1. In how many distinct ways can the letters in WASHINGTON DC be arranged?

A. 12! B. 11! C. 12! / 2 D. 11! / 2 E. NOTA

2. A teacher hands out 12 identical pieces of candy among 6 students after a review game. One student won the game and must receive at least 3 pieces. All the others must receive at least 1. How many ways are there for the teacher to hand out the candy?

A. 252 B. 126 C. 63 D. 189 E. NOTA

3. Find the constant term in the expansion of $\left(2x^3 + \frac{1}{x}\right)^{12}$.

A. 1760 B. 8 C. 220 D. 3960 E. NOTA

4. Find the number of terms in the expansion $(w + x + y + 2)^9$.

A. 550 B. 440 C. 495 D. 220 E. NOTA

5. Sharay has a keychain that she needs to place 7 keys on. In how many ways can Sharay place her 7 keys on the key chain? (Only count configurations that are distinguishable, a keychain can be rotated and flipped)

A. 360 B. 720 C. 5040 D. 2520 E. NOTA

6. Given $\binom{81}{3} = 85320$ and $\binom{81}{4} = 1663740$, find $\binom{82}{4}$.

A. 1672170 B. 1759060 C. 1739060 D. 1750060 E. NOTA

7. Consider a 10 x 10 grid of unit squares. If the number of squares that can be made is m, and the number of rectangles that can be made is n, find $m + n$. (The sides of the rectangles and squares must be along the original edges or gridlines. Congruent shapes in different locations are different.)

A. 2025 B. 2410 C. 3035 D. 3410 E. NOTA

8. How many subsets of $\{1, 2, 3, 4, 5, 6, 7, 8\}$ are there?

A. 255 B. 128 C. 256 D. 127 E. NOTA

9. At a party, every child shake hand with every other child once. Every parent shake hand with every other parent once. There are no handshakes between parents and children. If there are 40 parents and 50 children, how many handshakes occurred?

A. 2075 B. 2045 C. 2055 D. 2005 E. NOTA

10. How many distinguishable permutations of the letters in BALLOON have the property that the first and last letters are different?

A. 120 B. 1140 C. 1260 D. 1120 E. NOTA

11. Bob the alien wants to create words. His words have three letters, a consonant, then a vowel, and then another consonant, his alphabet has 20 letters – 17 consonants and 3 vowels. How many words can be created?

A. 867 B. 1083 C. 1200 D. 153 E. NOTA

12. A committee of 3 is to be selected from 13 Democrats, 12 Republicans, and 11 Libertarians. What is the probability that at least 2 parties are represented?

A. 6269/7140 B. 6469/7140 C. 6369/7140 D. 1 E. NOTA

13. Six boys and three girls are to line up in a row. In how many ways can they line up with the restriction that all boys must be next to each other?

A. 30,240 B. 40,320 C. 17,080 D. 43,200 E. NOTA

14. How many 6-digit numbers can be made with their digits in strictly decreasing order from left to right?

A. 210 B. 420 C. 84 D. 168 E. NOTA

15. How many 4-digit numbers can be made with their digits in strictly increasing order from left to right?

A. 210 B. 126 C. 105 D. 63 E. NOTA

16. Olivia is creating a sandwich that contains one bread, two different meats, and one vegetable. If there are 8 breads, 5 meats, and 4 vegetables to choose from, how many distinguishable sandwiches can Olivia make? (The order of meat does not matter)

A. 480 B. 640 C. 160 D. 320 E. NOTA

17. Amy is trapped on the cartesian grid. She can only move up or to the right. If she starts at (1, 1), how many ways can he get to (4, 12) while going through (2, 6)?

A. 168 B. 84 C. 48 D. 336 E. NOTA

18. Michelle is buying chicken nuggets from McDonald's. McDonald's offers sizes of chicken nuggets in boxes of 7 and boxes of 9. Assume there are infinite of each what is the largest amount of chicken nuggets Michelle cannot buy directly?

A. 43 B. 40 C. 47 D. 38 E. NOTA

19. Let n be an integer such that 30^n evenly divides 2020! Find the largest value of n.

A. 500 B. 503 C. 504 D. 507 E. NOTA

20. Suppose a committee of 4 is randomly chosen from 10 people, Erick and Kevin among the 10. Determine the probability that Erick and Kevin are either both in the committee, or both out of the committee.

A. 7/16 B. 8/15 C. 7/15 D. 1/2 E. NOTA

21. How many 4-digit numbers are divisible by 5 and have distinct digits?

A. 952 B. 1008 C. 896 D. 966 E. NOTA

22. What is the maximum number of points of intersection between 12 circles and 9 lines where the circles and lines are distinct?

A. 276 B. 384 C. 429 D. 252 E. NOTA

23. Find the coefficient of the x^3 term in the expansion of $\left(3x + \frac{1}{x^3}\right)^7$.

A. 729 B. 1701 C. 5003 D. 2835 E. NOTA

24. 7 people, Timmy, Jake, Edward, and Samuel among them, sit around a circular table. Timmy and Jake sit together. Edward and Samuel sit together. In how many distinguishable ways can they be seated? (Rotations are not distinguishable)

A. 96 B. 64 C. 108 D. 72 E. NOTA

25. A coin is flipped 8 times. If there are more tails than heads, what is the probability that there are exactly 6 tails?

A. 56/93 B. 28/93 C. 8/93 D. 1/93 E. NOTA

26. In the math team, 18 people take physics, 33 people take chemistry, and 40 take biology. 23 take both chemistry and biology, 16 take both biology and physics, and 5 take both physics and chemistry, 3 take all. How many students are on the math team if every student takes at least one class?

A. 40 B. 43 C. 46 D. 50 E. NOTA

27. How many ordered triples of nonnegative integers (a, b, c) satisfy the inequality $a + b + c \leq 9$?

A. 219 B. 220 C. 210 D. 165 E. NOTA

28. Let N be the sum of the elements in the 60^{th} row of Pascal's triangle. Compute the remainder when N is divided by 61. (Note: the row of Pascal's triangle containing a single 1 is the 0^{th} row.)

A. 1 B. 2 C. 7 D. 13 E. NOTA

29. You are in a single elimination tennis tournament with 63 other people. How many matches must be played to determine a winner?

A. 31 B. 32 C. 63 D. 64 E. NOTA

30. How many ways can you assign 4 indistinguishable balls to 4 indistinguishable boxes?

A. 5 B. 15 C. 35 D. 256 E. NOTA