

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

Practice 6-8

The Binomial Theorem

Use the Binomial Theorem to expand each binomial.

1. $(x + 2)^4$
 2. $(a + 2)^7$
 3. $(x + y)^7$
 4. $(d - 2)^9$
 5. $(2x - 3)^8$
 6. $(x - 1)^9$
 7. $(2x^2 - 2y^2)^6$
 8. $(x^5 + 2y)^7$
9. What is the probability that you will roll exactly five sixes in ten tosses of a number cube?
 10. One airline recently had a rate of 52 complaints per 100,000 departures, or a 0.00052 probability of a complaint on each flight.
 - a. What is the probability that the airline will not have a complaint in 20 flights?
 - b. What is the probability that the airline will not have a complaint in 100 flights?
 - c. What is the probability that the airline will have a complaint in 100 flights?
 11. 6% of the circuit boards assembled at a certain production plant are defective. If five circuit boards are chosen at random, what is the probability that exactly two are defective?
 12. The probability that a baby will be a boy is $\frac{1}{2}$. What is the probability that a family with five children has all boys?
 13. Your friend's batting average is 0.225. What is the probability of her getting three or more hits in the next five times at bat?
 14. If a classmate randomly guesses on ten multiple choice questions, what is the probability that six or more answers will be right? The probability of each answer being correct is 0.2.

Use Pascal's Triangle to expand each binomial.

15. $(n - 3)^3$
16. $(2n + 2)^4$
17. $(n - 6)^5$
18. $(n - 1)^6$
19. $(2a + 2)^3$
20. $(x^2 - y^2)^4$
21. $(2x + 3y)^5$
22. $(2x^2 + y^2)^6$
23. $(x^2 - y^2)^3$
24. $(2b + c)^4$
25. $(3m - 2n)^5$
26. $(x^3 - y^4)^6$

Expand each binomial.

27. $(x + 1)^7$
28. $(x + 4)^8$
29. $(x - 3y)^6$
30. $(x + 2)^5$
31. $(x^2 - y^2)^5$
32. $(3 + y)^5$
33. $(x^2 + 3)^6$
34. $(x - 5)^7$
35. $(x - 4y)^4$