

# Fundamental Counting Principles

**Determine how many different computer passwords are possible if:**

**(a) digits and letters can be repeated, and (b) digits and letters cannot be repeated.**

1. 3 digits followed by 4 letters.
2. 2 digits followed by 5 letters.
3. A men's department store sells 3 different suit jackets, 6 different shirts, 8 different ties, and 4 different pairs of pants. How many different suits consisting of a jacket, shirt, tie, and pants are possible?
4. A baseball manager is determining the batting order for the team. The team has 9 players, but the manager definitely wants the pitcher to bat last. How many batting orders are possible?
5. How many eight-digit numbers can be formed if the leading digit cannot be a zero and the last number cannot be 1?
6. How many 4 digit odd numbers can be formed if no digit can be repeated?
7. The standard configuration for an Alaska license plate is 3 letters followed by 3 digits. How many different license plates are possible if letters and digits can be repeated? How many if they cannot be repeated?
8. A single die is rolled. How many ways can you roll a number less than 3, then an even, and then an odd?
9. A single die is rolled. How many ways can you roll a number that is prime, followed by a 6?
10. A red die and a blue die are rolled – in how many ways can you get a sum of 6?
11. From a standard deck of cards, how many ways can you pick a face card, then a spade? Provided you put the first card back?
12. From a standard deck of cards, how many ways can you pick a king, a heart, and then a five? Provided you put the cards back into the deck.

13. You are taking a survey on your experience at Taco Bell. For the first five questions you can answer Below Average, Average, or Above Average for each question. The last three questions you can respond with either Agree or Disagree. How many total outcomes are there for this survey?
14. How many odd 2-digit positive integers greater than 20 are there?
15. How many even 3-digit positive integers can be written using the digits 1, 2, 4, 7, and 8?
16. In how many different ways can a 10-question true-false test be answered if every question must be answered? What if it is all right to leave questions unanswered?
17. How many ways are there to write a 3-digit positive integer using the digits 1, 3, 5, 7, and 9 if no digit is used more than once?
18. How many positive odd integers less than 10,000 can be written using the digits 3, 4, 6, 8, and 0?
19. How many license plates of 3 symbols (letters and digits) can be made using at least 2 letters for each?
20. Suppose you have totally forgotten the combination to your locker. There are three numbers in the combination, and you're sure each number is different. The numbers on the lock's dial range from 0 to 35. If you test one combination every 12 seconds, how long (in days to the nearest hundredth) will it take to test all possible combinations?
21. DNA molecules include the base units adenine, thymine, cytosine, and guanine (A, T, C, and G). The sequence of base units along a strand of DNA encodes genetic information. In how many different sequences can A, T, C, and G be arranged along a short strand of DNA that has only 8 base units?
22. How many 3-letter code words can be formed if at least one of the letters is to be chosen from the vowels a, e, i, o, and u?

### **Answers**

- |                 |                 |                   |                              |           |
|-----------------|-----------------|-------------------|------------------------------|-----------|
| 1a. 456,976,000 | 1b. 258,336,000 | 2a. 1,188,137,600 | 2b. 710,424,000              | 3. 576    |
| 4. 40,320       | 5. 81,000,000   | 6. 2,240          | 7. 17,576,000 and 11,232,000 |           |
| 8. 18           | 9. 3            | 10. 5             | 11. 156                      | 12. 208   |
| 13. 1,944       | 14. 40          | 15. 75            | 16. 1,024 and 59,049         | 17. 60    |
| 18. 125         | 19. 37,856      | 20. 5.95 days     | 21. 65,536                   | 22. 8,315 |