

2006 Bellevue BATH Competition

Team Test

Scoring: Correct = +4, Blank = 0, Incorrect = -2

Rules: You have 20 minutes for this test. All answers must be simplified as much as possible or they will be considered incorrect. Only answers on the official answer sheet will be graded. The scoring system is described above.

1. Evaluate 99999^2 .
2. Find the area of a triangle with side lengths 21, 29, 34.
3. Find the number of digits in each repeating block of $\frac{1}{321}$.
4. Prime factorize 1234567890.
5. Find all integer solutions to $(x^3 - 7x - 7)^{x^2+4x+10} = 1$.
6. Evaluate $\frac{7777777777777777}{1 \cdot 11 \cdot 101 \cdot 10001}$.
7. Given that $\tan(\theta) = 2$ and $0 < \theta < 90^\circ$, find $\tan(6\theta)$.
8. The probability of you getting this question right is $P = \frac{928548344}{2785645032}$. If you had 5 answer choices, how many could you eliminate immediately? (Too bad you don't!)
9. Evaluate $\sum_{i=1}^{\infty} \left[\sum_{j=0}^i \binom{i}{j} \right]^{-1}$.
10. 3 is prime. Is 5557? How about 5581?
11. A ball is dropped from a height of x feet. Let $\{a_i\}_{i=0}^{\infty}$ define the sequence of heights of successive bounces with $a_0 = x$, $a_i = \frac{1}{i(i+1)}$ for $i \geq 1$. Given that the ball bounces for a total distance of 3 feet, what is x ?
12. How many positive integral solutions does $x^9 + y^9 + z^9 = 1953127$ have?
13. Evaluate pie to the nearest hundreth.
14. If $a \geq b$ and $a \leq b$, find $a^2 + b^2$ in terms of $c = a + b$.
15. Evaluate $\sum_{a=1}^{10} \sum_{b=1}^{10} \sum_{c=1}^{10} \sum_{d=1}^{10} dcab$.
16. Find the number of seconds that the AIME takes.
17. True or false: A.E. Cool's pie are square.
18. It is March 14th. What do you do?
19. Which is bigger, 2^{65} or 3^{41} ?
20. How many integers x satisfy $\pi \leq |x| \leq \pi^3$?
21. For what real values of a is $a^7 + a^2 + 1 < 3a^3$?
22. Find positive integers a, b, c, d such that $a^3 + b^3 + c^3 + d^3 = 2002^{2002}$.
23. Fermat's Last Theorem was conjectured by:

24. Write two of Euler's Formulas.

25. Take the number of words in this sentence, add it to the number of letters, and multiply that result by the number of spaces.

26. If you have a set of 11 distinct positive integers, find the smallest N such that the sum of all 11 is greater than N but the sum of any 5 is at most $\frac{N}{2}$.

27. If $a^7 = 8031810176$, what is a ?

28.

$ABCD$ is a rectangle. Find the area of the circumscribed circle of $ABCD$.

29. The color of the ocean is the same as the color of the sky. What is it?

30.

What type of knot is this?