

Combinations: Selecting Items Where Order Does Not Matter

Probability & Counting Worksheet · Grade 9–11

Name: _____

Date: _____

Learning Objectives

- Understand the definition of a combination and how it differs from a permutation
- Apply the combination formula to evaluate expressions of the form $C(n, r)$
- Solve real-world word problems involving combinations

Problems

1. Evaluate the combination below using the combination formula.

$$C(5, 2)$$

2. Evaluate the combination below using the combination formula.

$$C(7, 3)$$

3. Evaluate the combination below using the combination formula.

$$C(8, 5)$$

4. A student wants to choose 2 toppings from a list of 6 available pizza toppings. How many different combinations of toppings are possible?

$$C(6, 2)$$

5. A teacher needs to select 4 students from a class of 9 to form a study group. How many different groups can be formed?

$$C(9, 4)$$

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6. From a deck of 10 cards numbered 1 through 10, how many ways can you choose 3 cards?

$$C(10, 3)$$

7. A basketball coach must pick 5 starters from a roster of 12 players. In how many ways can the starting lineup be chosen? Note that positions do not matter.

$$C(12, 5)$$

8. Solve for n in the equation below, given that the answer is a whole number greater than zero.

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

9. A committee of 3 men and 2 women must be formed from a group of 6 men and 5 women. How many different committees are possible?

$$C(6, 3) \times C(5, 2)$$

10. A school club has 8 members and needs to form a subcommittee of at least 2 but no more than 3 members. How many different subcommittees are possible in total?

$$C(8, 2) + C(8, 3)$$

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Combinations: Selecting Items Where Order Does Not Matter — Answer Key

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Answer Key

1. Answer: 10

- Use the formula $C(n,r) = n! / [(n-r)! * r!]$
- $C(5,2) = 5! / (3! * 2!) = 120 / (6 * 2) = 120 / 12 = 10$

2. Answer: 35

- $C(7,3) = 7! / (4! * 3!)$
- Expand: $(7 * 6 * 5) / (3 * 2 * 1) = 210 / 6 = 35$

3. Answer: 56

- $C(8,5) = 8! / (3! * 5!)$
- Expand numerator up to 5!: $(8 * 7 * 6) / (3 * 2 * 1) = 336 / 6 = 56$

4. Answer: 15

- $C(6,2) = 6! / (4! * 2!)$
- $(6 * 5) / (2 * 1) = 30 / 2 = 15$

5. Answer: 126

- $C(9,4) = 9! / (5! * 4!)$
- $(9 * 8 * 7 * 6) / (4 * 3 * 2 * 1) = 3024 / 24 = 126$

6. Answer: 120

- $C(10,3) = 10! / (7! * 3!)$
- $(10 * 9 * 8) / (3 * 2 * 1) = 720 / 6 = 120$

7. Answer: 792

- $C(12,5) = 12! / (7! * 5!)$
- $(12 * 11 * 10 * 9 * 8) / (5 * 4 * 3 * 2 * 1) = 95040 / 120 = 792$

8. Answer: $n = 7$

- $C(n,2) = n(n-1)/2 = 21$
- $n(n-1) = 42$, so $n = 7$ (since $7 * 6 = 42$)

9. Answer: 200

- $C(6,3) = (6 * 5 * 4) / (3 * 2 * 1) = 20$
- $C(5,2) = (5 * 4) / (2 * 1) = 10$
- Total = $20 * 10 = 200$

10. Answer: 84

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- $C(8,2) = (8 \times 7)/(2 \times 1) = 28$
 - $C(8,3) = (8 \times 7 \times 6)/(3 \times 2 \times 1) = 56$
 - Total = $28 + 56 = 84$
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