2. \( S = \{ H, D, B \} \)

6. Each outcome will be a 4-tuple \((a, b, c, d)\) with \(a\) being either even or odd, \(b\) being either heads or tails, \(c\) being the color of the card drawn, and \(d\) being the rank of the card drawn.

The number of possible outcomes is \(2 \cdot 2 \cdot 2 \cdot 13 = 8(13) = 104\).

16. \[ \Pr(s_3) = 1 - \Pr(s_1) - \Pr(s_2) \]
   \[ = 1 - \frac{3}{7} - \frac{2}{7} \]
   \[ = \frac{2}{7} \]

18. \[ 1 = \Pr(s_1) + \Pr(s_2) + \Pr(s_3) \]
   \[ 1 = \frac{1}{4} \Pr(s_3) + \frac{1}{5} \Pr(s_3) + \Pr(s_3) \]
   \[ 1 = \left(\frac{5}{20} + \frac{4}{20} + \frac{20}{20}\right) \Pr(s_3) \]
   \[ 1 = \frac{29}{20} \Pr(s_3) \]
   \[ \Pr(s_3) = \frac{20}{29} \]
28. \[ P_r(E) = P_r(s_1) + P_r(s_2) = .37 + .19 = .56 \]
\[ P_r(1F) = P_r(s_1) + P_r(s_3) + P_r(s_5) = .37 + .22 + .13 = .72 \]

Section 6.2

2. B the event that a black face card is drawn
   A the event that an ace is drawn

\[ P_r(A \cup B) = P_r(A) + P_r(B) - P_r(A \cap B) \]
\[ = \frac{4}{52} + \frac{6}{52} - 0 \]
\[ = \frac{10}{52} \]

6. \( E_4 \) the event that a 4 is rolled
\( E_5 \) the event that a 5 is rolled
\( E_6 \) the event that a 6 is rolled

\[ P_r(E_4 \cup E_5 \cup E_6) = P_r(E_4) + P_r(E_5) + P_r(E_6) \]
\[ - P_r(E_4 \cap E_5) - P_r(E_5 \cap E_6) - P_r(E_4 \cap E_6) \]
\[ + P_r(E_4 \cap E_5 \cap E_6) \]
\[ = \left( \frac{3}{36} \right) + \frac{4}{36} + \frac{5}{36} \]
\[ - \frac{1}{36} - \frac{2}{36} - \frac{3}{36} \]
\[ + \frac{1}{36} \]
\[ = \frac{1}{13} \]

14. 14 O A's  
19 1 A  
25 2 A's  
22 3 A's  
10 4+ A's  

\[
1 - \frac{10}{96} = \frac{80}{96} = \frac{40}{48} = \frac{5}{6}
\]

24. \( \Pr(EU\bar{F}) = \Pr(E) + \Pr(F) - \Pr(EN\bar{F}) \)

\[
= .42 + .55 - .28 = .97 - .28 = .69
\]

30. \( E_{19} \) event that family had 19-in. TV set  
\( E_{25} \) event that family had 25-in. TV set  
\[
\Pr(E_{19}) = \frac{815}{1042} \quad \Pr(E_{25}) = \frac{548}{1042} \quad \Pr(E_{19} \cap E_{25}) = \frac{361}{1042}
\]

\[
\Pr(E_{19} \cup E_{25}) = \Pr(E_{19}) + \Pr(E_{25}) - \Pr(E_{19} \cap E_{25})
\]

\[
= \frac{815}{1042} + \frac{548}{1042} - \frac{361}{1042} = \frac{501}{1042}
\]
2. | Underclass | 3rd Year | 4th Year | Total |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B or Better</td>
<td>23</td>
<td>27</td>
<td>5</td>
</tr>
<tr>
<td>C or Worse</td>
<td>14</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>37</td>
<td>20</td>
</tr>
</tbody>
</table>

(a) \(\frac{55}{94}\)

(b) \(\frac{27}{37}\)

6. \(\frac{1}{3}\)

10. E  The sum is 7

\[ \begin{align*}
1,6 \\
6,1 \\
2,5 \\
5,2 \\
3,4 \\
4,3 \\
\end{align*} \]

\[ \Pr(E) = \frac{6}{36} = \frac{1}{6} \]

F  at least 1 of the die is a 1

\[ \begin{align*}
1,\bar{6} \\
\bar{6},1 \\
1,5 \\
\bar{5},1 \\
1,\bar{4} \\
\bar{4},1 \\
1,\bar{3} \\
\bar{3},1 \\
1,2 \\
2,1 \\
2,\bar{5} \\
\bar{5},2 \\
2,4 \\
\bar{4},3 \\
2,3 \\
\bar{3},4 \\
3,5 \\
\bar{5},3 \\
3,\bar{5} \\
\bar{5},4 \\
4,\bar{5} \\
\bar{5},6 \\
4,5 \\
\bar{5},6 \\
\end{align*} \]

\[ \Pr(F) = \frac{11}{36} \]

G  the sum is odd

\[ \begin{align*}
1,6 \\
6,1 \\
2,5 \\
5,2 \\
3,4 \\
4,3 \\
1,\bar{6} \\
\bar{6},1 \\
1,5 \\
\bar{5},1 \\
1,\bar{4} \\
\bar{4},1 \\
1,\bar{3} \\
\bar{3},1 \\
1,2 \\
2,1 \\
2,\bar{5} \\
\bar{5},2 \\
2,4 \\
\bar{4},3 \\
2,3 \\
\bar{3},4 \\
3,5 \\
\bar{5},3 \\
3,\bar{5} \\
\bar{5},4 \\
4,\bar{5} \\
\bar{5},6 \\
4,5 \\
\bar{5},6 \\
\end{align*} \]

\[ \Pr(G) = \frac{1}{2} \]
10. continued

(a) $\Pr(E | F) = \frac{\Pr(ENF)}{\Pr(F)} = \frac{\frac{2}{36}}{\frac{11}{36}} = \frac{2}{36} \cdot \frac{36}{11} = \frac{2}{11}$

(b) $\Pr(F | E) = \frac{\Pr(FNE)}{\Pr(E)} = \frac{\frac{2}{36}}{\frac{1}{6}} = \frac{2}{36} \cdot 6 = \frac{12}{36} = \frac{1}{3}$

(c) $\Pr(E | G) = \frac{\Pr(ENG)}{\Pr(G)} = \frac{\frac{6}{36}}{\frac{1}{2}} = \frac{6}{36} \cdot 2 = \frac{12}{36} = \frac{1}{3}$

(d) $\Pr(G | E) = \frac{\Pr(GNE)}{\Pr(E)} = \frac{\frac{6}{36}}{\frac{1}{6}} = \frac{6}{36} \cdot 6 = 1$

14. D event that bomber plane is shot down
   T event that bomber plane hits target

\[ \Pr(E) = 0.36 \]
\[ \Pr(T) = \Pr(D \cap T) + \Pr(D^c \cap T) \]
\[ = 0 + (0.62)(0.84) \]
\[ = 0.5208 \]
20. \( U_1 \) event that urn I is chosen

\( U_2 \) event that urn II is chosen

\( R \) event that a red ball is chosen

\( W \) event that a white ball is chosen

[Diagram]

- \( U_1 \) with a probability of \( \frac{4}{13} \) leading to \( R \) with \( \frac{4}{13} \) and \( W \) with \( \frac{9}{13} \).
- \( U_2 \) with a probability of \( \frac{1}{2} \) leading to \( R \) with \( \frac{8}{10} \) and \( W \) with \( \frac{2}{10} \).