PERMUTATIONS AND ARRANGEMENTS FOR AMC 8: PRACTICE SET

ANDY JO

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1. Problems

Beginner.

1. (2004 AMC 8, Problem #2) How many different four-digit numbers can be formed by rearranging the four digits in 2004?
(A) 4 **(B)** 6 **(C)** 16 **(D)** 24 **(E)** 81

2. Four friends take seats in a row of 7 empty chairs, one friend to a chair. In how many ways can they be seated?

3. (2019 AMC 10A, Problem #2) What is the hundreds digit of $(20! - 15!)$?
(A) 0 **(B)** 1 **(C)** 2 **(D)** 4 **(E)** 5

4. (1993 AJHSME, Problem #12) If each of the three operation signs, $+$, $-$, $\times$, is used exactly **once** in one of the blanks in the expression

$$5 _ 4 _ 6 _ 3$$

then the value of the result could equal
(A) 9 **(B)** 10 **(C)** 15 **(D)** 16 **(E)** 19

5. (2020 AMC 10A, Problem #6) How many 4-digit positive integers (that is, integers between 1000 and 9999, inclusive) having only even digits are divisible by 5?
(A) 80 **(B)** 100 **(C)** 125 **(D)** 200 **(E)** 500

Intermediate.

6. (2003 AMC 8, Problem #16) Ali, Bonnie, Carlo and Dianna are going to drive together to a nearby theme park. The car they are using has four seats: one driver's seat, one front passenger seat and two back seats. Bonnie and Carlo are the only two who can drive the car. How many possible seating arrangements are there?
(A) 2 **(B)** 4 **(C)** 6 **(D)** 12 **(E)** 24

7. (2018 AMC 8, Problem #16) Professor Chang has nine different language books lined up on a bookshelf: two Arabic, three German, and four Spanish. How many ways are there to arrange the nine books on the shelf keeping the Arabic books together and keeping the Spanish books together?
(A) 1440 **(B)** 2880 **(C)** 5760 **(D)** 182,440 **(E)** 362,880

8. (1968 AHSME, Problem #21) If $S = 1! + 2! + 3! + \cdots + 99!$, then the units digit in the value of S is:
(A) 9 **(B)** 8 **(C)** 5 **(D)** 3 **(E)** 0

9. (2018 AMC 10A, Problem #4) How many ways can a student schedule 3 mathematics courses — algebra, geometry, and number theory — in a 6-period day if no two mathematics courses can be taken in consecutive periods?
(What courses the student takes during the other 3 periods is of no concern here.)
(A) 3 **(B)** 6 **(C)** 12 **(D)** 18 **(E)** 24

10. (2013 AMC 10A, Problem #13) How many three-digit numbers are not divisible by 5, have digits that sum to less than 20, and have the first digit equal to the third digit?
(A) 52 **(B)** 60 **(C)** 66 **(D)** 68 **(E)** 70

Advanced.

11. (2013 AMC 10B, Problem #18) The number 2013 has the property that its units digit is the sum of its other digits, that is $2 + 0 + 1 = 3$. How many integers less than 2013 but greater than 1000 have this property?

(A) 33 **(B)** 34 **(C)** 45 **(D)** 46 **(E)** 58

12. (2009 AMC 8, Problem #16) How many 3-digit positive integers have digits whose product equals 24?

(A) 12 **(B)** 15 **(C)** 18 **(D)** 21 **(E)** 24

13. (2019 AMC 10A, Problem #17) A child builds towers using identically shaped cubes of different colors. How many different towers with a height 8 cubes can the child build with 2 red cubes, 3 blue cubes, and 4 green cubes? (One cube will be left out.)

(A) 24 **(B)** 288 **(C)** 312 **(D)** 1,260 **(E)** 40,320

14. (2017 AMC 8, Problem #19) For any positive integer M, the notation $M!$ denotes the product of the integers 1 through M. What is the largest integer n for which 5^n is a factor of the sum:

$$98! + 99! + 100!$$

(A) 23 **(B)** 24 **(C)** 25 **(D)** 26 **(E)** 27

15. (2024 AMC 10B, Problem #20) Three different pairs of shoes are placed in a row so that no left shoe is next to a right shoe from a different pair. In how many ways can these six shoes be lined up?

(A) 60 **(B)** 72 **(C)** 90 **(D)** 108 **(E)** 120

2. Answer Key

Problem	Letter	Value
1	B	6
2		840
3	A	0
4	E	19
5	B	100
6	D	12
7	C	5760
8	D	3
9	E	24
10	B	60
11	D	46
12	D	21
13	D	1,260
14	D	26
15	A	60