Subject AbdelRahman Adel AbdelFattah Sheet 6 Date 17012296

1. $P(A,B|C) = P(A|C)\,P(B|C)$

$$\frac{P(A,B,C)}{\cancel{P(C)}} = \frac{P(A,C)\,P(B,C)}{\cancel{P(C)}\,P(C)}$$

$$P(A,B,C) = \frac{P(A,C)\,P(B,C)}{P(C)} \Rightarrow (1)$$

From (1)

$$P(A|B,C)\,\cancel{P(B,C)} = \frac{P(A,C)\,\cancel{P(B,C)}}{P(C)}$$

$$\boxed{P(A|B,C) = P(A|C)} \Longrightarrow \text{first one}$$

From (1)

$$P(B|A,C)\,\cancel{P(A,C)} = \frac{P(A,C)\,P(B,C)}{P(C)}$$

$$\boxed{P(B|A,C) = P(B|C)} \Longrightarrow \text{Second One}$$

2. ~~$P(\text{toothache}) = \sum_{x,y} P(\text{toothac}$~~

- $P(\text{toothache}) = \sum_{x,y} P(\text{toothache}, x, y)$

$$= 0.108 + 0.012 + 0.016 + 0.064$$

$$\boxed{P(\text{toothache}) = 0.2}$$

- $P(\text{Cavity}) = \sum_{x,y} P(\text{cavity}, x, y)$

$$= 0.108 + 0.012 + 0.072 + 0.008$$

$$P(\text{Cavity}) = 0.2$$

OSCAR

Subject ______________ Date / /

- $P(\text{Toothache} \mid \text{Cavity}) = \dfrac{P(\text{Toothache}, \text{Cavity})}{P(\text{Cavity})}$

$P(\text{Toothache} \mid \text{Cavity}) = \dfrac{0.108 + 0.012}{0.2} = \dfrac{3}{5} = 0.6$

Normalization

$P(x, y, \text{Cavity})$ Normalized

	toothache		¬tooth	
Cavity	0.108	0.012	0.072	0.008

$\longrightarrow Z = 0.2$

	Toothache		¬Tooth	
Cavity	0.54	0.06	0.072	0.04

$P(T \mid C) = 0.6$

~~P(Toothache | cavity) = P~~

$P(\text{Cavity} \mid \text{toothache} \vee \text{catch}) = \dfrac{P(\text{Cavity}, (\text{toothache} \vee \text{catch}))}{P(\text{toothache} \vee \text{catch})}$

$= \cancel{\dfrac{P(\text{Cavity}, (\text{toothache} \vee \text{catch}))}{P(\neq 0}}$

$P(\text{Catch}, \text{toothache}, x)$

Normalize

	tooth ∨ catch
Cavity	0.108
not	0.016

$\longrightarrow Z = 0.124$

	Tooth ∨ Catch
Cavity	0.871
Not	0.129

$P(\text{Cavity} \mid \text{toothache} \vee \text{Catch}) = 0.871$ //

OSCAR

2

Subject ____ Date / /

(3) $P(\text{Seems } B \mid \text{Actual } B) = 0.75$

$P(SB \mid AG) = 0.25$

$P(SG \mid AG) = 0.75$

$P(SG \mid AB) = 0.25$

$$P(AB \mid SB) = \frac{P(AB, SB)}{P(SB)} = \frac{P(SB \mid AB)\, P(AB)}{P(SB)}$$

$$= \frac{0.75\ P(AB)}{P(SB)}$$

$$P(SB) = \sum_x P(SB, x) = P(SB, AG) + P(SB, AB)$$

$$P(AB \mid SB) = \frac{0.75\ P(AB)}{P(SB, AG) + P(SB, AB)} = \frac{0.75\ P(AB)}{P(SB \mid AG)\, P(AG) + P(SB \mid AB)\, P(AB)}$$

$$= \frac{0.75\ P(AB)}{0.25\ P(AG) + 0.75\ P(AB)}$$

Not Possible without $P(AG)$ & $P(AB)$

then if

$P(AG) = 0.9$

$P(AB) = 0.1$

$$P(AB \mid SB) = \frac{0.75 \times 0.1}{0.25 \times 0.9 + 0.75 \times 0.1} = \frac{1}{4} = 0.25$$

The Car is more likely to be green #

OSCAR

/3