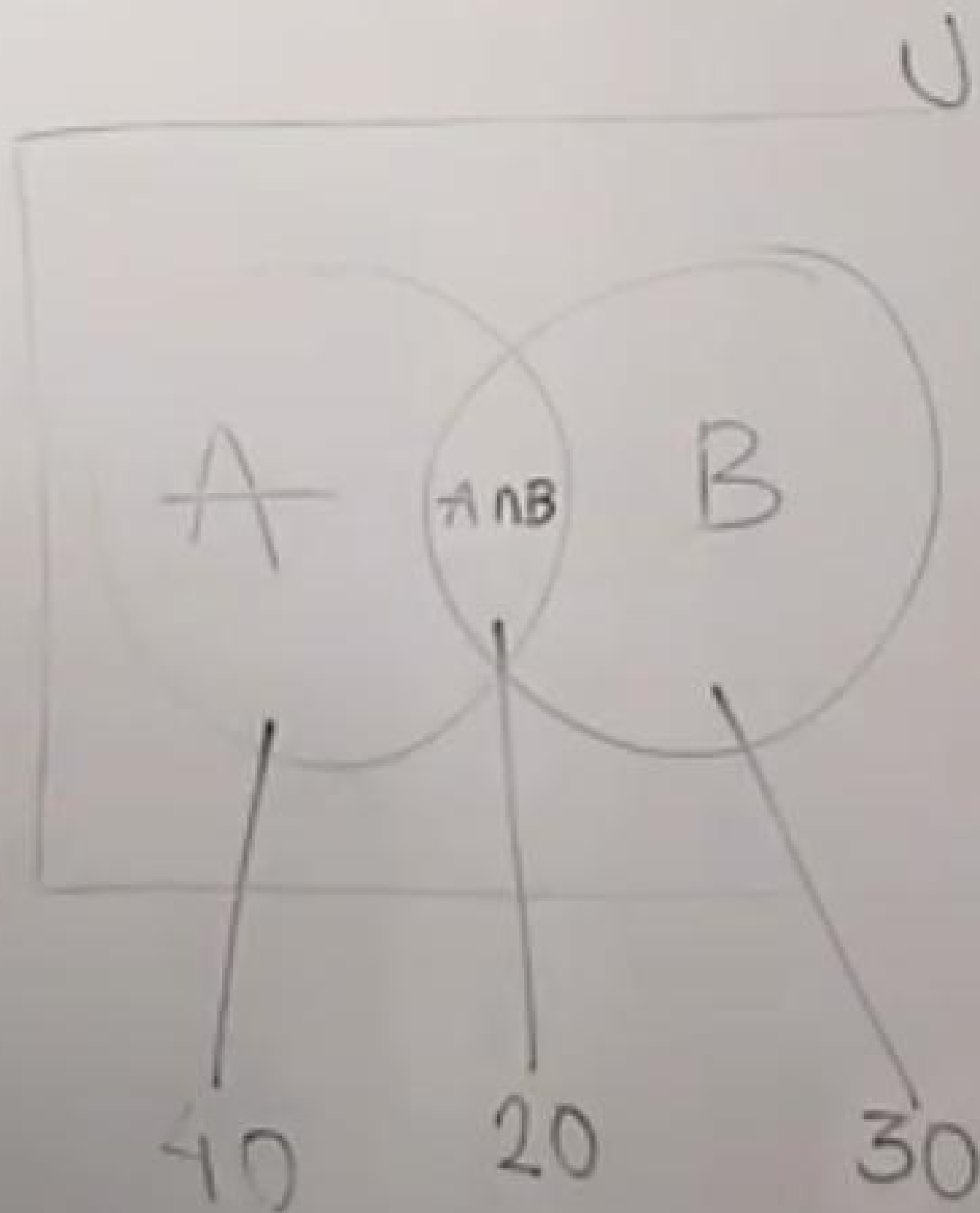
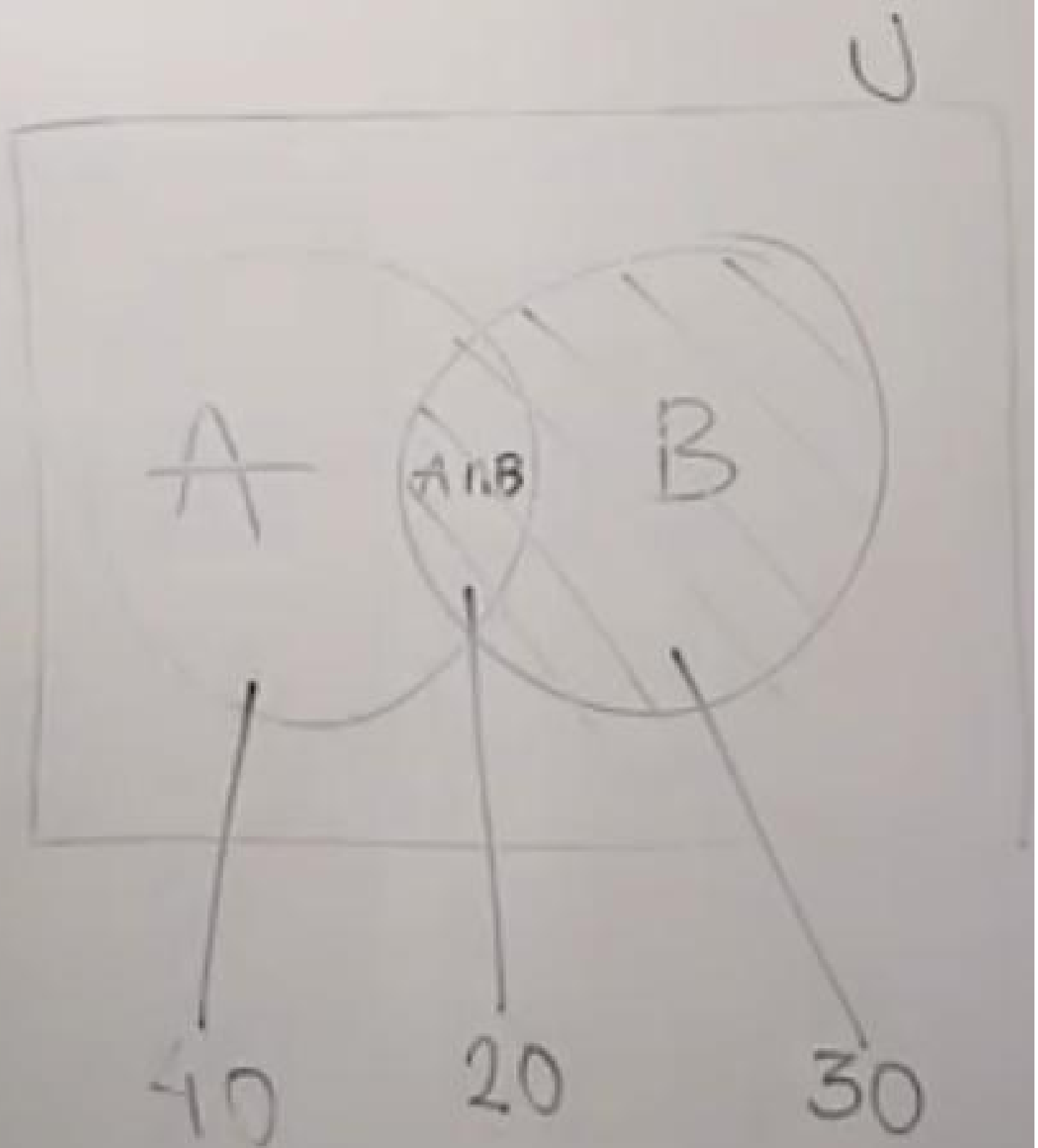


Conditional Probability





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

$$\bullet P(B) = \frac{30}{100} = 0.3$$

$$\bullet P(A \cap B) = \frac{20}{100} = 0.2$$

$$\bullet P(A|B) = \frac{0.2}{0.3} = 0.67$$

Baye's Theorem

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

Posterior ← $P(A|B)$

$P(B|A)$ → Likelihood

$P(A)$ → Prior

$P(B)$ → Marginal

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

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

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

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

$$P(\text{King} | \text{Face})$$

$$= \frac{P(\text{Face} | \text{King}) \cdot P(\text{King})}{P(\text{face})}$$

$$= \frac{1 \cdot 4/52}{12/52}$$

$$= \frac{1 \cdot 1/13}{3/13} = \left(\frac{1}{3} \right)$$

Naive Bayes Classifier Algo.

Fruit = { Yellow, Sweet, long }

Fruit	Yellow	Sweet	Long	Total
Orange	350	450	0	650
Banana	400	300	350	400
Others	50	100	50	150
Total	800	850	400	1200

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

$$P(\text{Yellow}|\text{orange}) = \frac{P(\text{orange}|\text{Yellow}) \cdot P(\text{Yellow})}{P(\text{orange})} = \frac{\frac{350}{800} \times \frac{800}{1200}}{\frac{650}{1200}}$$

$$P(\text{sweet}|\text{orange}) = (P(\text{orange} | \text{sweet}) * P(\text{sweet})) / P(\text{orange})$$

$$P(\text{sweet}|\text{orange}) = ((450/850)*(850/1200)) / (650/1200)$$

$$P(\text{sweet}|\text{orange}) = ((0.529411765)*(0.708333333)) / (0.541666667)$$

$$P(\text{sweet}|\text{orange}) = 0.375 / 0.541666667$$

$$P(\text{sweet}|\text{orange}) = 0.692307692$$

$$P(\text{long}|\text{orange}) = (P(\text{orange}|\text{long}) * P(\text{long})) / P(\text{orange})$$

$$P(\text{long}|\text{orange}) = ((0/400)*(400/1200)) / (650/1200)$$

$$P(\text{long}|\text{orange}) = 0/0.541666667$$

$$P(\text{long}|\text{orange}) = 0$$

$$P(\text{Fruit}|\text{Orange}) = 0.53 * 0.69 * 0 = 0$$

|

$$P(\text{Fruit} | \text{Orange}) = 0.53 \times 0.69 \times 0 = 0$$

$$P(\text{Fruit} | \text{Banana}) = 1 \times 0.75 \times 0.87$$
$$= 0.65$$

$$P(\text{Fruit} | \text{others}) = 0.33 \times 0.66 \times 0.33$$
$$= 0.072$$

$$P(\text{Fruit} | \text{Orange}) = 0.53 \times 0.69 \times 0 = 0$$

$$P(\text{Fruit} | \text{Banana}) = 1 \times 0.75 \times 0.87 \\ = 0.65$$

$$P(\text{Fruit} | \text{others}) = 0.33 \times 0.66 \times 0.33 \\ = 0.072$$

Fruit = Banana