M362K: January 22nd, 2024.

Reading Assignments: Section 1.1. "Odds"

Section 1.2. Interpretation

Problem. We toss a coin 3 times and observe the sequence of heads (H) and tails (T) that appears.

Write down the appropriate outcome space Ω for this "experiment".

$\longrightarrow$: $\Omega = \{H,T\}^3 = \{H,T\} \times \{H,T\} \times \{H,T\} =$

$= \{(H,H,H),$

$(H,H,T), (H,T,H), (T,H,H),$

$(H,T,T), (T,H,T), (T,T,H),$

$(T,T,T)\}$ $\square$

Let A be the event that two or more heads appear consecutively. Write down the event A as a set of elementary outcomes from Ω.

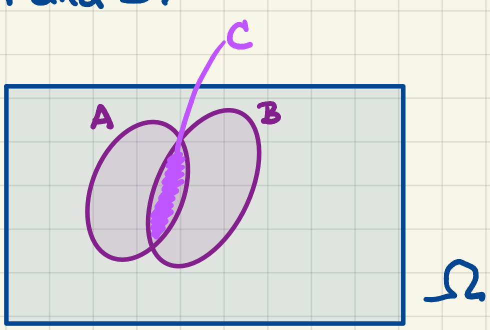
$\longrightarrow$: $A = \{HHH, HHT, THH\}$ $\square$

Let B be the event that all tosses are the same. Write down B in terms of elementary outcomes.

$\longrightarrow$: $B = \{HHH, TTT\}$ $\square$

Let C denote the event that only heads appear. Express C in terms of A and B.

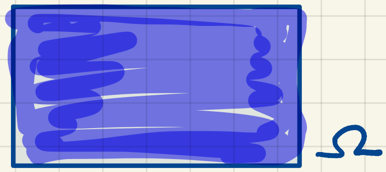
$\longrightarrow$: $C = A \cap B = AB$



$\square$

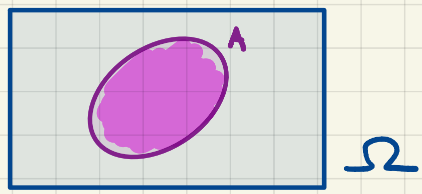
Section 1.3. Distributions

Outcome space ... Ω

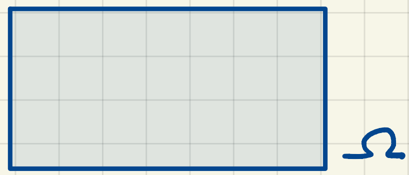


event ... E, F

A, B, C

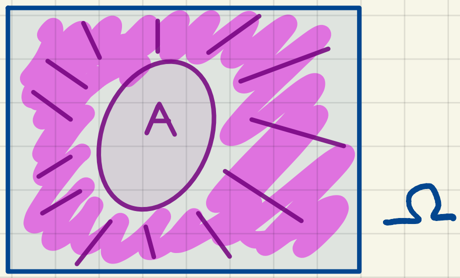


impossible event $\emptyset$

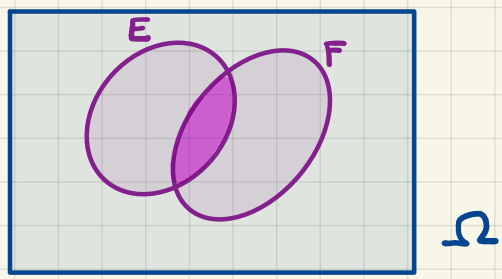


not A, opposite of A,
complement of A

$\boxed{A^c}$

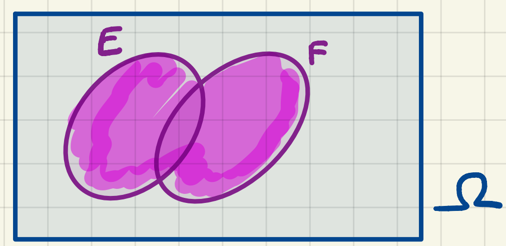


both E and F $E \cap F = EF$



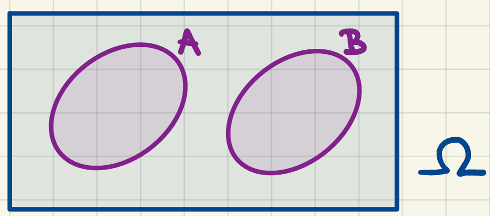
either E or F or both

$E \cup F$



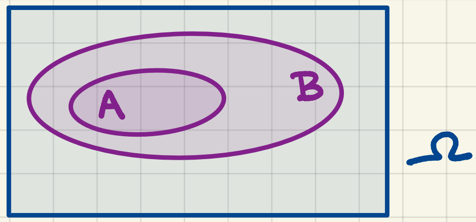
A and B are mutually exclusive
A and B are disjoint

$A \cap B = \emptyset$



If A, then B
or
A subset of B $A \subseteq B$

$A \subset B$ (strict)



Example. Consider a roll of a regular die w/ faces numbered $\{1,2,3,4,5,6\}$.

Let $A = \{\text{the result is an even number}\} = \{2,4,6\}$

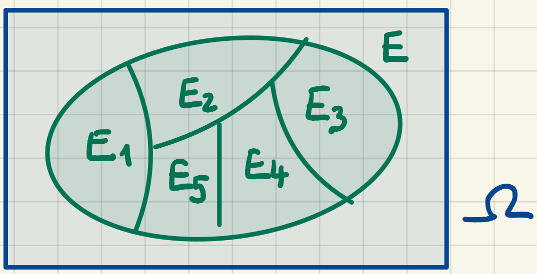
$B = \{\text{the result is a prime number}\} = \{2,3,5\}$

$C = \{\text{the result is not prime or composite}\} = \{1\}$

$A \cap B = \{2\}$ not mutually exclusive

$A \cap C = \emptyset$ mutually exclusive

Partitions.



We say that E is partitioned into n events $E_1, E_2, \dots, E_n$ if

(i) $E = \bigcup_{i=1}^{n} E_i = E_1 \cup E_2 \cup \cdots \cup E_n$

(ii) $E_1, \dots, E_n$ are mutually exclusive