

\* Properties of Probability  $\Rightarrow$  [Axioms] Date: / /

①  $P(\emptyset) = 0, \quad P(S) = 1$

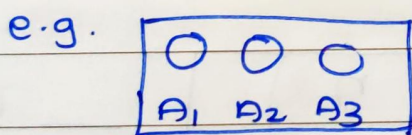
$\uparrow$  empty set  
 $\uparrow$  its an event  
 that will never  
 occur

$\uparrow$  sample space.

②  $P\left(\bigcup_{n=1}^{\infty} A_n\right) = \sum_{n=1}^{\infty} P(A_n)$

$\uparrow$  union  
 (finite/ $\infty$ )

$\Rightarrow$  if  $A_1, A_2, \dots, A_n$   
 are disjoint event  
 i.e. in venn diagram  
 they won't overlap.



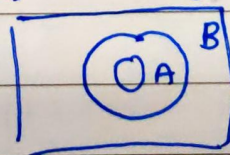
Properties  $\rightarrow$

①  $P(A^c) = 1 - P(A)$

$\uparrow$  compliment of  
 event A

② if  $A \subseteq B \rightarrow P(A) \leq P(B)$

$\uparrow$   
 if A occurs  
 B occurs



③  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

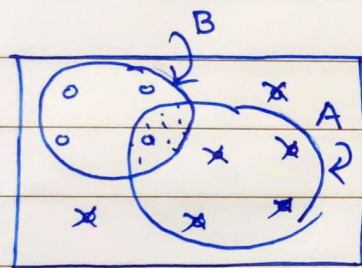


$$\textcircled{4} P(A \cup B \cup C) = P(A) + P(B) + P(C) \\ - P(A \cap B) - P(B \cap C) - P(A \cap C) \\ + P(A \cap B \cap C)$$

### # Conditional Probability $\Rightarrow$

Defination -  $P(A|B) = \frac{P(A \cap B)}{P(B)}$ , if  $P(B) > 0$

# Probability of A given B occurs.



Pebble World.

- ①  $P(B)$  Occures
- ②  $x \rightarrow$  Denotes events of  $B^c$ .
- ③ Given event A, to find

probability of A happening is -

new world which is  $P(B)$ , and given A,  
(sample space)

$P(A) =$  Only happening part of A  
which is overlapping in the  
happening world / new sample set.

### # Theorem $\Rightarrow$

$$\textcircled{1} P(A \cap B) = P(A|B) \times P(B) = P(A) \cdot P(B|A)$$

$$\textcircled{2} P(A_1, \dots, A_n) = P(A_1) \cdot P(A_2|A_1) \cdot P(A_3|A_1, A_2) \\ \dots (P(A_n|A_{n-1}, \dots, A_1))$$

$$\textcircled{3} P(A|B) = \frac{P(A) \cdot P(B|A)}{P(B)} \text{ --- Bayes Th}^m$$