The Fundamental Counting Principle, Permutations and Combinations

Fundamental Counting Principle: $m_1 \bullet m_2$

m_1 : number of ways for Event$_1$

m_2 : number of ways for Event$_2$

Permutations: $_nP_r = \dfrac{n!}{(n-r)!}$

Example of a Permutation: In a group of seven people, in how many ways can three of them be arranged in height order?

Combinations: $_nC_r = \dfrac{n!}{r!(n-r)!}$

Example of a Combination: In a group of seven people, how many committees of three can be formed?

1. Evaluate each.

   a) $_8P_3$

   b) $_{20}P_4$

   c) $_8C_3$

   d) $_{20}C_4$

2. How many different pairs of letters from the alphabet are possible?

3. How many different two-digit odd numbers are possible?

4. How many different telephone numbers are possible within each area code?

5. If a state's license plate consists of 3 letters and 4 numbers, how many different license plates are possible?

6. In how many ways can a ten question True/False exam be answered?

7. A student must select one from three math courses, one of two science courses and one of five history courses. How many schedules are possible?

8. Ten horses are running in a race. In how many different ways could the top three places be decided in a horse race?

9. A student has four books.

   a) How many different ways can they be arranged on a shelf?

   b) How many different ways can they be arranged alphabetically on a shelf?

10. In how many ways can the letters in each word be arranged?

    a) MONDAY

    b) BOOKKEEPER

11. A company has four positions available. If there are 20 people to choose from, in how many different ways can the positions be filled?

12. In a class of 20 students, a committee of six is to be formed.

    a) How many different six-person committees can be formed?

    b) If the class has 7 girls and 13 boys and the committee is to consist of 3 girls and 3 boys, how many different six-person committees can be formed?

13. In a standard deck of 52 cards, how many different poker hands are possible?

14. If there are 60 numbers to choose from in a state lottery, in how many ways can a player choose five numbers?

15. In a standard deck of 52 cards, in how many ways can you select a full house?