

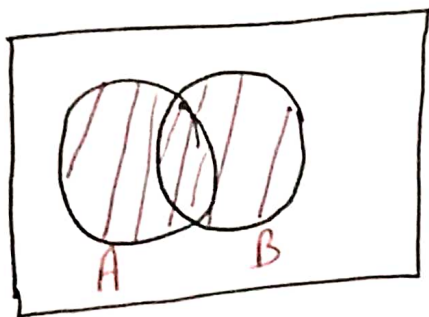
18-11-2020

## Unit-7

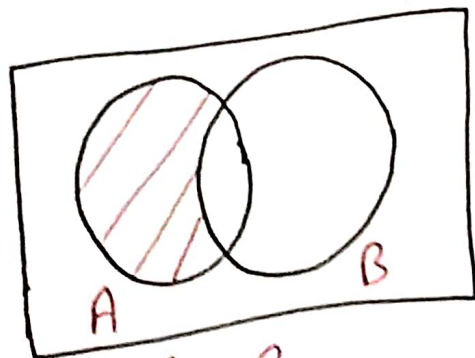
### Probability

- Probability tells us how often some event will happen after many repeated trials. This topic covers theoretical, experimental, compound probability, permutations, combinations, and more!
- Whenever we are unsure about the outcome of an event, we can talk about the probabilities of certain outcomes - how likely they are.
- Sample space  $\div$  set of all possible outcomes.

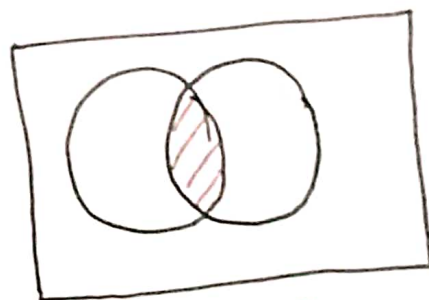
⇒ Set Operations



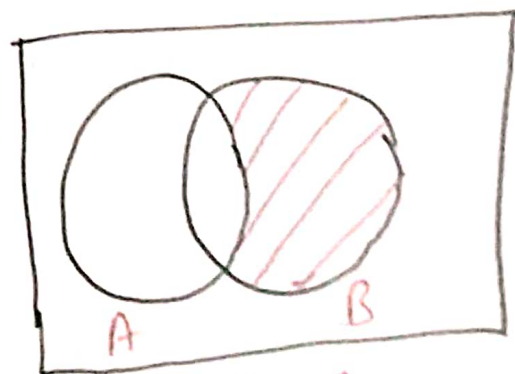
$A \cup B$   
Union



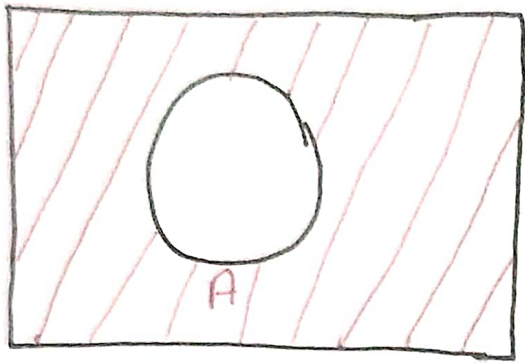
$A - B$



$A \cap B$   
Intersection.



$B - A$



$$A' = U - A$$

⇒ Experimental probability ⇒

Calculating estimate of something happening based on data & experience in the past

⇒ Addition rule for probability ⇒  
 $P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)$

⇒ Compound probability of independent events.

- For independent events, A and B.  
 $P(A \text{ and } B)$ , i.e. Prob. that A happens and then B happens would be  
 $P(A \cdot B) = P(A) \times P(B)$

for eg:

For coin toss,

$$P(H \cdot H) = P(H_1) \times P(H_2) = \frac{1}{4}$$

$$P(T T H) = P(T) \times P(T) \times P(H) = \frac{1}{8}$$

⇒ Some shortcuts

$$P(\text{at least 1 success}) = 1 - P(\text{all failures})$$

$$P(\text{at least 1 failure}) = 1 - P(\text{all successes})$$

⇒ Multiplication rule for dependent Events

if  $A$  and  $B$  are dependent events.

$$P(A \text{ and } B) = P(A) \times P(B/A)$$

### ⇒ NOTE :

- When we calculate probabilities involving one event AND another event occurring, we multiply their probabilities.
- If first event impacts the probability of second event, we call them dependent events, else they are independent.
- ~~$P(A \text{ and } B)$~~

For Dependent events :

$$P(A \text{ and } B) = P(A) \cdot P(B/A) = P(B) \cdot P(A/B)$$

⇒ Conditional probability

- If we have to check whether two events  $A$  and  $B$  are dependent or not.

Find  $P(A)$  and  $P(A/B)$

For  $A$  and  $B$  to be independent,  
 $P(A) \approx P(A/B)$