Probability & Statistics - 1 - B Div - Semester 1 - IADS

Friday, November 26, 2021 7:24 AM

Probability = $\frac{\text{favourable outcomes}}{\text{Total outcomes}}$

H T

$\frac{1}{2}$

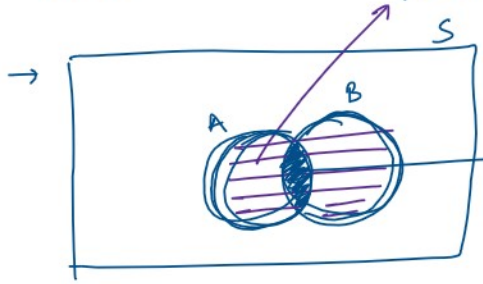
0 — Impossible Event

1 — Sure Event

Union (Or)

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

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



$A \cap B$

↓

Intersection

↳ (And)

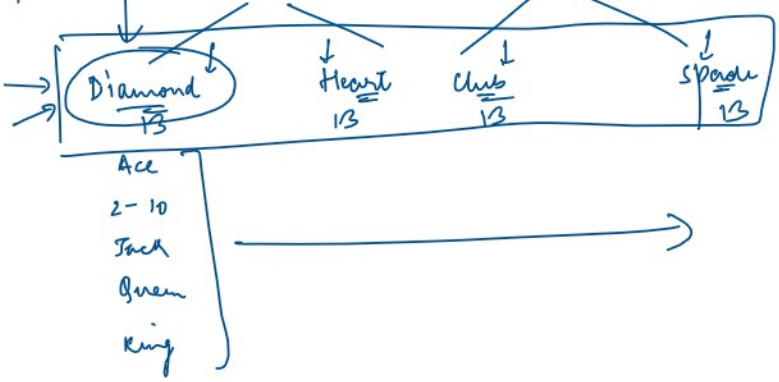
$\frac{1 \times 13}{13 \times 4}$ $P(\text{Diamond}) = \frac{1}{4}$ $\frac{13}{52}$ 52

$P(\text{Ace}) = \frac{4}{52} = \frac{1}{13}$

$\frac{1}{4}$ 26 R 26 B

$= 1 - \frac{48}{52}$

$\frac{1 \times 4}{13 \times 4}$



$\frac{{}^{4}C_1}{{}^{52}C_1}$

Ace

2 - 10

Jack

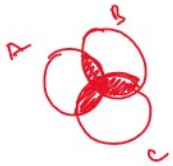
Queen

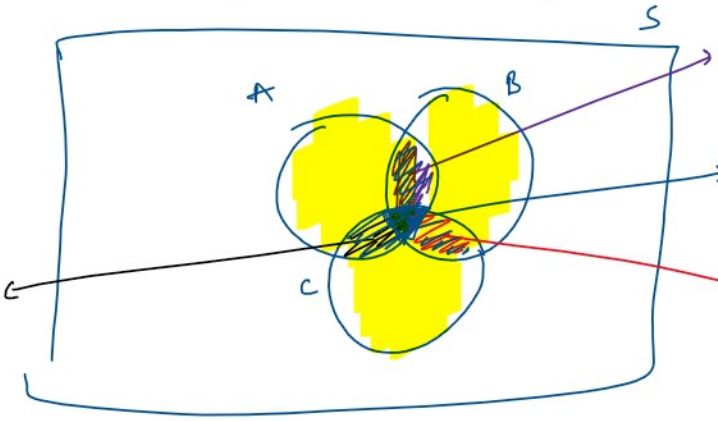
King

Union ↓ Or

Intersection ↓ And

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



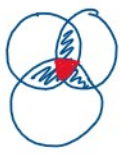


→ And

Or

$P(A \cap B \cap C)$

P(A and B and C)



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

↳ Three events

$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) \ldots$ → Three events

Conditional Probability

$$\Rightarrow P(A|B) = \frac{P(A \cap B)}{P(B)}$$

A → Saloni is studying

B → Shagun is having her lunch

Independent Events

If A and B are independent,

$$P(A|B) = P(A) \Rightarrow \frac{P(A \cap B)}{P(B)} = P(A)$$

then $P(A \cap B) = P(A) \cdot P(B)$

Bayes' Theorem

$$P(E_i|A) = \frac{P(E_i \cap A)}{P(A)}$$

$P(A) = \frac{1}{3}$

$P(B) = \frac{1}{3}$

$P(C) = \frac{1}{3}$

$P(\text{Late}|A) = \frac{2}{3}$

$P(\text{Late}|B) = 10\%$

$P(\text{Late}|C) = 30\%$

$$P(C|\text{Late}) = \frac{P(C) \times P(\text{Late}|C)}{P(A) \times P(\text{Late}|A) + P(B) \times P(\text{Late}|B) + P(C) \times P(\text{Late}|C)}$$

$$= \frac{\frac{1}{3} \times 30\%}{\frac{1}{3} \times \frac{2}{3} + \frac{1}{3} \times 0.1 + \frac{1}{3} \times 0.3}$$

3 Bus Routes

Delhi - Gurgaon

Mumbai - Gurgaon

A - B

$\frac{1}{3}$ — A $\frac{2}{3}$

$\frac{1}{3}$ — B $\frac{10}{100}$

$\frac{1}{3}$ → C 30%

D

10 AM

$$P(E_i|A) = \frac{P(A|E_i) \times P(E_i)}{\sum_{j=1}^{n} P(A|E_j) \cdot P(E_j)}$$

Why? How?

What? What?

How? Why?

Random Variables

No order

> 1 outcome

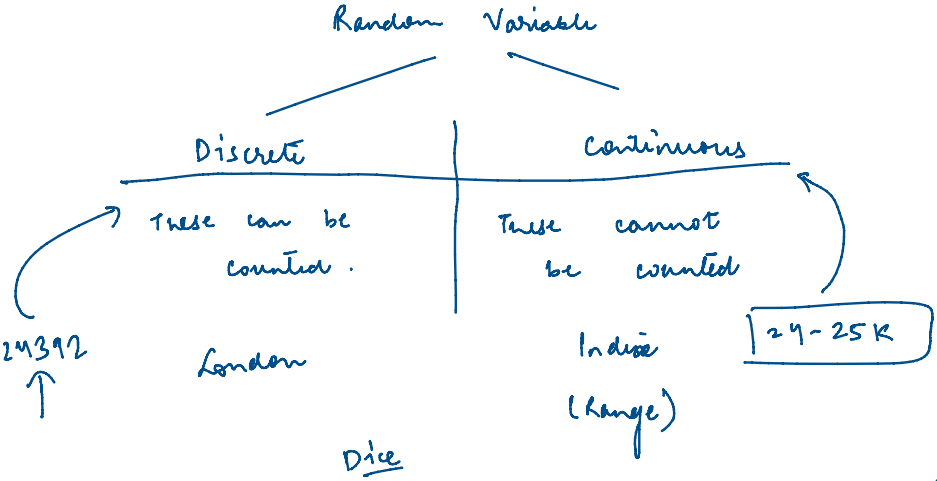
Dice 1 2 3 4 5 6

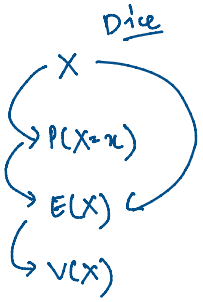
→ 2 1 4 3 5 1 6 2 1 3 2 4 1 6 6 5

Coin H T

H H H T T H T T T H

Stock Price 2700 2704 2617 2701 2704.26





$P(X = 3) = \frac{1}{6}$

$P(X = x)$ → (Discrete)

X → Random variable

x → Any particular value of this r.v

$f_X(x)$ → continuous

Prob = Fav / Total

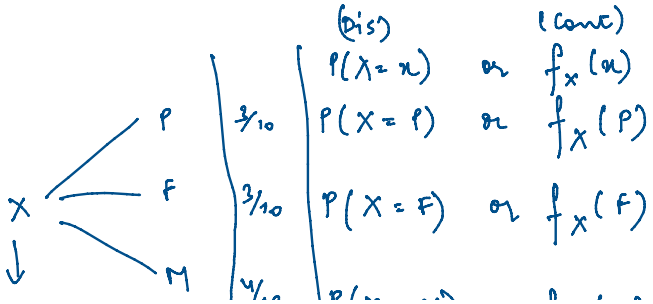
0 Impossible 1 Sure

10 chocolates

3 → plain dairy milk

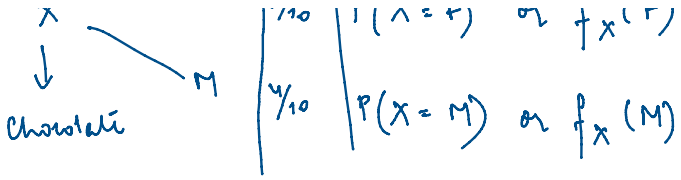
3 → Fruit & Nut

4 → Milk chocolate



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

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



$- P(A \cap C) - P(B \cap C)$

$+ P(A \cap B \cap C)$

Conditional Prob

$$P(A/B) = \frac{P(A \cap B)}{P(B)}$$

Independent → $P(A \cap B) = P(A) \cdot P(B)$

Bayes Theorem →

$$P(E_i/A) = \frac{P(A/E_i) \cdot P(E_i)}{\sum_{j=1}^{n} P(A/E_j) \cdot P(E_j)}$$

Random Variable

- No order
- >1 outcomes

Dis → Counted (Exact Value) → $P(X = x)$

Cont → Cannot be counted (Range) → $f_X(x)$

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