Mental Math
Test #643

Name: _____________________
ID Number: _____________________
School: _____________________
Division (circle one): Mu   Alpha   Theta   Sponsor
1. When simplified, what is the denominator of $\frac{7}{\sqrt{11} - \sqrt{5}}$?

2. Two circles with radius 1 are drawn inside a square such that the circles do not overlap, one circle is tangent to two sides of the square only while the other circle is tangent to the other two sides of the square, and the two circles are tangent to each other. The square encloses how much area?

3. Find the larger angle, in degrees, formed by a clock’s hands at 4:00 PM.

4. When multiplied out, what is the units’ digit of $3^{50}$?

5. Evaluate: $2^{2^2}$

6. Solve for $x$:
   
   
   
   $6x - 6 + 10x - 10 + 20x - 20 = 72$


8. Convert the radian-measure angle $5\pi$ to degrees.

9. Calculate the area of the region:
   
   
   
   $|x| + |y| \leq 2.$

10. How many even, positive, prime numbers are there?

11. Evaluate:

   
   
   
   $1 + 2 + 4 + 8 + 16 + 32 + 64 + 128 + 256$

12. If $a \cdot b = 10$, $a \cdot c = 15$, and $b \cdot c = 6$, what is $a \cdot b \cdot c$?

13. Evaluate: $76 \cdot 84$

14. How many integer solutions are there to the equation: $x^4 = |x|$?

15. A square has a diagonal of 2. What is the square’s enclosed area?

16. Evaluate: $rac{5}{3} + \frac{7}{5}$

17. Evaluate: $i^2 + i^4 + i^8$

18. Evaluate: $\frac{6! + 7! + 8!}{6!}$

19. Calculate the area enclosed by a hexagon with side length 2.

20. Evaluate and express in base 10:

   
   
   
   $10000_2 + 100_2$

21. What is the $10^{th}$ positive, prime number?

22. Which is greater: $20^{15}$ or $2015$?

23. How many unique permutations of the letters in the word “ALPHA” exist?

24. Evaluate: $\sum_{x=1}^{10}(2x + 1)$

25. How many seconds are there for each question on this test if you spend the same amount of time on each question?

26. Evaluate: $1 + 2 \cdot 3 - 4/5$

27. Find the product of the real zeros of:

   
   
   
   $x^6 + 14x^5 - 14x^3 - 168x = 0.$

28. Which is greater, $2^{20}$ or $10^6$?

29. How many possible orders are there to work the problems on this test? (Express in factorial notation)

30. Evaluate: $\sqrt{1800}$

31. Calculate 150% of 150.

32. A clock has a 1 meter long minute hand. How many meters will the tip of the minute hand travel in 8 minutes?

33. How many seconds are there in a day?

34. Find the median of the data set:

   
   
   
   10, 4, 6, 2, 20, 9, 18.

35. Evaluate: $\log_2 4^2$

36. Find the product of the expected value of one roll of a standard, six-sided die and the number of edges on the die.

37. Find the remainder when 623 is divided by 9.

38. If $f(x) = x^2 + 1$, what is $f(f(2))$?

39. What is the greatest prime factor of 102?

40. Evaluate: $100! / 98!$