Exercises 5.4

1. $4 \cdot 2 = 8$ routes
2. $3 \cdot 3 = 9$ routes
3. $3 \cdot 2 = 6$ routes
4. $4 \cdot 4 = 16$ routes
5. $44 \cdot 43 \cdot 42 = 79,464$ possibilities
6. $20 \cdot 19 \cdot 18 = 6840$ possibilities
7. $20 \cdot 19 \cdot 18 = 6840$ possibilities
8. $6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$ possibilities
9. 30 because $30 \cdot 29 = 870$
10. 25 because $25 \cdot 24 = 600$
11. **a.** $8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 40,320$ ways

    b. $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1 = 720$ ways
12. **a.** $9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 362,880$ ways

    b. $3 \cdot 2 \cdot 1 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 4320$ ways
13. $4 \cdot 3 \cdot 2 \cdot 1 = 24$ words
14. $26 \cdot 25 \cdot 25 = 16,250$ words
15. $2 \cdot 3 = 6$ outfits
16. $2 \cdot 4 \cdot 2 = 16$ outfits
17. $3 \cdot 12 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 360,000$ serial numbers
18. $9 \cdot 26 \cdot 26 \cdot 26 \cdot 9 \cdot 9 \cdot 9 = 115,316,136$ license plates
19. $10^9 - 1 = 999,999,999$ social security numbers
20. $1 \cdot 26 \cdot 26 + 1 \cdot 26 \cdot 26 \cdot 26 = 18,252$ call letters
21. $8 \cdot 2 \cdot 10 = 160$ area codes
22. $8 \cdot 10 \cdot 10 = 800$ area code

23. $9 \cdot 10 \cdot 10 \cdot 1 \cdot 1 = 900$ 5-digit palindromes

24. $9 \cdot 10 \cdot 10 \cdot 1 \cdot 1 \cdot 1 = 900$ 6-digit palindromes

25. $26 \cdot 26 \cdot 1 \cdot 1 = 676$ 4-letter palindromes

26. $26 \cdot 26 \cdot 1 = 676$ 3-letter palindromes

27. $15 \cdot 15 = 225$ matchups

28. $16 \cdot 16 = 256$ matchups

29. $3200 \cdot 2 \cdot 24 \cdot 52 = 7{,}987{,}200$ deals per year

30. $25 \cdot 25 = 625$ with repetition

$25 \cdot 24 = 600$ without repetition

31. $26 \cdot 26 \cdot 26 = 17{,}576$ sets of unique initials. Since there are 20,000 students, at least two students have the same set of initials

32. $26 \cdot 26 = 676$ sets of unique initials. Since there are 700 employees, at least two employees have the same set of initial.

33. $7 \cdot 5 = 35$ different possible halftime scores

34. If Gloria has 7 of each, she would have $7 \cdot 7 \cdot 7 = 343$ outfits (which is not enough). If Gloria would need 8 of each, so she would have $8 \cdot 8 \cdot 8 = 512$ outfits. Therefore, she has 8 of each.

35. $5 \cdot 4 = 20$ different mismatched sets

36. $11 \cdot 10 = 110$ different mismatched sets

37. $2^6 = 64$ possible sequences

38. $2^5 = 32$ possible sequences

39. $2^5 = 32$ possible ways

40. $3^5 = 243$ possible ways

41. $4^{10} = 1{,}048{,}576$ possible ways

42. $5^{10} = 9{,}765{,}625$ possible ways

43. $10^5 = 100{,}000$ possible zip codes

44. $10^4 = 10{,}000$ possible zip codes

45. $8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 40{,}320$ ways

$40320 \cdot 15 = 604{,}800$ seconds

$\frac{604800}{60} = 10{,}080$ minutes

$\frac{10080}{60} = 168$ hours

$\frac{168}{24} = 7$ days

46. $25 \cdot 25 \cdot 9 \cdot 9 \cdot 9 \cdot 25 \cdot 25 = 284{,}765{,}625$ ways

$\frac{284765625}{500000} = 569.53125$ weeks

$\frac{569.53125}{52} \approx 11$ years

47. $6 \cdot 7 \cdot 4 = 168$ days or 24 weeks

48. $7 \cdot 10 \cdot 4 = 280$ different meals

49. $5 \cdot 11 \cdot (7 \cdot 2 + 1) \cdot 10 = 8250$ different ways

50. $5 \cdot 5 \cdot 2 = 50$ possibilities

51. $2^4 = 16$ possible ways

52. $2^8 = 256$ possible ways

53. $2 \cdot 38 \cdot 38 = 2888$ different outcomes

54. $18 \cdot 17 \cdot 16 = 4896$ different outcomes

55. **a.** $9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 362{,}880$

b. $8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 1 = 40{,}320$

c. $1 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 1 \cdot 1 = 720$

56. $4 \cdot 3 \cdot 10 = 120$ different subjects are needed

57. $\frac{10 \cdot 9}{2} + 10 \cdot 10 = 145$ handshakes

58. $3 \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1 = 36$ different ways

59. $4 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 972$ ways

60. $3 \cdot 20 = 60$ ways

61. $7 \cdot 4 \cdot 2^6 = 1792$ different ballots

$8 \cdot 5 \cdot 3^6 = 29{,}160$ different ballots

62. $3 \cdot 6 + 3 \cdot 7 = 39$ different segments.

63. $2^4 = 16$ possible ways