

Practice 6-7**Permutations and Combinations**

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Indicate whether each situation involves a combination or a permutation.

- Five apples chosen at random from a case of apples.
- Ten applicants line up for a job interview.
- Three students elected president, secretary, and treasurer of the student body.
- Four students chosen at random from the student body.

Evaluate each expression.

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| 5. ${}_{12}C_{11}$ | 6. ${}_{12}C_{10}$ | 7. ${}_{12}C_5$ | 8. ${}_{12}C_1$ |
| 9. ${}_{12}C_{12}$ | 10. ${}_5C_4 + {}_5C_3$ | 11. $\frac{{}_5C_3}{{}_5C_2}$ | 12. $4({}_7C_2)$ |

How many combinations of five can you make from each set?

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| 13. Xul, Ben, Sue, Tom, and Ria | 14. $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ |
| 15. 14 novels on a reading list | 16. 50 states |

Evaluate each expression.

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| 17. $8!$ | 18. $\frac{11!}{9!}$ | 19. $6!4!$ | 20. $3(5!)$ |
| 21. ${}_{12}P_{11}$ | 22. ${}_{12}P_{10}$ | 23. ${}_{12}P_5$ | 24. ${}_{12}P_1$ |

- In how many ways can four distinct positions for a relay race be assigned from a team of nine runners?
- A committee must choose 3 finalists from 15 scholarship candidates. How many ways can the committee choose the three finalists?
- A traveler can choose from three airlines, five hotels, and four rental car companies. How many arrangements of these services are possible?
- In how many ways can four students be seated at a table with six chairs?

Assume a and b are positive integers. Decide whether each statement is true or false. If it is true, explain why. If it is false, give a counterexample.

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| 29. $a!b! = b!a!$ | 30. $(a^2)! = (a!)^2$ | 31. $a \cdot b! = (ab)!$ |
| 32. $(a + 0)! = a!$ | 33. $(a + b)! = a! + b!$ | 34. $(a!)! = (a!)^2$ |