

Find the value/variable given in each problem in simplest form. You have 15 minutes to complete this test.

~~~~~ Good luck, and have fun! ~~~~~

\_\_\_\_\_ 1)  $1 - \frac{1}{3} + \frac{1}{9} - \frac{1}{27} + \frac{1}{81} - \frac{1}{243}$

\_\_\_\_\_ 2) The number of even positive integer factors of  $2022^2$

\_\_\_\_\_ 3) The sum of the factors of 999

\_\_\_\_\_ 4)  $\sqrt{8 + 5\sqrt{2} + \sqrt{8 + 5\sqrt{2} + \dots}}$

\_\_\_\_\_ 5)  $\sqrt[3]{357911}$

\_\_\_\_\_ 6)  $38^2 + 77^2$

\_\_\_\_\_ 7) The median of  $\frac{9}{11}$ ,  $\frac{14}{17}$ , and  $\frac{23}{29}$

\_\_\_\_\_ 8)  $0.9\overline{87}$  as a reduced common fraction

\_\_\_\_\_ 9)  $\begin{vmatrix} 3 & 1 & 4 \\ 1 & 5 & 9 \\ 2 & 6 & 5 \end{vmatrix} + \begin{vmatrix} 2 & 7 & 1 \\ 8 & 2 & 8 \\ 1 & 8 & 2 \end{vmatrix}$

\_\_\_\_\_ 10) The day of the week that held February 19, 2022

\_\_\_\_\_ 11) The area of a regular hexagon with apothem  $3 - 2\sqrt{2}$

\_\_\_\_\_ 12) The sum of all positive integers less than 101 whose reciprocals are terminating decimals

\_\_\_\_\_ 13) The surface area of a sphere with inscribed cube with side length 3

\_\_\_\_\_ 14)  $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ , given  $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$

\_\_\_\_\_ 15)  $23^{23} \pmod{9}$

\_\_\_\_\_ 16) The smaller angle in degrees of the hands of a clock at 9:25

\_\_\_\_\_ 17) The sum of the digits of  $111, 111, 111^2$

\_\_\_\_\_ 18)  $1 - 2 + 3 - 4 + 5 - 6 + \dots + 2021 - 2022$

\_\_\_\_\_ 19) The  $x$ -intercept of the asymptote of  $f(x) = \frac{3x^3 - 8x + 4x^2 - 9}{6x^2 - x + 5}$

\_\_\_\_\_ 20)  $\prod_{n=1}^{2022} \left(9 - \frac{n}{100}\right)$

\_\_\_\_\_ 21)  $6 + 66 \cdot 666 + 6666$

\_\_\_\_\_ 22) The smallest positive integer that is equivalent to 3 mod 5, 6 mod 7, and 8 mod 11

\_\_\_\_\_ 23) The 22<sup>nd</sup> term of the arithmetic sequence with fifth term  $-19$  and thirty-first term  $55$

\_\_\_\_\_ 24)  $\arctan\left(\frac{\cos x + \sin x}{\cos x - \sin x}\right)$  if  $x = \frac{\pi}{24}$

\_\_\_\_\_ 25) This positive answer, halved, then squared, then subtracted from 1 three times