\_\_\_ In the coordinate plane, consider the points  $A = (0, 0)$ ,  $B = (4, 0)$ , and  $C = (9, 0)$ . Over all points  $P$  in the plane, compute the minimum value of  $AP + BP + CP$ .
17. \_\_\_\_\_ The rationalized form of  $\frac{2 + 7i}{4 - 5i}$  can be written as  $\frac{a}{b} + \frac{c}{d}i$ , where both fractions are simplified and  $c, d > 0$ . What is  $c + d$ ?
18. \_\_\_\_\_ Evaluate the sum of the first 20 Fibonacci numbers (the sequence which starts as 1, 1, 2, 3, 5, 8, ... where each term after the first two is the sum of the previous two terms).
19. \_\_\_\_\_ What is the average of the first 12 digits of  $\pi$  (as an improper fraction)?
20. \_\_\_\_\_ Compute the slope of the line tangent to  $x^2 + y^2 = 5$  at  $(2, 1)$ .