1. (a) $S = \{(r,r),(r,g),(r,b),(g,r),(g,g),(g,b),(b,r),(b,g),(b,b)\}$
   (b) $S = \{(r,g),(r,b),(g,r),(g,b),(b,r),(b,g)\}$

3. $EF = \{(1,2),(1,4),(1,6),(2,1),(4,1),(6,1)\}$
   $E \cup F$ occurs if the sum is odd or if at least one of the dice lands on 1.
   $FG = \{(1,4),(4,1)\}$. $EF^c$ is the event that neither of the dice lands on 1 and the sum is odd. $EFG = FG$.

9. Choose a customer at random. Let $A$ denote the event that this customer carries an American express card and $V$ the event that he or she carries a VISA card.

$$P(A \cup V) = P(A) + P(V) - P(AV) = .24 + .61 - .11 = .74$$

Therefore, 75 percent of the establishment’s customers carry at least one of the two types of credit cards it accepts.

13. (a) 20000
   (b) 12000
   (c) 11000
   (d) 68000
   (e) 10000

23. The answer is $5/12$, which can be seen as follows:

$$1 = P\{\text{first higher}\} + P\{\text{second higher}\} + P\{\text{same}\}$$
$$= 2P\{\text{second higher}\} + P\{\text{same}\}$$
$$= 2P\{\text{second higher}\} + 1/6$$

Another way of solving is to list all the outcomes for which the second is higher. There is 1 outcome when the second die lands on two, 2 when it lands on three, 3 when it lands on four, 4 when it lands on five, and 5 when it lands on six. Hence, the probability is $(1 + 2 + 3 + 4 + 5)/36 = 5/12$.

24. Probability that the sum of upturned faces equals $i$

   $= (i-1)/36$, for $i = 2,3,\ldots,7$
   $= (13-i)/36$, for $i = 8,9,\ldots,12$.

T1. Suppose $x$ is an outcome of $EF$. Then it is an outcome of $E$ and an outcome of $F$. Therefore, it is an outcome of $E$, and $EF$ is a subset of $E$.
Suppose $x$ is an outcome of $E$. Then it is an outcome of $E$ or an outcome of $F$. Therefore, it is an outcome of $E \cup F$, and $E$ is a subset of $E \cup F$. 
T2. Let $E$ be a subset of $F$. If $x$ is an outcome of $E$, then it is an outcome of $F$. Therefore if $x$ is not an outcome of $F$, it is not an outcome of $E$ (the contrapositive). I.e., if $x$ is an outcome of $F^c$, then it is an outcome of $E^c$. Therefore, $F^c$ is a subset of $E^c$.

T7. (a) $E$
(b) $EF$
(c) $EG \cup F$