EXAMPLE 3 on p. 683 for Exs. 11–17

LICENSE PLATES **For the given configuration, determine how many different license plates are possible if (a) digits and letters can be repeated, and (b) digits and letters cannot be repeated.**

11. 4 letters followed by 3 digits

12. 2 letters followed by 5 digits

13. 4 letters followed by 2 digits

14. 5 digits followed by 3 letters

15. 1 digit followed by 5 letters

16. 6 letters

17. **TAKS REASONING** How many different license plates with 2 letters followed by 4 digits are possible if digits and letters cannot be repeated?

Ⓐ 3,276,000 Ⓑ 6,760,000 Ⓒ 32,292,000 Ⓓ 45,697,600

EXAMPLES 4 and 5 on pp. 684–685 for Exs. 18–41

FACTORIALS **Evaluate the expression.**

18. $7!$

19. $11!$

20. $1!$

21. $8!$

22. $4!$

23. $0!$

24. $12!$

25. $6!$

26. $3! \cdot 4!$

27. $3(4!)$

28. $\frac{8!}{(8-5)!}$

29. $\frac{9!}{4! \cdot 4!}$

PERMUTATIONS **Find the number of permutations.**

30. ${}_4P_4$

31. ${}_6P_2$

32. ${}_{10}P_1$

33. ${}_8P_7$

34. ${}_7P_4$

35. ${}_9P_2$

36. ${}_{13}P_8$

37. ${}_7P_7$

38. ${}_5P_0$

39. ${}_9P_4$

40. ${}_{11}P_4$

41. ${}_{15}P_0$

42. **TAKS REASONING** Let n be a positive integer. Find the number of permutations of n objects taken $n - 1$ at a time. *Compare* your answer with the number of permutations of all n objects. Does this make sense? *Explain.*

EXAMPLE 6 on p. 686 for Exs. 43–55

PERMUTATIONS WITH REPETITION **Find the number of distinguishable permutations of the letters in the word.**

43. OFF

44. TREE

45. SKILL

46. YELLOW

47. GRAVEL

48. PANAMA

49. ARKANSAS

50. FACTORIAL

51. MAGNETIC

52. HONOLULU

53. CLEVELAND

54. MISSISSIPPI

55. **TAKS REASONING** What is the number of distinguishable permutations of the letters in the word HAWAII?

Ⓐ 24 Ⓑ 180 Ⓒ 360 Ⓓ 720

56. **ERROR ANALYSIS** In bingo, balls labeled from 1 to 75 are drawn from a container without being replaced. *Describe* and correct the error in finding the number of ways the first 4 numbers can be chosen for a game of bingo.

$75 \cdot 75 \cdot 75 \cdot 75$
$= 31{,}640{,}625$ ✗

57. **TAKS REASONING** *Explain* how the fundamental counting principle can be used to justify the formula for the number of permutations of n distinct objects.

SOLVING EQUATIONS **Solve for n.**

58. ${}_nP_4 = 8({}_nP_3)$

59. ${}_nP_6 = 5({}_nP_5)$

60. ${}_nP_5 = 9({}_nP_4)$

61. **CHALLENGE** Find the number of distinguishable permutations of 6 letters that are chosen from the letters in the word MANATEE.