

1 Taking ECE 3100 until A+

- a. A good sample space is the set of numbers $\Omega = \{1, 2, 3, 4, 5, 6, \dots\}$ where the number represents that amount of times the student took ECE 3100 to get an A+.
- b. $E = \{n\}$ is the event that you get an A+ by the n th try.
- c. $E = \infty$ is the event that you continue taking ECE 3100 forever.

2 Constructing a sample space

- a. A good sample space is the unit square, $\Omega = \{(x, y) | 0 \leq x \leq 1, 0 \leq y \leq 1\}$
- b. The event is a portion of the unit square,
 $E = \{(x, y) | |x| + |y| \leq a, 0 \leq x \leq 1, 0 \leq y \leq 1\}$

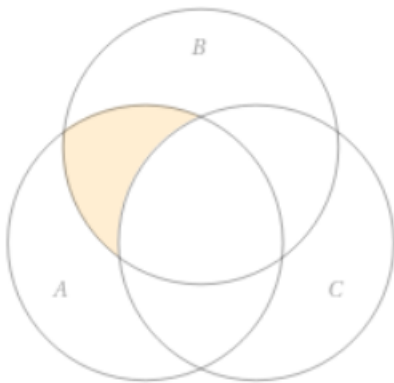
3 Events and set operations

$$\begin{aligned} A &= \{2, 4, 6\} \quad B = \{4, 5, 6\} \\ (A \cup B)^c &= A^c \cap B^c = \{1, 3, 5\} \cap \{1, 2, 3\} = \{1, 3\} \\ (A \cap B)^c &= A^c \cup B^c = \{1, 3, 5\} \cup \{1, 2, 3\} = \{1, 2, 3, 5\} \end{aligned}$$

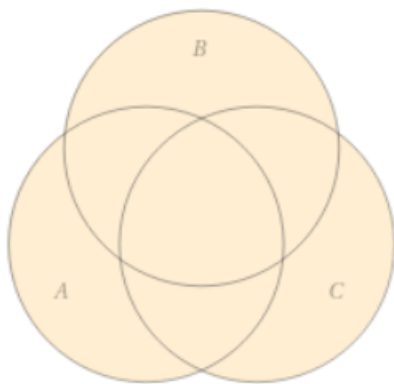
4 Events and set operations

- a. $A^c = (A^c \cap B) \cup (A^c \cap B^c) = A^c \cap (B \cup B^c) = A^c \cap \Omega = A^c$
 $B^c = (A \cap B^c) \cup (A^c \cap B^c) = (A \cup A^c) \cap B^c = \Omega \cap B^c = B^c$
- b. $(A \cap B)^c = (A^c \cap B) \cup (A^c \cap B^c) \cup (A \cap B^c) = (A \cup B^c)^c \cup (A \cup B)^c \cup (A^c \cup B)^c =$
 $((A \cup B^c) \cap (A \cup B))^c \cup (A^c \cup B)^c = (A \cap (B^c \cup B))^c \cup (A^c \cup B)^c = (A \cap \Omega)^c \cup (A^c \cup B)^c =$
 $A^c \cup (A^c \cup B)^c = (A \cap (A^c \cup B))^c = ((A \cap A^c) \cup (A \cap B))^c = (\emptyset \cup (A \cap B))^c = (A \cap B)^c$
- c. $A = \{1, 3, 5\} \quad B = \{1, 2, 3\},$
 $(\{1, 3, 5\} \cap \{1, 2, 3\})^c = (\{1, 3\})^c = \{2, 4, 5, 6\} = (\{2, 4, 6\} \cap \{1, 2, 3\}) \cup (\{2, 4, 6\} \cap \{4, 5, 6\}) \cup$
 $(\{1, 3, 5\} \cap \{4, 5, 6\}) = \{2\} \cup \{4, 6\} \cup \{5\} = \{2, 4, 5, 6\}$

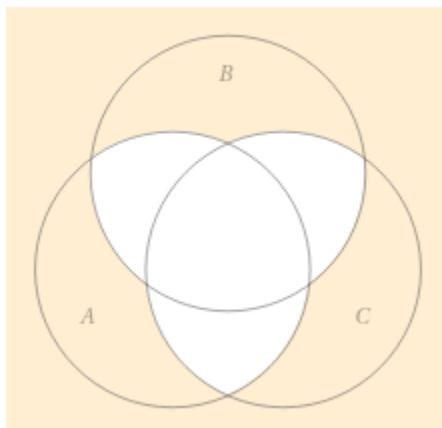
5 Events and Venn Diagram



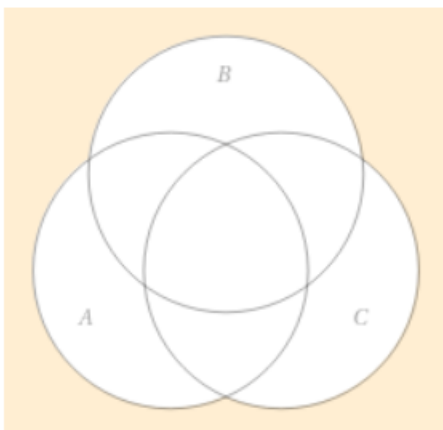
a. $A \cap B \cap C^c$



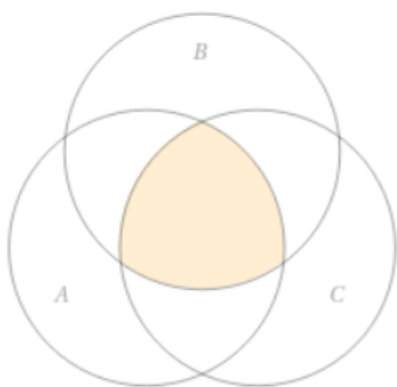
b. $A \cup B \cup C$



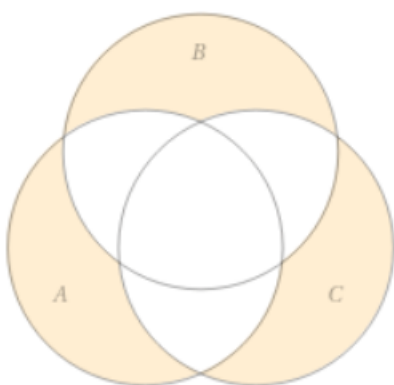
c. $((A \cap B) \cup (A \cap C) \cup (B \cap C))^c$



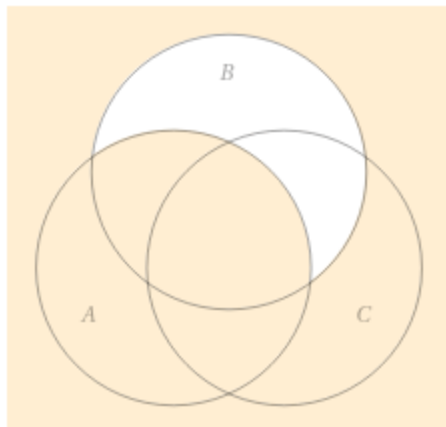
d. $(A \cup B \cup C)^c$



e. $A \cap B \cap C$



f. $(A \cup B \cup C) \cap (A \cap B \cap C)^c \cap (A \cap B)^c \cap (A \cap C)^c \cap (B \cap C)^c$



g. $A \cup (A^c \cap B^c)$