Exercise 7

Let A denotes "returned clothes from branch A" $P(A) = 1/2$

Let B denotes "returned clothes from branch B" $P(B) = 3/10$

Let C denotes "returned clothes from branch C" $P(C) = 1/5$

Let D denotes "returned clothes bcs defects"

Let M denotes "returned clothes bcs change mind"

Let W denotes "returned clothes bcs wrong size"

i. $P(M|A) = 0.3$

ii. $P(C|W) = \dfrac{P(W|C)P(C)}{P(W|A)P(A) + P(W|B)P(B) + P(W|C)P(C)}$

$$= \dfrac{\left(\frac{3}{8}\right)\left(\frac{1}{5}\right)}{\left(\frac{3}{5}\right)\left(\frac{1}{2}\right) + \left(\frac{1}{3}\right)\left(\frac{3}{10}\right) + \left(\frac{3}{8}\right)\left(\frac{1}{5}\right)}$$

$$= \frac{3}{19} = 0.158$$

iii. $P(B|D) = \dfrac{P(D|B)P(B)}{P(D|A)P(A) + P(D|B)P(B) + P(D|C)P(C)}$

$$= \dfrac{\left(\frac{1}{2}\right)\left(\frac{3}{10}\right)}{\left(\frac{1}{10}\right)\left(\frac{1}{2}\right) + \left(\frac{1}{2}\right)\left(\frac{3}{10}\right) + \left(\frac{1}{4}\right)\left(\frac{1}{5}\right)}$$

$$= \frac{3}{5} = 0.6$$

Exercise 8

P(M) = 0.51

a) $P(\bar{M}) = 1 - 0.51$
   $= 0.49$

b) $P(R|M) = 0.095$
   $P(R|\bar{M}) = 0.017$
   $P(R) = P(R|M)\,P(M) + P(R|\bar{M})\,P(\bar{M})$
   $\quad = (0.095)(0.51) + (0.017)(0.49) = 0.05678$

   i) $P(R|M) = 0.095$

   ii) $P(M|R) = \dfrac{P(R|M)\,P(M)}{P(R)}$

   $\quad = \dfrac{(0.095)(0.51)}{0.05678}$

   $\quad = 0.853$

   iii) $P(\bar{R}|\bar{M}) = 1 - P(R|\bar{M})$
   $\quad\quad = 1 - 0.017$
   $\quad\quad = 0.983$

   Number of females from urban area
   $= 0.983 \times 100\,000$
   $= 98300$

Exercise 9

Let S denotes the event " subjects studied sent to prison "

Let C denotes the event " chose to plead guilty "

$P(S) = 0.45$

$P(C|S) = 0.4$

$P(C|S') = 0.55$

i) $P(S') = 1 - P(S)$

$= 1 - 0.45$

$= 0.55$

ii) $P(S|C) = \dfrac{P(C|S)\,P(S)}{P(C|S)\,P(S) + P(C|S')\,P(S')}$

$= \dfrac{(0.4)(0.45)}{(0.4)(0.45) + (0.55)(0.55)}$

$= 0.373$

iii) $P(S'|C) = 1 - P(S|C)$

$= 1 - 0.373$

$= 0.627$

iv) $P(C) = P(C|S)\,P(S) + P(C|S')\,P(S')$

$= (0.4)(0.45) + (0.55)(0.55)$

$= 0.4825$