Exercise Set 11.7

1. $P(\text{female}) = \frac{23}{89}$

2. $P(\text{male}) = \frac{66}{89}$

3. $P(\text{in the Army}) = \frac{36}{89}$

4. $P(\text{in the Navy}) = \frac{29}{89}$

5. $P(\text{a woman in the Air Force}) = \frac{6}{89}$

6. $P(\text{man in Marine Corps}) = \frac{5}{89}$

7. $P(\text{woman, among Air Force}) = \frac{6}{18} = \frac{1}{3}$

8. $P(\text{man, among single parents}) = \frac{5}{6}$

9. $P(\text{woman in Air Force}) = \frac{6}{23}$

10. $P(\text{man, among males}) = \frac{5}{66}$

11. $P(R) = \frac{n(E)}{n(S)} = \frac{1}{6}$

12. $P(R) = \frac{n(E)}{n(S)} = \frac{1}{6}$

13. $P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

14. $P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

15. $P(E) = \frac{n(E)}{n(S)} = \frac{2}{6} = \frac{1}{3}$

16. $P(E) = \frac{n(E)}{n(S)} = \frac{0}{6} = 0$

17. $P(E) = \frac{n(E)}{n(S)} = \frac{4}{52} = \frac{1}{13}$

18. $P(E) = \frac{n(E)}{n(S)} = \frac{13}{52} = \frac{1}{4}$

19. $P(E) = \frac{n(E)}{n(S)} = \frac{12}{52} = \frac{3}{13}$

20. $P(E) = \frac{n(E)}{n(S)} = \frac{12}{52} = \frac{3}{13}$

21. $P(E) = \frac{n(E)}{n(S)} = \frac{1}{4}$

22. $P(E) = \frac{n(E)}{n(S)} = \frac{2}{4} = \frac{1}{2}$

23. $P(E) = \frac{n(E)}{n(S)} = \frac{7}{8}$

24. $P(E) = \frac{n(E)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

25. $P(E) = \frac{n(E)}{n(S)} = \frac{3}{36} = \frac{1}{12}$

26. $P(E) = \frac{n(E)}{n(S)} = \frac{5}{36}$

27. Buying 1 ticket:
$$P(E) = \frac{n(E)}{n(S)} = \frac{1}{_{51}C_6} = \frac{1}{18{,}009{,}460}$$
Buying 100 tickets:
$$P(E) = \frac{100}{18{,}009{,}460} = \frac{5}{900{,}473}$$

28. $$_{30}C_6 = \frac{30!}{24!6!}$$
$$= \frac{30\cdot 29\cdot 28\cdot 27\cdot 26\cdot 25}{6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}$$
$$= 593{,}775$$
For 1 ticket:
$$P(E) = \frac{n(E)}{n(S)} = \frac{1}{593{,}775}$$
For 100 tickets:
$$P(E) = \frac{n(E)}{n(S)} = \frac{100}{593{,}775} = \frac{4}{23{,}751}$$

29. **a.** $_{52}C_5 = \frac{52!}{47!5!}$
$= \frac{52 \cdot 51 \cdot 50 \cdot 49 \cdot 48}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 2{,}598{,}960$

b. $_{13}C_5 = \frac{13!}{8!5!} = \frac{13 \cdot 12 \cdot 11 \cdot 10 \cdot 9}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 1287$

c. $P(E) = \frac{n(E)}{n(S)} = \frac{1287}{2{,}598{,}960} \approx 0.0005$

30. P(3 picture cards) =
$\frac{_{12}C_3}{_{52}C_3} = \frac{220}{22{,}100} = \frac{11}{1105} \approx 0.00995$

31. $P(\text{not completed 4 years of college}) = 1 - P(\text{completed 4 years of college}) = 1 - \frac{45}{174} = \frac{43}{58}$

32. $P(\text{not completed 4 years high school}) = 1 - P(\text{completed 4 years high school}) = 1 - \frac{29}{174} = \frac{1}{6}$

33. $P(\text{completed H.S. or less than 4 yrs college}) = P(\text{completed H.S}) + P(\text{less than 4 yrs college})$
$= \frac{56}{174} + \frac{44}{174} = \frac{100}{174} = \frac{50}{87}$

34. $P(\text{completed less than 4 yrs HS or 4 yrs HS}) = \frac{29+56}{174} = \frac{85}{174}$

35. $P(\text{completed 4 yrs H.S. or man}) = P(\text{completed 4 yrs H.S.}) + P(\text{man}) - P(\text{man who completed 4 yrs H.S})$
$= \frac{56}{174} + \frac{82}{174} - \frac{25}{174} = \frac{113}{174}$

36. $P(\text{completed 4 yrs HS or is a woman})$
$= P(\text{completed 4 yrs HS}) + P(\text{woman}) - P(\text{woman completed 4 yrs HS})$
$= \frac{56}{174} + \frac{92}{174} - \frac{31}{174} = \frac{117}{174} = \frac{39}{58}$

37. $P(\text{not king}) = 1 - P(\text{king}) = 1 - \frac{4}{52} = 1 - \frac{1}{13} = \frac{12}{13}$

38. $P(\text{not dealt picture card}) = 1 - P(\text{picture card}) = 1 - \frac{12}{52} = \frac{10}{13}$

39. $P(2 \text{ or } 3) = P(2) + P(3) = \frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$

40. $P(\text{red 7 or black 8}) = P(\text{red 7}) + P(\text{black 8}) = \frac{2}{52} + \frac{2}{52} = \frac{4}{52} = \frac{1}{13}$

41. $P(7 \text{ or red card}) = P(7) + P(\text{red card}) - P(7 \text{ and red}) = \frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52} = \frac{7}{13}$

64. total area $= 12^2 = 144$ in.^{2}
middle colored area $= 3^2 = 9$ in.^{2}
other colored area $= 9^2 - 6^2$
$= 81 - 36 = 45$ in.^{2}

$$P(E) = \frac{9}{144} + \frac{45}{144} = \frac{54}{144} = \frac{3}{8}$$

66. First find the total number of all three-digit numbers: $9 \cdot 10 \cdot 9 = 810$.
There are $1 \cdot 9 \cdot 1 = 9$ three-digit numbers beginning with 1 and ending with 1. There are $1 \cdot 9 \cdot 1 = 9$ three-digit numbers beginning with 2 and ending with 2. There will also be 9 three-digit numbers read the same forward and backward beginning with 3. The same will hold for the number of three-digit numbers read the same forward and backward beginning with 4, 5, 6, 7, 8, and 9.
So there are $9 \cdot 9 = 81$ three-digit numbers read the same forward and backward. The probability of selecting one of these numbers is $\frac{81}{810} = \frac{1}{10}$.

67. a. P(Democrat who is not a business major)

$$= \frac{\text{\# of students who are Democrats but not business majors}}{\text{\# of students}}$$

$$= \frac{29-5}{50} = \frac{24}{50} = \frac{12}{25}$$

b. P(neither Democrat nor business major)
$= 1 - P$(Democrat or business major)
$= 1 - (P(\text{Democrat}) + P(\text{business major}) - P(\text{Democrat and business major}))$

$$= 1 - \left(\frac{29}{50} + \frac{11}{50} - \frac{5}{50}\right) = 1 - \frac{35}{50} = \frac{15}{50} = \frac{3}{10}$$

68. P(driving while intoxicated or having a driving accident)
$= P$(driving while intox.) $+ P$(a driving accident.) $- P$(driving while intox. and a driving accident)
Let $p = P$(having a driving accident while intoxicated).
Then
$0.32 = 0.32 + 0.09 - p$
$0.35 = 0.41 - p$
$p = .06$
So, P(having a driving accident while intoxicated) $= 0.06$.

69. 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. $100\% - 99\% = 0.01$

d. $\frac{365}{365} \cdot \frac{364}{365} \cdot \frac{363}{365} \cdots \frac{346}{365} \approx 0.59$
$1 - 0.59 = 0.41$

e. With 23 people, the probability that at least two people have the same birthday is

$$P(E) = 1 - \frac{365}{365} \cdot \frac{364}{365} \cdot \frac{363}{365} \cdots + \frac{342}{365}$$
$$\approx 1 - 0.4927 \approx 0.5073$$