

Chapter 1: Probability Theory Exercises

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Exercise 1.1

- (a) $S = \{ssss | s \in \{H, T\}\}$, a string of length 4 with alphabet H and T
- (b) $S = \mathbb{N} \cup \{0\}$ since damaged leaves are non-negative whole number
- (c) $S = \mathbb{N} \cup \{0\}$ since we count in hours which is a non-negative whole number
- (d) $S = \mathbb{R}^+$ since weight can be any positive real number
- (e) $S = [0, 1]$ fraction is between 0 and 1

Exercise 1.4

- (a) $P(A \cup B \cup (A \cap B)) = P(A \cup B) = P(A) + P(B) - P(A \cap B)$ Note $A \cap B \subset A$
- (b)
$$\begin{aligned} P((A \cup B) \cap (A \cap B)^c) &= P(A \cup B) + P((A \cap B)^c) - P(A \cup B \cup (A \cap B)^c) \\ &= P(A \cup B) + 1 - P(A \cap B) - 1 \\ &= P(A) + P(B) - 2P(A \cap B) \end{aligned}$$
- (c) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- (d) $P(A) + P(B) - 2P(A \cap B)$