

PROBABILITY

SAMPLE SPACE: All possible outcomes

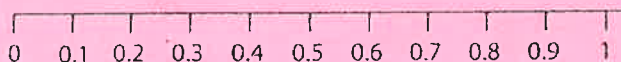
Symbol: S

EVENT: Desired outcome

PROBABILITY: $P(E) = \frac{\text{\# of desired outcomes}}{\text{\# of possible outcomes}}$

RULES:

- The probability of any event MUST be between 0 and 1, inclusive.



- All possible outcomes must ADD UP TO 1.

COMPLEMENT RULE: "Not"

The complement of an event is the probability IT WILL NOT HAPPEN.



Symbol: A^c "the complement of event A"

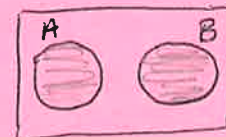
A^c
 A^c

--the event that A does not happen.

$$P(A^c) = 1 - P(A)$$

MUTUALLY EXCLUSIVE EVENTS: Disjoint

Two or more events that can NEVER HAPPEN TOGETHER!



Probability of mutually exclusive events:

$$P(A \text{ or } B) = P(A) + P(B)$$
$$P(A \cup B)$$

Example: Flipping a coin and rolling a die.

What is the probability of getting Tails ^{OR} a 5?

Let A = Getting tails

Let B = Rolling a 5

$$P(A) = \frac{1}{2}$$

$$P(B) = \frac{1}{6}$$

$$P(A \text{ or } B) = P(A) + P(B)$$
$$= \frac{1}{2} + \frac{1}{6}$$

$$= \frac{3}{6} + \frac{1}{6} = \frac{4}{6}$$

$$= \frac{2}{3}$$

Possible Outcomes

Tails
OR
1, 5

NOT MUTUALLY EXCLUSIVE

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \cup B) =$$

2-WAY TABLES:

Example:

SUIT	CARD		Total
	Face card	Nonface card	
Hearts	3	10	13
Not Hearts	9	30	39
Total	12	40	52

Let H = Hearts

Let F = Face card

1. Find $P(H) = \frac{13}{52} = \frac{1}{4}$

2. Find $P(H^c) = \frac{39}{52} = \frac{3}{4}$

3. Find $P(F \text{ or } H^c) = P(F) + P(H^c) - P(F \cap H^c)$
 $\frac{12}{52} + \frac{39}{52} - \frac{9}{52} = \frac{42}{52} = \frac{21}{26}$

4. Find $P(F \text{ and } H) = \frac{3}{52}$

5. Find $P(F^c \text{ or } H) = P(F^c) + P(H) - P(F^c \cap H)$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

