Name:________________________________ Date:________________________

Logarithm Challenge Problems:

1. If $\log_3(18) = a$, evaluate $\log_3(72)$ in terms of a.
2. What is $8^{\log_4 6}$?
3. Evaluate: $\log_4 512$
4. If $\log_4 6 = p$, express $\log_3 12$ in terms of p .+
5. Evaluate: $\log_4(128)$
6. If $\log_a 336 = b$ and $\log_a 21 = c$, express $\log_4 a$ in terms of b and c.
7. Evaluate: $\log_2 64$
8. Evaluate: $\log_3 32 * \log_2 81$
9. If $\log(p) + \log(\pi) = \log(p + \pi)$, what must p equal?
10. On what domain is $Log(Log(x))$ a function?
11. If $Log_y x + Log_x y = -2$, what is xy?

Multiple Choice:

12. If $\log(xy^3) = 1$ and $\log(x^2y) = 1$, what is $\log(xy)$?

a) $-\frac{1}{2}$ b) 0 c) $\frac{1}{2}$ d) $\frac{3}{5}$ e) 1

13. Given $\log_9 20 = a$ and $\log_3 n = 4a$, the value of n is:

a) 400 b) 100 c) 80 d) 20 e) $\sqrt{20}$

14. For all integers n greater than 1, define $a_n = \frac{1}{\log_n 2002}$. Let $b = a_2 + a_3 + a_4 + a_5$ and $c = a_{10} + a_{11} + a_{12} + a_{13} + a_{14}$. Then $b - c$ equals.

a) -2 b) -1 c) $\frac{1}{2002}$ d) $\frac{1}{1001}$ e) $\frac{1}{2}$

15. How many positive integers b have the property that $\log_b 729$ is a postive integer?

a) 0 b) 1 c) 2 d) 3 e) 4

16. Evaluate: $(\log_3 128)(\log_2 243)$

a) 35 b) 42 c) 12 d) 36 e) NOTA

17. Given that $\log_{17}(\log_{19}(\log_{25} x)) = 12$, what are the prime factors of x?

a) 5, 17 and 19 b) 5 c) 2 and 3 d) 17 e) NOTA

18. Evaluate the sum: $\sum_{i=11}^{100}[\log(\log_{i-1} i)]$.

a) $\log 10$ b) $\frac{100!}{10!}$ c) 10 d) $\log 2$ e) Answer not given

19. If $\log(2) \approx .301$, which of the following is closest to $\log(5000)$?

a) 3.010 b) 3.301 c) 3.602 d) 3.699 e) 3.903

20. Solve for x: $\log_{\sqrt{2}}(1/4)^{-2} = x$.

a) 16 b) $\sqrt{2}$ c) 2 d) 4 e) answer not given

21. If $a \geq b > 1$, what is the largest possible value of $\log_a(a/b) + \log_b(b/a)$?

a) -2 b) 0 c) 2 d) 3 e) 4

22. For all positive integers n, let $f(n)=\log_{2002} n^2$. Let

$$N=f(11)+f(13)+f(14).$$

Which of the following relations is true?

a) $N>1$ b) $N=1$ c) $1<N<2$ d) $N=2$ e) $N>2$

23. The set of all real numbers x for which

$$\log_{2004}(\log_{2003}(\log_{2002}(\log_{2001} x)))$$

is defined is $\{x \mid x>c\}$. What is the value of c?

a) 0 b) 2001^{2002} c) 2002^{2003} d) 2003^{2004} e) $2001^{2002^{2003}}$

24. How many distinct four-tuples (a, b, c, d) of rational numbers are there with

$$a\log_{10} 2+b\log_{10} 3+c\log_{10} 5+d\log_{10} 7=2005\,?$$

a) 0 b) 1 c) 17 d) 2004 e) infinitely many

25. Let S be the set of ordered triples (x, y, z) of real numbers for which

$$\log_{10}(x+y)=z \text{ and } \log_{10}(x^2+y^2)=z+1.$$

There are real numbers a and b such that for ordered triples (x, y, z) in S we have $x^3+y^3=a\cdot 10^{3z}+b\cdot 10^{2z}$. What is the value of $a+b$?

a) $\frac{15}{2}$ b) $\frac{29}{2}$ c) 15 d) $\frac{39}{2}$ e) 24

26. Let x be chosen at random from the interval (0,1). What is the probability that

$$[\log_{10} 4x]-[\log_{10} x]=0\,?$$

Here $[x]$ denotes the greatest integer that is less than or equal to x.

a) $\frac{1}{8}$ b) $\frac{3}{20}$ c) $\frac{1}{6}$ d) $\frac{1}{5}$ e) $\frac{1}{4}$

27. The numbers $\log(a^3b^7)$, $\log(a^5b^{12})$, and $\log(a^8b^{15})$ are the first three terms of an arithmetic sequence, and the 12$^{\text{th}}$ term of the sequence is $\log(b^n)$. What is n?

a) 40 b) 56 c) 76 d) 112 e) 14