

1. 1.1-4 1.2-4 1.2-2

A fair coin is tossed four times, and the sequence of heads and tails is observed.

- a) List each of the 16 sequences in the sample space \mathcal{S} .
- b) Let events A , B , C , and D be given by $A = \{\text{at least 3 heads}\}$, $B = \{\text{at most 2 heads}\}$, $C = \{\text{heads on the third toss}\}$, and $D = \{1 \text{ head and 3 tails}\}$. If the probability set function assigns $1/16$ to each outcome in the sample space, find
- (i) $P(A)$, (ii) $P(A \cap B)$, (iii) $P(B)$,
(iv) $P(A \cap C)$, (v) $P(D)$, (vi) $P(A \cup C)$
(vii) $P(B \cap D)$.

2. 1.1-6 1.2-8 1.2-6

If $P(A) = 0.4$, $P(B) = 0.5$, and $P(A \cap B) = 0.3$, find ...

- a) $P(A \cup B)$; b) $P(A \cap B')$; c) $P(A' \cup B')$.

3. Suppose that $P(A) = 0.40$, $P(B) = 0.50$, $P(A \cup B) = 0.70$. Find ...

- a) $P(A \cap B)$; b) $P(A' \cap B')$; c) $P(A' \cup B')$.

4. Suppose $P(A) = 0.40$, $P(B) = 0.34$, $P(C) = 0.55$,
 $P(A \cap B) = 0.19$, $P(A \cap C) = 0.25$, $P(B \cap C) = 0.17$,
 $P(A \cap B \cap C) = 0.07$.

- a) Find $P(A \cup B \cup C)$. b) Find $P((A \cap B) \cup C)$.
c) Find $P(A \cap (B \cup C))$.

5. Find the value of p that would make this a valid probability model.

- a) Suppose $S = \{0, 2, 4, 6, 8, \dots\}$ (even non-negative integers) and

$$P(0) = p, \quad P(k) = \frac{1}{3^k}, \quad k = 2, 4, 6, 8, \dots$$

- b) Suppose $S = \{1, 2, 3, 4, \dots\}$ (positive integers) and

$$P(1) = p, \quad P(k) = \frac{(\ln 3)^k}{k!}, \quad k = 2, 3, 4, \dots$$

6. Let $a > 1$. Suppose $S = \{2, 3, 4, 5, 6, \dots\}$ and $P(k) = \frac{c}{a^k}$, $k = 2, 3, 4, 5, 6, \dots$

- a) Find the value of c that makes this is a valid probability distribution.
b) Find $P(\text{outcome is odd})$.
c) Find $P(\text{outcome is less than or equal to } 5)$.

7. Suppose $S = \{2, 3, 4, 5, 6, \dots\}$ and $P(k) = c \frac{2^k}{k!}$, $k = 2, 3, 4, 5, 6, \dots$

- a) Find the value of c that makes this is a valid probability distribution.
b) Find $P(\text{outcome is greater than or equal to } 5)$.