1. How many ways can you seat five people in a row?
2. Two out of five students are to be selected to take AP Bio. How many ways can this be done?
3. The presidential candidates are going to the movies. How many ways can you seat the five people in a row if Donald and Hillary, two of the five people, refuse to sit next to each other?
4. How many three-digit numbers are multiples of 6?
5. (AMC 10) How many four-digit positive integers have at least one digit that is a 2 or a 3?
6. How many three-digit numbers have digits that sum to an odd number?
7. Philip is buying an outfit. He may choose from 3 shirts, 2 ties, and 4 necklaces. If he must pick one option from at least two of the articles mentioned, how many ways can Philip make his purchase?
8. How many "words" can be formed by rearranging the letters of the word "MEMES?"
9. How many divisors of 60^2 are not divisors of 60?
10. (Jayne Fischer) Mr. Mutke is selecting four people to make a team. He can choose from six boys and six girls. How many ways can he make his team such that there is at least one member that is a boy and one member that is a girl?
11. (AMC 10) Walking down Jane Street, Ralph passed four houses in a row, each painted a different color. He passed the orange house before the red house, and he passed the blue house before the yellow house. The blue house was not next to the yellow house. How many orderings of the colored houses are possible?
12. (AMC 10) A dessert chef prepares the dessert for every day of a week starting with Sunday. The dessert each day is either cake, pie, ice cream, or pudding. The same dessert may not be served two days in a row. There must be cake on Friday because of a birthday. How many different dessert menus for the week are possible?
13. How many subsets does the set $\{1, 2, 3, 4, 5, 6\}$ have?
14. (AMC 10) A pair of six-sided dice are labeled so that one die has only even numbers (two each of 2, 4, and 6), and the other die has only odd numbers (two of each 1, 3, and 5). The pair of dice is rolled. What is the probability that the sum of the numbers on the tops of the two dice is 7?
15. (AMC 10) Three tiles are marked X and two other tiles are marked O. The five tiles are randomly arranged in a row. What is the probability that the arrangement reads $XOXOX$?
16. (AIME) Consider 10 distinct points on a circle. How many convex polygons can be formed from some of these points?
17. Call a positive integer "cool" if its digits, when read from left to right, form a strictly decreasing sequence. For example, 9832 is cool. How many three-digit numbers are cool?

18. (AMC 10) Call a positive integer monotonous if it is a one-digit number or its digits, when read from left to right, form either a strictly increasing or a strictly decreasing sequence. For example, 3, 23578, and 987620 are monotonous, but 88, 7434, and 23557 are not. How many monotonous positive integers are there?

19. Maxwell is going to buy cars. He can choose cars from Toyota, Honda, or Boeing, and is going to buy 6 cars. How many ways can he make his purchase?

20. A set is "lucky" if the sum of its elements is odd. How many subsets of $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ are lucky?

21. (AIME) Find the number of subsets of $\{1, 2, 3, 4, 5, 6, 7, 8\}$ that are subsets of neither $\{1, 2, 3, 4, 5\}$ nor $\{4, 5, 6, 7, 8\}$.

22. (AMC 10) Eight distinct points are chosen on a circle such that no three meet at a point. All line segments connecting any two of the points are drawn. How many triangles are formed by the intersecting lines?

23. A six-carbon ring in the shape of a hexagon is formed such that the bond between each adjacent carbons is either a single bond or a double bond. Rings are considered identical if one can be rotated to achieve the other. How many distinct rings are there?

24. (AIME) Derek, Zeehong, and Brenda each independently choose a number from the set $\{1, 2, 3, 4, 5, 6\}$. How many ways can they choose their numbers such that Zeehong's number is at least Derek's number and Brenda's number is at least Zeehong's number?

25. (AIME) Call a set S product-free if there do not exist $a, b, c \in S$ (not necessarily distinct) such that $ab = c$. For example, the empty set and the set $\{16, 20\}$ are product-free, whereas the sets $\{4, 16\}$ and $\{2, 8, 16\}$ are not product-free. Find the number of product-free subsets of the set $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$.

26. (HMMT) Zeehong the Frog likes numbers whose digits strictly decrease, but numbers that violate this condition in at most one place are good enough. In other words, if d_i denotes the ith digit, then $d_i \leq d_{i+1}$ for at most one value of i. For example, Zeehong likes the numbers 43210, 132, and 3, but not the numbers 1337 and 123. How many 5-digit numbers does Zeehong like?

27. (AIME) Five towns are connected by a system of roads. There is exactly one road connecting each pair of towns. Find the number of ways there are to make all the roads one-way in such a way that it is still possible to get from any town to any other town using the roads (possibly passing through other towns on the way).

1. 120
2. 10
3. 72
4. 150
5. 5416
6. 450
7. 50
8. 30
9. 33
10. 465
11. 3
12. 729
13. 64
14. $\frac{1}{3}$
15. $\frac{1}{10}$
16. 968
17. 120
18. 1524
19. 28
20. 512
21. 196
22. 28
23. 13
24. 56
25. 252
26. 14034
27. 544