

## TASK 2

Probability that sensor is placed in

$$\text{Maine} : P(M) = 0.05$$

$$\text{Sahara} : P(S) = 0.95 = P(M^c)$$

Probability of getting daily high temperature  $> 80^\circ$

$$P(TG80/M) = 0.2$$

$$P(TG80^c/M) = 0.8$$

$[TG80^c = \text{less than } 80]$

$$P(TG80/M^c) = 0.9 = P(TG80/S)$$

$$P(TG80^c/M^c) = 0.1 = P(TG80^c/S)$$

a] Given : first email from sensor S indicates daily high under  $80^\circ$

Probability of sensor placed in Maine

$$P(M/TG80^c) = \frac{P(M) \times P(TG80^c/M)}{P(M) \times P(TG80^c/M) + P(S) \times P(TG80^c/S)}$$

$$= \frac{0.05 \times 0.8}{0.05 \times 0.8 + 0.95 \times 0.1}$$

$$= \frac{0.04}{0.04 + 0.095}$$

$$= \underline{\underline{0.2963}}$$

b] Given :- First email daily high under 80 degrees

Probability of getting second email indicating a daily high under 80 degrees

$$P(SMTG80^{\circ} // FMTG80^{\circ})$$

$$= \frac{P(SMTG80^{\circ}/M) \times P(M/FMTG80^{\circ}) + P(SMTG80^{\circ}/S) \times P(S/FMTG80^{\circ})}{P(SMTG80^{\circ})}$$

$$= \frac{0.8 \times 0.2963 + 0.1 \times 0.7037}{0.3074}$$

$$= \underline{\underline{0.3074}}$$

c] Probability that first three emails all indicate daily high under 80 degrees

$$1TG80^{\circ} = L80$$

FL80 = First email less than 80 degrees

SL80 = Second  $\longrightarrow$

TL80 = Third  $\longrightarrow$

$$P(FL80, SL80, TL80) =$$

$$= P(TL80, SL80, FL80)$$

$$= P(TL80 | SL80, FL80) \times P(SL80 | FL80) \times P(FL80)$$

$$= P(TL80 | SL80 | FL80) \times 0.3074 \times 0.135$$



$$P(TL80 | SL80, FL80) =$$

$$= P(TL80 | SL80, FL80, M) * P(M | SL80, FL80) + \\ P(TL80 | SL80, FL80, S) * P(S | SL80, FL80)$$

$$= P(TL80 | M) * P(SL80, FL80 | M) P(M) / P(SL80, FL80) \\ + P(TL80 | S) * P(SL80, FL80 | S) P(S) / P(SL80, FL80)$$

$$= \{ P(TL80 | M) * P(SL80 | M) * P(FL80 | M) P(M) + \\ P(TL80 | S) * P(SL80 | S) * P(FL80 | S) P(S) \}$$

$$P(FL80) P(SL80 | FL80)$$

$$= 0.63977$$

$$P(FL80, SL80, TL80) = 0.63977 * 0.3074 * 0.135 \\ = \underline{\underline{0.02655}}$$