Advanced Computer Linguistics - Assignment 1
Samuel Petit - 17333946

Question 1

(i) implies (ii):

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

(ii) implies (i):

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

Question 2

a

$$P(gw|ps) = \frac{28}{28+40} = \frac{28}{30}$$

Counts $gw \cap \neg ps$ and $\neg gw \cap \neg ps$ are not useful in this situation.

b

$$P(ps|gw) = \frac{28}{28+2} = \frac{28}{168}$$

Counts $gw \cap \neg ps$ and $\neg gw \cap \neg ps$ are not useful in this situation.

Question 3

Question 4

$$P(cool:+) = \frac{62+108}{38+292} = \frac{170}{330} = 0.52 \quad (1)$$

$$P(cool:+|noisy:+) = \frac{62}{62+38} = \frac{62}{100} = 0.62 \quad (2)$$

We have $P(cool:+) \neq P(cool:+|noisy:+)$ so the variables are not independant.

Question 5

$$P(cool : +|open : +) = \frac{90}{100} = 0.9 \tag{3}$$

$$P(cool : +|open : +, noisy : +) = \frac{54}{64} = 0.9 \tag{4}$$

We have $P(cool : +|open : +) = P(cool : +|open : +, noisy : +)$ so cool: + is conditionally independant of noisy: + given open: +.

$$P(cool : +|open : -) = \frac{80}{400} = \frac{8}{40} \tag{5}$$

$$P(cool : +|open : -, noisy : +) = \frac{8}{40} \tag{6}$$

We have $P(cool : +|open : -) = P(cool : +|open : -, noisy : +)$ so cool: + is conditionally independant of noisy: + given open: -.