Chapter 1: Probability Theory Exercises

Ran Xie

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Problem 0.1.2.1

Since $A\triangle B = A \cup B - A \cap B$. Then

$$\begin{aligned} A\triangle B &= A \cup B - A \cap B \\ &= (A \cup B) \cap (A \cap B)^c \\ &= (A \cup B) \cap (A^c \cup B^c) \\ &= (A \cap A^c) \cup (B \cap B^c) \cup (A \cap B^c) \cup (B \cap A^c) \\ &= (A \cap B^c) \cup (B \cap A^c) \\ &= (A - B) \cup (B - A) \end{aligned}$$

$$\begin{aligned} A \cap C \triangle B \cap C &= (A \cap C - B \cap C) \cup (B \cap C - A \cap C) \\ &= [(A \cap C) \cap (B^c \cup C^c)] \cup [(B \cap C) \cup (A^c \cup C^c)] \\ &= [A \cap C \cap B^c \cup A \cap C \cap C^c] \cup [B \cap C \cap A \cup B \cap C \cap C^c] \\ &= [A \cap C \cap B^c \cup \emptyset] \cup [B \cap C \cap A \cup \emptyset] \\ &= A \cap B^c \cap C \cup B \cap A^c \cap C \\ &= (A - B) \cap C \cup (B - A) \cap C \\ &= [(A - B) \cup (B - A)] \cap C \\ &= (A \triangle B) \cap C \end{aligned}$$

Exercise 0.1.3.1

$A \times B \neq B \times A$ Since Cartesian product is a set of ordered pair