Name: _____

School: _____

1. _____ Evaluate 103×109.

2. _____ Find the arithmetic mean of the following data set: 5, 7, 7, 13, 19, 19, 0.

3. _____ What is the remainder when 526 is divided by 19?

4. _____ Simplify the following expression: $\dfrac{2 \cdot n!}{(n-2)! \cdot (3n)}$ for integral $n \geq 2$.

5. _____ What is the probability of flipping exactly 4 tails in 7 flips, assuming you are flipping a fair coin?

6. _____ What are the coordinates of the vertex of the parabola defined by $y = -2x^2 + 7x + 2$?

7. _____ Evaluate $\dfrac{63^2 - 62^2}{38^2 - 37^2}$.

8. _____ Find the sum of all values on the interval $[0, 4\pi)$ for which $\sec x \tan x = -\csc x \cot x$.

9. _____ Find the area of triangle ABC given that $c = 9$, $b = 12$, and $\angle A = 60°$.

10. _____ Matthew is a high roller; that's to say, when he wins a jackpot, he wins an enormous amount. Suppose Matthew had no money before winning \$2 million. How many pounds of Boston Butt could he buy, at \$12 a pound, if he exhausted his intake, to the nearest 1000 pounds?

11. _____ Evaluate: $\displaystyle\lim_{x \to 0} \dfrac{\tan 6x}{\sin 4x}$.

12. _____ Evaluate: $\displaystyle\lim_{x \to 0} \dfrac{\tan 6x}{\cos 4x}$.

13. _____ Which number has a larger absolute value: $\sqrt{19}$ or $\sqrt[5]{-1032}$?

14. _____ Find the sum of the first 8 terms of the arithmetic sequence: 4, 12, 20, ...

15. _____ Let x be the number of positive integral factors of 625, and let y be the expected value of a roll of a fair, 6-sided die. Find xy.

16. _____ Solve for x: $216^{x-4} = 36^{2x+1}$.

17. _____ What is the 4th element in the 9th row of Pascal's triangle? Assume the row consisting of a single 1 is row 0.

18. _____ Evaluate $\left(\dfrac{8 \times 10^6}{2 \times 10^{-9}}\right)^3$, expressed in scientific notation.

19. _____ Evaluate $\dfrac{2^{20}}{8^3}$. Express your answer either as an integer or a power of 2.

20. _____ To 1 significant figure, 6×10^{23} is a quantity known as a mole. Suppose Theresa has half a mole of papers in her binder with an average of 400 words per paper. How many total words on paper are in Theresa's binder? Use the 1 significant figure approximation of a mole in your calculations but express your answer 2 significant figures, in scientific notation.

21. _____ What is the lateral surface area of a right circular cylinder with height 8 and radius 5?

22. _____ Let x be the probability of drawing a red jack from a standard 52-card deck and let y be the probability of drawing either a 4 or 9 from a standard 52-card deck with 2 additional jokers (54 cards total). Find $\dfrac{x}{y}$.

23. _____ Evaluate $20564 - 13909$.

24. _____ Simplify: $\left(\dfrac{x^2 y}{z^3}\right)^3 \left(\dfrac{z^2 y^2}{x}\right)^2$.

25. _____ Govind and Markemia are running in a 200 meter race. Suppose Govind runs at an average speed of 5 meters per second for the first 95 meters, and then instantaneously accelerates to 7.5 meters per second, which he maintains for the duration of the race. Markemia starts 6 seconds after Govind, and she runs at an average speed of 5 meters per second for 48 meters before instantaneously accelerating to 9.5 meters per second, which she maintains for the duration of the race. Who wins the race, and by how many seconds?

26. _____ Solve for k if $3^k = \dfrac{1}{2187}$.

27. _____ What is the probability that Charkues (pronounced char-KEECE) will roll an odd prime number for the first time on his fourth roll, given that he rolls a fair, 6-sided die?

28. _____ Evaluate $\langle 3,\ -7,\ -4\rangle \cdot \langle -2,\ 3,\ 5\rangle$.

29. _____ For $f(x) = 3x - 5$ and $g(x) = -x^2 + x + 2$, find $f(g(2))$.

30. _____ Alyssa and Thomas are growing corn. Alyssa has a green thumb; the corn she plants grows 100% of the time. The corn that Thomas plants grows 70% of the time. Given that Thomas planted $\dfrac{2}{3}$ of a field and Alyssa planted the other $\dfrac{1}{3}$, what is the probability that any given grown ear of corn was planted by Alyssa?

31. _____ Find the determinant of $A - B$, given that $A = \begin{bmatrix} 2 & -2 \\ 5 & -7 \end{bmatrix}$ and $B = \begin{bmatrix} 11 & -5 \\ 1 & 3 \end{bmatrix}$.

32. _____ What is the inverse of the function $y = \dfrac{x+1}{x-2}$?

33. _____ Evaluate 194×208.

34. _____ What is the sum of the first 7 perfect squares?

35. _____ Tramayne is going for a run. He starts at his house before running along a circular path of radius 1.5 miles. He runs 2 laps and returns to his starting point. What was Tramayne's net distance traveled, in miles?

36. _____ How many zeroes are at the end of 21!?

37. _____ What is the quantity and nature of the roots defined by $f(x) = 3x^2 - 6x + 4$? Choose from (2, rational), (2, irrational), (1, double root), or (2, imaginary).

38. _____ What is the coefficient of the x^2 term in the full expansion of $(2x + 3)^6$?

39. _____ What is the range of the function $y = \dfrac{6x+7}{8-5x}$? Express your answer in either inteval notation or set builder notation.

40. _____ Eliot lives in Minnesota. One morning, he notices that the actual outside temperature is $-13°$F, with sustained winds of 20 mph. He wants to find the apparent temperature, and he knows that the formula for apparent temperature is $T_{\text{apparent}} = \dfrac{T_{\text{actual}} \cdot w}{8} - 1.5$, where T_{apparent} is the apparent temperature, T_{actual} is the outside temperature and w is the wind speed. What is the apparent temperature?