

11-1

Practice

Form G

Permutations and Combinations

1. How many 2-letter pairs of 1 vowel and 1 consonant can you make from the English alphabet? Consider "y" to be a consonant.
2. An ice cream shop offers 33 flavors of ice cream and 7 toppings. How many different sundaes can the shop make using 1 flavor and 1 topping?
3. A contest winner gets to choose 1 of 8 possible vacations and bring 1 of 10 friends with her. How many different ways could the contest winner select her prize?

Evaluate each expression.

4. $8!$
5. $\frac{11!}{9!}$
6. $6!4!$
7. $3(5!)$
8. $\frac{9!}{2!6!}$
9. $3(7!)$
10. $\frac{10!}{5!}$
11. $\frac{3!8!}{5!}$

12. An art gallery plans to display 7 sculptures in a single row.
 - a. How many different arrangements of the sculptures are possible?
 - b. If one sculpture is taken out of the show, how many different arrangements are possible?

Evaluate each expression.

13. ${}_{12}P_{11}$
14. ${}_{12}P_{10}$
15. ${}_{12}P_5$
16. ${}_{12}P_1$
17. ${}_5P_2$
18. ${}_7P_4$
19. ${}_8P_6$
20. ${}_6P_2$

21. In how many ways can four distinct positions for a relay race be assigned from a team of nine runners?

Evaluate each expression.

22. ${}_{12}C_{11}$
23. ${}_{12}C_{10}$
24. ${}_{12}C_5$
25. ${}_{12}C_1$
26. ${}_{12}C_{12}$
27. ${}_5C_4 + {}_5C_3$
28. $\frac{{}_5C_3}{{}_5C_2}$
29. $4({}_7C_2)$

30. Thirty people apply for 10 job openings as welders. How many different groups of people can be hired?

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Practice (continued)

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Permutations and Combinations

For each situation, determine whether to use a permutation or a combination. Then solve the problem.

31. You draw the names of 5 raffle winners from a basket of 50 names. Each person wins the same prize. How many different groups of winners could you draw?
32. A paint store offers 15 different shades of blue. How many different ways could you purchase 3 shades of blue?
33. How many different 5-letter codes can you make from the letters in the word *cipher*?

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

34. $a!b! = b!a!$

35. $(a^2)! = (a!)^2$

36. $a \cdot b! = (ab)!$

37. $(a + 0)! = a!$

38. $\frac{a!}{b!} = \left(\frac{a}{b}\right)!$

39. $a!(b! + c!) = ab! + a!c!$

40. A restaurant offers a fixed-priced meal of 1 appetizer, 1 entrée, 2 sides, and 1 dessert. How many different meals could you choose from 4 appetizers, 5 entrees, 8 sides, and 3 desserts?

41. **Writing** Explain the difference between a permutation and a combination.

42. **Reasoning** Show that for $n = r$, the value of ${}_nC_r = 1$.