

c. $(a+b)(a+b)^k = (a+b) \left[\binom{k}{0}a^k + \binom{k}{1}a^{k-1}b + \binom{k}{2}a^{k-2}b^2 + \cdots + \binom{k}{k-1}ab^{k-1} + \binom{k}{k}b^k \right]$ or $(a+b)^{k+1} = \binom{k}{0}a^{k+1} + \binom{k}{1}a^k b + \binom{k}{2}a^{k-1}b^2 + \binom{k}{3}a^{k-2}b^3 + \cdots + \binom{k}{k-1}ab^k + \binom{k}{k}b^{k+1}$

d. $(a+b)^{k+1} = \binom{k}{0}a^{k+1} + \left[\binom{k}{0} + \binom{k}{1} \right]a^k b + \left[\binom{k}{1} + \binom{k}{2} \right]a^{k-1}b^2 + \left[\binom{k}{2} + \binom{k}{3} \right]a^{k-2}b^3 + \cdots + \left[\binom{k}{k-1} + \binom{k}{k} \right]ab^k + \binom{k}{k}b^{k+1}$

e. $(a+b)^{k+1} = \binom{k}{0}a^{k+1} + \binom{k+1}{1}a^k b + \binom{k+1}{2}a^{k-1}b^2 + \binom{k+1}{3}a^{k-2}b^3 + \cdots + \binom{k+1}{k}ab^k + \binom{k+1}{k+1}b^{k+1}$

f. $(a+b)^{k+1} = \binom{k+1}{0}a^{k+1} + \binom{k+1}{1}a^k b + \binom{k+1}{2}a^{k-1}b^2 + \binom{k+1}{3}a^{k-2}b^3 + \cdots + \binom{k+1}{k}ab^k + \binom{k+1}{k+1}b^{k+1}$

86. 6840 87. 56 88. true

Section 11.6

Check Point Exercises

1. 72 2. 729 3. 676,000 4. 840 5. 720 6. a. combinations b. permutations 7. 210 8. 1820

Exercise Set 11.6

1. 3024 2. 210 3. 6720 4. 5040 5. 720 6. 362,880 7. 1 8. 1 9. 126 10. 210 11. 330 12. 792 13. 1

14. 1 15. 1 16. 1 17. combinations 18. permutations 19. permutations 20. combinations 21. 0 22. 0 23. $\frac{3}{4}$

24. $\frac{83}{84}$ 25. -9499 26. -2062 27. $\frac{3}{68}$ 28. $\frac{21}{44}$ 29. 27 ways 30. 12 choices 31. 40 ways 32. 144 ways 33. 243 ways

34. 6561 ways 35. 144 area codes 36. 35,152 call letters 37. 120 ways 38. 24 ways 39. 6 paragraphs 40. 4 ways

41. 720 ways 42. 5040 ways 43. 8,648,640 ways 44. 6840 ways 45. 120 ways 46. 336 ways 47. 15,120 lineups

48. 840 arrangements 49. 20 ways 50. 330 committees 51. 495 collections 52. 3003 ways 53. 24,310 groups

54. about 3.07×10^{19} ways 55. 22,957,480 selections 56. 45,057,474 selections 57. 360 ways 58. 76,904,685 selections

59. 1716 ways 60. 177,600 ways 61. 1140 ways 62. 19,600 ways 63. 840 passwords 64. 15,120 ways 65. 2730 cones

66. 4495 bowls 67. 720 68. 120 69. 20 70. 15 71. 24 72. 600 83. makes sense 84. makes sense

85. does not make sense 86. does not make sense 87. false 88. false 89. true 90. false 91. 14,400 ways 92. 144 numbers

93. 450 ways 95. $\frac{2}{3}$ 96. $\frac{1}{3}$ 97. $\frac{2}{3}$

Section 11.7

Check Point Exercises

1. a. $\frac{7664}{100,000}$ or $\frac{479}{6250} \approx 0.077$ b. $\frac{720}{800}$ or $\frac{9}{10} = 0.9$ c. $\frac{720}{7664}$ or $\frac{45}{479} \approx 0.094$ 2. $\frac{1}{3}$ 3. $\frac{1}{9}$ 4. $\frac{1}{13}$ 5. $\frac{1}{13,983,816} \approx 0.0000000715$

6. $\frac{160}{191}$ 7. $\frac{1}{3}$ 8. $\frac{3}{4}$ 9. a. 0.99 b. 0.64 10. $\frac{1}{361} \approx 0.00277$ 11. $\frac{1}{16}$

Exercise Set 11.7

1. 0.10 2. 0.24 3. 0.52 4. 0.48 5. 0.01 6. 0.05 7. 0.59 8. 0.41 9. 0.61 10. 0.57 11. $\frac{1}{6}$ 12. $\frac{1}{6}$ 13. $\frac{1}{2}$

14. $\frac{1}{2}$ 15. $\frac{1}{3}$ 16. 0 17. $\frac{1}{13}$ 18. $\frac{1}{4}$ 19. $\frac{3}{13}$ 20. $\frac{3}{13}$ 21. $\frac{1}{4}$ 22. $\frac{1}{2}$ 23. $\frac{7}{8}$ 24. $\frac{1}{2}$ 25. $\frac{1}{12}$ 26. $\frac{5}{36}$

27. $\frac{1}{18,009,460}$; $\frac{5}{900,473}$ 28. $\frac{1}{593,775}$; $\frac{4}{23,751}$ 29. a. 2,598,960 b. 1287 c. $\frac{1287}{2,598,960} \approx 0.0005$ 30. $\frac{11}{1105} \approx 0.00995$ 31. $\frac{43}{58}$

32. $\frac{1}{6}$ 33. $\frac{50}{87}$ 34. $\frac{85}{174}$ 35. $\frac{113}{174}$ 36. $\frac{39}{58}$ 37. $\frac{12}{13}$ 38. $\frac{10}{13}$ 39. $\frac{2}{13}$ 40. $\frac{7}{13}$ 41. $\frac{7}{13}$ 42. $\frac{7}{13}$ 43. $\frac{3}{4}$ 44. $\frac{7}{8}$

45. $\frac{33}{40}$ 46. $\frac{13}{20}$ 47. $\frac{1}{36}$ 48. $\frac{1}{36}$ 49. $\frac{1}{3}$ 50. $\frac{1}{6}$ 51. $\frac{1}{64}$ 52. $\frac{1}{128}$ 53. a. $\frac{1}{256}$ b. $\frac{1}{4096}$ c. $\left(\frac{15}{16}\right)^{10} \approx 0.524$

d. $1 - \left(\frac{15}{16}\right)^{10} \approx 0.476$ 64. does not make sense 65. does not make sense 66. does not make sense 67. makes sense 68. $\frac{3}{8}$

70. $\frac{1}{10}$ 71. a. $\frac{12}{25}$ b. $\frac{3}{10}$ 72. 0.06 73. a. The first person can have any birthday in the year. The second person can have all but one birthday. b. $\frac{365}{365} \cdot \frac{364}{365} \cdot \frac{363}{365} \approx 0.99$ c. ≈ 0.01 d. ≈ 0.41 e. 23 people

Chapter 11 Review Exercises

1. $a_1 = 3; a_2 = 10; a_3 = 17; a_4 = 24$ 2. $a_1 = -\frac{3}{2}; a_2 = \frac{4}{3}; a_3 = -\frac{5}{4}; a_4 = \frac{6}{5}$ 3. $a_1 = 1; a_2 = 1; a_3 = \frac{1}{2}; a_4 = \frac{1}{6}$

4. $a_1 = \frac{1}{2}; a_2 = -\frac{1}{4}; a_3 = \frac{1}{8}; a_4 = -\frac{1}{16}$ 5. $a_1 = 9; a_2 = \frac{2}{27}; a_3 = 9; a_4 = \frac{2}{27}$ 6. $a_1 = 4; a_2 = 11; a_3 = 25; a_4 = 53$ 7. 65 8. 95

9. -20 10. $\sum_{i=1}^{15} \frac{i}{i+2}$ 11. $\sum_{i=1}^{13} i^3$ or $\sum_{i=1}^{10} (i+3)^3$ 12. 7, 11, 15, 19, 23, 27 13. -4, -9, -14, -19, -24, -29 14. $\frac{3}{2}, 1, \frac{1}{2}, 0, -\frac{1}{2}, -1$

15. -2, 3, 8, 13, 18, 23 16. $a_6 = 20$ 17. $a_{12} = -30$ 18. $a_{14} = -38$ 19. $a_n = 4n - 11; a_{20} = 69$ 20. $a_n = 220 - 20n; a_{20} = -180$

21. $a_n = 8 - 5n; a_{20} = -92$ 22. 1727 23. 225 24. 15,150 25. 440 26. -500 27. -2325 28. a. $a_n = 4.75n + 34.25$ b. 96%