

- 6: (1, 5), (2, 4), (3, 3), (4, 2), (5, 1); $\frac{5}{36}$
 7: (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1); $\frac{1}{6}$
 8: (2, 6), (3, 5), (4, 4), (5, 3), (6, 2); $\frac{5}{36}$
 9: (3, 6), (4, 5), (5, 4), (6, 3); $\frac{1}{9}$
 10: (4, 6), (5, 5), (6, 4); $\frac{1}{12}$
 11: (5, 6), (6, 5); $\frac{1}{18}$
 12: (6, 6); $\frac{1}{36}$
5. (a) 240 (b) (card number and suit, die number)
 (c) (i) $\frac{1}{4}$ (ii) $\frac{1}{4}$ (iii) $\frac{1}{20}$ (iv) $\frac{1}{10}$ (v) $\frac{1}{10}$
 6. (a) $\frac{2}{729}$ (b) $\frac{1}{81}$ (c) $\frac{4}{729}$
 (d) $\frac{1}{4}$ (e) $\frac{32}{729}$ (f) $\frac{35}{324}$
 7. Two-engine plane is safer, $\frac{3}{4}$ vs. $\frac{11}{16}$.
 8. (a) $\frac{1}{2}$ (b) $\frac{2}{9}$ (c) $\frac{1}{42}$ (d) $\frac{5}{84}$
 9. (a) $\frac{1}{4}$ (b) $\frac{79}{200}$ (c) $\frac{121}{200}$
 10. (a) $\frac{1}{8}$ (b) $\frac{1}{2}$ (c) $\frac{7}{8}$
 11. (a) 1000 (b) $\frac{1}{10}$ (c) $\frac{1}{5}$
 12. (a) 17 576 000 (b) $\frac{1}{26}$ (c) $\frac{1}{17\,576\,000}$
 13. (a) (i) $\frac{128}{625}$ (ii) $\frac{1}{3125}$ (iii) $\frac{64}{3125}$ (iv) $\frac{2944}{3125}$

4.6 Exercises, page 255

1. (a) 120 (b) 60 (c) 29 030 400
 (d) 5 (e) 720 (f) 6006
 2. (a) n (b) $3n$ (c) $n - r$
 3. (a) $5!$ (b) $\frac{8!}{5!}$ (c) $\frac{30!}{27!3!}$ (d) $\frac{12!}{10!}$
 4. (a) 3 628 800 (b) 362 880 (c) 40 320
 5. 2730
 6. (a) 720 (b) 360
 7. 415 800
 8. (a) Each side is 360.
 (b) (i) $n = 5$ (ii) $n = 10$ (iii) $n = 18$ (iv) $n = 19$
 9. (a) 9360
 (b) (i) $\frac{10}{39}$ (ii) $\frac{19}{156}$ (iii) $\frac{6}{65}$ (iv) $\frac{19}{780}$ (v) $\frac{7}{1170}$
 10. (a) 9600
 (b) (i) $\frac{1}{4}$ (ii) $\frac{1}{8}$ (iii) $\frac{9}{100}$ (iv) $\frac{1}{40}$ (v) $\frac{1}{150}$
 11. (a) $\frac{1}{1\,000\,000}$ (b) $\frac{1}{10\,000}$
 12. (a) $\frac{1}{22}$ (b) $\frac{1}{44}$ (c) $\frac{2}{33}$
 13. $\frac{1}{10!}$
 14. (a) 2 159 206 336 (b) 456 976 000 (c) 77 907 188 096
 15. $n = 6$

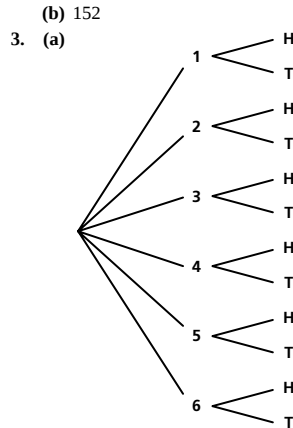
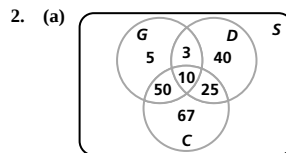
4.7 Exercises, page 262

1. (a) 56 (b) 35 (c) 12
 (d) 10 (e) 120 (f) 1
 2. 924
 3. 3150
 4. (a) $\binom{18}{2} = 153$ (b) $\binom{10}{2} = 45$ (c) $\frac{5}{17}$
 5. 752 538 150
 6. (a) 126 (b) 40 (c) 20
 (d) 1 (e) 121 (f) 45
 (g) (b) $\frac{20}{63}$ (c) $\frac{10}{63}$ (d) $\frac{1}{126}$ (e) $\frac{121}{126}$ (f) $\frac{5}{14}$

8. (a) 1260 (b) $\frac{2}{9}$
 9. (a) $\frac{11}{850}$ (b) $\frac{2}{17}$ (c) $\frac{1}{5525}$ (d) $\frac{11}{1105}$
 10. (a) $\frac{9}{38}$ (b) $\frac{69}{190}$ (c) $\frac{121}{190}$
 11. 1:13 983 815
 12. (a) $\frac{1}{2}, \frac{1}{2}$ (b) 1:1, 1:1
 13. (a) 5:6 (b) 6:5
 14. 4:1
 15. 2:3
 16. (a) probability of unfavourable outcome: probability of favourable outcome
 (b) $\frac{1}{101}$
 17. (a) Both involve selections of different objects. In permutations, order is important and in combinations, order is not important.
 (b) ${}_nC_r$ is the number of ways r objects can be selected from n different objects if order is not important. ${}_nP_r$ is the number of ways r objects can be selected from n different objects if order is important. ${}_nC_r = \frac{{}_nP_r}{r!}$
 18. (a) $\frac{145}{11\,792}$ (b) $\frac{20}{469}$ (c) $\frac{1}{9\,657\,648}$
 19. No, 135 games need to be played in 10 cities.

Chapter 4 Wrap-Up, page 268

1. (a) 24 (b) 0 (c) 1
 (d) 1 (e) 1 (f) 153



- (b) 6 (c) 3
4. Use a spreadsheet to generate about 30 random integers from 1 to 12. Count the number of terms until you arrive at your birth month. Repeat. Answers may vary; for example, 10 after repeating 20 times.
5. (a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{91}{216}$ (d) $\frac{6}{4165}$
 (e) $\frac{11}{663}$ (f) $\frac{1}{143}$ (g) $\frac{1}{120}$
 6. (a) 1 860 480 (b) 362 880 (c) 10 897 286 400
 (d) 60 (e) 1320 (f) 50 400
 (g) 369 600 (h) 12 (i) 80 640
 (j) 8 042 346 130 104 (k) 1013
 7. no, dependent, $P(A | B) \neq P(A | B')$
 8. (a) 0.0915 (b) 0.3917