

Chapter 10: Permutations & Combinations (IC)

1. If the NCAA has applications from 6 universities for hosting its intercollegiate tennis championships in 2014 and 2015, how many ways may they select the hosts for these championships:

a) if they are not both to be held at the same university? $P(6, 2)$ or $\underline{6 \cdot 5} = \underline{30}$

b) if they may both be held at the same university? $\underline{6 \cdot 6} = \underline{36}$

2. There are five finalists in the Mr. Rock Hill pageant. In how many ways may the judges choose a winner and a first runner-up?

$P(5, 2)$ or $\underline{5 \cdot 4} = \underline{20}$

3. In a primary election, there are four candidates for mayor, five candidates for city treasurer, and two candidates for county attorney. In how many ways may voters mark their ballots if they vote in all three of the races?

$\underline{4 \cdot 5 \cdot 2} = \underline{40}$ or $4C_1 \cdot 5C_1 \cdot 2C_1$

4. A multiple-choice test consist of 15 questions, each permitting a choice of 5 alternatives. In how many ways may a student fill in the answers if they answer each question.

5^{15}

5. A television director is scheduling a certain sponsor's commercials for an upcoming broadcast. There are six slots available for commercials. In how many ways may the director schedule the commercials:

a) if the sponsor has six different commercials, each to be shown once? $6!$ or $\underline{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = \underline{720}$

b) if the sponsor has three different commercials, each to be shown twice? $C(6, 2) \cdot C(4, 2) \cdot C(3, 2) = \underline{90}$

c) if the sponsor has two different commercials, each to be shown three times? $C(6, 3) \cdot C(3, 3) = \underline{20}$

d) if the sponsor has three different commercials, the first of which is to be shown three times, the second two times, and the third once?

$C(6, 3) \cdot C(3, 2) \cdot C(1, 1) = \underline{60}$

6. In how many ways can five persons line up to get on a bus? $5!$ or $\underline{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = \underline{120}$

7. How many permutations are there of the letters in the word "great?" $5! = \underline{120}$

8. How many permutations are there of the letters in the word "greet?" $\frac{5!}{2!} = \underline{60}$

9. How many permutations are there of the word "statistics?" $\frac{10!}{3! 3! 2!} = \underline{50,400}$

10. How many permutations of the word "statistics" begin and end with the letter "s"? $8!$ (middle 8 letters)

$\underline{3360} = \text{t's} \rightarrow 3! 2! \leftarrow \text{i's}$

11. A college football team plays 10 games during the season. In how many ways can it end the season with 5 wins, 4 losses, and 1 tie?

$$C(10, 5) \cdot C(5, 4) \cdot C(1, 1) = 1260$$

12. If eight people eat dinner together, in how many different ways can 3 order chicken, 4 order steak, and 1 order lobster?

$$C(8, 3) \cdot C(5, 4) \cdot C(1, 1) = 280$$

13. Suppose a True-False test has 20 questions.

a) In how many ways can a student mark the test if each question is answered?

$$2^{20}$$

b) In how many ways can a student mark the test if 10 questions are marked correctly and 10 incorrectly?

$$C(20, 10) \cdot C(10, 10) = 184,756$$

14. Among the seven nominees for two vacancies on the city council are three men and four women. In how many ways can these vacancies be filled:

a) with any two of the nominees?

$$C(7, 2) = 21$$

b) with any two of the women?

$$C(4, 2) = 6$$

c) with one of the men and one of the women?

$$C(4, 1) \cdot C(3, 1) = 12$$

15. Mr. Jones owns 4 pairs of pants, 7 shirts, and 3 sweaters. In how many ways can he choose 2 of the pairs of pants, 3 of the shirts, and 1 of the sweaters to pack for the trip?

$$C(4, 2) \cdot C(7, 3) \cdot C(3, 1) = 630$$

16. In how many ways can one A, three B's, two C's, and one F be distributed among the seven students in a computer class?

$$C(7, 1) \cdot C(6, 3) \cdot C(3, 2) \cdot C(1, 1) = 420$$

17. An art collector, who owns 10 original paintings, is preparing a will. In how many ways can the collector leave these paintings to three heirs?

$$3^{10}$$

18. A baseball fan has a pair of tickets to 6 different home games of the Chicago Cubs. If the fan has five friends who like baseball, how many ways may he take one of them along to each of the six games?

$$5^6$$