ANLP ASSIGNMENT - I

1) $P(A \cap B) = P(A|B) \times P(B)$

$P(\text{is-abbreviation} \mid \text{three letter word}) = 0.8$

$P(\text{3 letter word}) = 0.0003$

$P($Period occuring after a 3 letter word and this period indicates an abbreviation$)$

$= 0.8 \times 0.0003$

$= 0.00024$

2) $P(X=0) = P(X=0 \,\&\, Y=0) + P(X=0 \,\&\, Y=1)$

$= 0.32 + 0.08$

$= 0.4$

Similarly $P(X=1) = 0.6$

$P(Y=0) = 0.8$

$P(Y=1) = 0.2$

If X & Y are independent if $P(X \cap Y) = P(X).P(Y)$

case 1 $P(X=0) \times P'(Y=0) = 0.4 \times 0.8 = 0.32$

case 2 $P(X=0) \times P(Y=1) = 0.4 \times 0.2 = 0.08$

case 3 $P(X=1) \times P(Y=0) = 0.6 \times 0.8 = 0.48$

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case 4

$P(X=1) \times P(Y=1) = 0.6 \times 0.2 = 0.12$

Since for all cases

$P(X).P(Y) = P(X \cap Y)$ hence X and Y defined in the table are independently distributed

3 a) $P(\cancel{A \cap B}) = \cancel{\frac{P(A|B)}{P(B)}}$ $\quad P(A|B) = \frac{P(A \cap B)}{P(B)}$

Let A be the event where ~~at~~ least one of the dice shows/ lands on "one"

Let B be the event where both the dice ~~are~~ land on different numbers

$P(A \cap B) = \frac{10}{36}$ [the 10 outcomes are (1,2), (1,3) (1,4) (1,5) (1,6) (2,1) (3,1) (4,1) (5,1) (6,1)]

$P(B) = \frac{30}{36}$ [all options apart from (1,1), (2,2) (3,3) (4,4) (5,5) (6,6)]

$$P(A|B) = \frac{\frac{10}{36}}{\frac{30}{36}} = \frac{1}{3}$$

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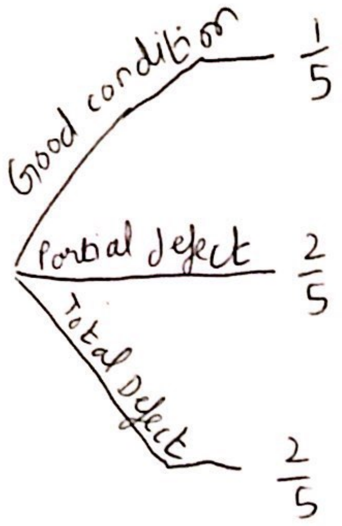
3 b)



Since the bulb was working initially then it had to be either a Good one or partially defective
Only the good bulb will still work after a week

$$P(\text{working after a week}) = \frac{\frac{1}{5}}{\frac{1}{5} + \frac{2}{5}} = \frac{1}{3}$$

4) Bayers Theorem

$$P(\text{British} \mid \text{Vowel}) = \frac{P(\text{Vowel} \mid \text{British}) \times P(\text{British})}{P(\text{Vowel})}$$

$$P(\text{Vowel} \mid \text{British}) = \frac{3}{6} = \frac{1}{2}$$

$$P(\text{British}) = \frac{4}{10}$$

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$P(\text{Vowel}) = P(\text{British}) \times P(\text{Vowel} \mid \text{British}) + P(\text{American}) P(\text{vowel} \mid \text{American})$

$$= \frac{4}{10} \times \frac{1}{2} + \frac{6}{10} \times \frac{2}{5}$$

$$= \frac{1}{5} + \frac{6}{25}$$

$$= \frac{11}{25}$$

Hence

$$P(\text{British} \mid \text{Vowel}) = \frac{\frac{1}{2} \times \frac{4}{10}}{\frac{11}{25}}$$

$$= \frac{2 \times 25}{11 \times 10}$$

$$= \frac{5}{11}$$

Hence $\frac{5}{11}$ is the probablity for the writer being British

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