

Section 15-11: Combinations

Comparing Permutations and Combinations

1. 060426a, P.I. A2.S.11
In a game, each player receives 5 cards from a deck of 52 different cards. How many different groupings of cards are possible in this game?
[A] ${}_{52}P_5$ [B] $5!$ [C] $\frac{52!}{5!}$ [D] ${}_{52}C_5$
2. 010307a, P.I. A2.S.9
There are 12 people on a basketball team, and the coach needs to choose 5 to put into a game. How many different possible ways can the coach choose a team of 5 if each person has an equal chance of being selected?
[A] ${}_{12}C_5$ [B] ${}_5P_{12}$ [C] ${}_5C_{12}$ [D] ${}_{12}P_5$
3. 010628a, P.I. A2.S.9
A committee of five members is to be randomly selected from a group of nine freshmen and seven sophomores. Which expression represents the number of different committees of three freshmen and two sophomores that can be chosen?
[A] ${}_9C_3 \cdot {}_7C_2$ [B] ${}_9C_3 + {}_7C_2$
[C] ${}_9P_3 \cdot {}_7P_2$ [D] ${}_{16}C_3 \cdot {}_{16}C_2$
4. 010515a, P.I. A2.S.11
How many different three-member teams can be selected from a group of seven students?
[A] 35 [B] 1 [C] 5,040 [D] 210
5. 010729a, P.I. A2.S.11
If the Math Olympiad Club consists of eighteen students, how many different teams of four students can be formed for competitions?
[A] 73,440 [B] 66 [C] 3,060 [D] 72
6. 069907a, P.I. A2.S.11
How many different three-member teams can be formed from six students?
[A] 120 [B] 216 [C] 20 [D] 720
7. 060320a, P.I. A2.S.11
How many different five-member teams can be made from a group of eight students, if each student has an equal chance of being chosen?
[A] 40 [B] 56 [C] 6,720 [D] 336
8. 080626a, P.I. A2.S.11
In the next Olympics, the United States can enter four athletes in the diving competition. How many different teams of four divers can be selected from a group of nine divers?
[A] 3,024 [B] 126 [C] 6,561 [D] 36
9. 010424a, P.I. A2.S.11
Five people have volunteered to work on an awards dinner at Madison High School. How many different committees of four can be formed from the five people?
[A] 20 [B] 5 [C] 10 [D] 1

10. 080025a, P.I. A2.S.11
Alan, Becky, Jesus, and Mariah are four students in the chess club. If two of these students will be selected to represent the school at a national convention, how many combinations of two students are possible?
11. 060534a, P.I. A2.S.11
An algebra class of 21 students must send 5 students to meet with the principal. How many different groups of 5 students could be formed from this class?
12. 080126a, P.I. A2.S.11
Megan decides to go out to eat. The menu at the restaurant has four appetizers, three soups, seven entrees, and five desserts. If Megan decides to order an appetizer or a soup, and one entree, and two different desserts, how many different choices can she make?
13. 080229a, P.I. A2.S.11
On a bookshelf, there are five different mystery books and six different biographies. How many different sets of four books can Emilio choose if two of the books must be mystery books and two of the books must be biographies?
14. 060114a, P.I. A2.S.11
If there are four teams in a league, how many games will have to be played so that each team plays every other team once?
[A] 16 [B] 8 [C] 6 [D] 3
15. 060632a, P.I. A2.S.11
Five friends met for lunch, and they all shook hands. Each person shook the other person's right hand only once. What was the total number of handshakes?
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16. 080527a, P.I. A2.S.11
The expression ${}_9C_2$ is equivalent to
[A] ${}_9P_7$ [B] ${}_9C_7$ [C] ${}_9P_2$ [D] $\frac{9!}{2!}$
17. 080720a, P.I. A2.S.11
The expression ${}_8C_3$ is equivalent to
[A] ${}_8P_5$ [B] $\frac{8!}{3!}$ [C] ${}_8P_3$ [D] ${}_8C_5$

[1] D

[2] A

[3] A

[4] A

[5] C

[6] C

[7] B

[8] B

[9] B

[2] 6 and appropriate work is shown, such as using the combination ${}_4C_2$, listing all six possible outcomes, or drawing a correct tree diagram.

[1] A correct setup of combinations is shown, but an incorrect solution, such as leaving ${}_4C_2$, or no integral solution is found.

or [1] An appropriate list or tree diagram is shown, but an incorrect solution is found, such as 5, by omitting one of the possible combinations.

or [1] 12 but a complete list or tree diagram is shown.

or [1] 6 but no work is shown.

[0] The answer is completely incorrect, such as ${}_4P_2$ or 4×3 .

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[10] obviously incorrect procedure.

[2] 20,349, and appropriate work is shown, such as ${}_{21}C_5 = 20,349$.

[1] Appropriate work is shown, but one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made, such as determining the value of ${}_{21}P_5$.

or [1] 20,349, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[11] incorrect procedure.

[3] 490, and appropriate work is shown, such as $7 \cdot 7 \cdot 10$.

[2] Appropriate work is shown, but one computational error is made.

or [2] Appropriate work is shown, but an incorrect answer is found, based on an incorrect

number of possible dessert combinations or an incorrect number of soup or appetizer choices.

or [2] Appropriate work is shown, but an incorrect answer is found, based on one error in the tree diagram.

or [2] $\frac{1}{490}$, but appropriate work is shown.

[1] 7, 7, and 10 are added instead of multiplied.

or [1] The counting principle is used correctly, but incorrect substitutions are made, but

an appropriate answer is shown.

or [1] 490, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[12] incorrect procedure.

[3] 150, and appropriate work is shown, such as ${}_5C_2 \bullet {}_6C_2$.

[2] Appropriate work is shown, but one computational error is made.

or [2] All the possible combinations of two mystery books and all the possible combinations of two biographies are calculated, but the answers are not multiplied.

[1] Appropriate work is shown, but more than one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made, such as the computation ${}_{11}C_4 = 330$.

or [1] 150, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[13] incorrect procedure.

[14] C _____

[2] 10, and appropriate work is shown, such as ${}_5C_2$ or a diagram or a list.

[1] Appropriate work is shown, but one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] 10, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[15] incorrect procedure.

[16] B _____

[17] D _____