Answer Key

$$\begin{array}{|c|c|c|c|c|c|c|c|c|} \hline & \mathbf{G} \ \mathbf{1} & \mathbf{G} \ \mathbf{2} & \mathbf{G} \ \mathbf{3} & \mathbf{G} \ \mathbf{4} & \mathbf{G} \ \mathbf{5} & \mathbf{G} \ \mathbf{6} \\ \hline \hline & \mathbf{R} \ \mathbf{1} & (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ & \mathbf{R} \ \mathbf{2} & (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ \hline & \mathbf{1}. & \mathbf{R} \ \mathbf{3} & (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ & \mathbf{R} \ \mathbf{4} & (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ & \mathbf{R} \ \mathbf{5} & (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ & \mathbf{R} \ \mathbf{6} & (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \\ \hline \end{array}$$

a.
$$n(E) = 6$$
, $n(S) = 6 \cdot 6 = 36$, $Prob(E) = \frac{6}{36} = \frac{1}{6}$

b. Outcomes are
$$(2, 2)$$
, $(3, 1)$, and $(1, 3)$. $n(E) = 3$, $n(S) = 36$, $Prob(E) = \frac{3}{36} = \frac{1}{12}$

c. Outcomes are
$$(1, 4)$$
, $(2, 4)$, $(3, 4)$, $(5, 4)$, $(6, 4)$, $(4, 1)$, $(4, 2)$, $(4, 3)$, $(4, 5)$, $(4, 6)$
 $n(E) = 10$, $n(S) = 36$, $Prob(E) = \frac{10}{36} = \frac{5}{18}$

d. Outcomes are
$$(1, 4)$$
, $(2, 4)$, $(3, 4)$, $(4, 4)$, $(5, 4)$, $(6, 4)$, $(4, 1)$, $(4, 2)$, $(4, 3)$, $(4, 5)$, $(4, 6)$
 $n(E) = 11$, $n(S) = 36$, $Prob(E) = \frac{11}{36}$

	Dice sum	Outcomes	n(E)
2.	2	(1, 1)	1
	3	(2, 1), (1, 2)	2
	4	(1, 3), (2, 2), (3, 1)	3
	5	(1, 4), (2, 3), (3, 2), (4, 1)	4
	6	(1, 5), (2, 4), (3, 3), (4, 2), (5, 1)	5
	7	(1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1)	6
	8	(2, 6), (3, 5), (4, 4), (5, 3), (6, 2)	5
	9	(3, 6), (4, 5), (5, 4), (6, 4)	4
	10	(4, 6), (5, 5), (6, 4)	3
	11	(5, 6), (6, 5)	2
	12	(6, 6)	1

a.
$$n(S) = 36$$

b.
$$n(E) = 1$$
, $Prob(E) = \frac{1}{36}$

c.
$$n(E) = 5$$
, $Prob(E) = \frac{5}{36}$

d.
$$n(E) = 5 + 4 + 3 + 2 + 1 = 15$$
, $Prob(E) = \frac{15}{36}$

3. a. Permutation, P(52, 2) is the sample space (n(S)).

b.
$$n(E) = 52(3) = 156$$

c.
$$\frac{(52)(3)}{(52)(51)}$$

- 4. a. This is an ordered list problem. n = 2, r = 5, so $n(S) = 2^5 = 32$.
 - b. End in heads: $2 \cdot 2 \cdot 2 \cdot 1 \cdot 1 = 8$
 - c. End in tails: $2 \cdot 2 \cdot 2 \cdot 1 \cdot 1 = 8$
 - d. Use the rule of sums.

e.
$$n(E) = 8 + 8 = 16$$

f.
$$Prob(E) = \frac{n(E)}{n(S)} = \frac{16}{32} = \frac{1}{2}$$

- 5. a. $S = \{1, 2, 3, 4, 5, 6\}, n(S) = 6.$
 - b. $\bar{E} = \text{All results}$ are different numbers.
 - c. Permutation, n = 6, r = 3
 - d. $Prob(\bar{E}) = n(\bar{E})/n(S) = \frac{P(6,3)}{6^3} = \frac{5}{9} = 0.\bar{5}$
 - e. $Prob(E) = 1 Prob(\bar{E}) = 1 0.55 \approx 0.44$