Topic 2: Basic Probability Solutions

Q1

Needs warranty-related repair	U.S.	Non-U.S.	Total
Yes	0.025	0.015	0.04
No	0.575	0.385	0.96
Total	0.600	0.400	1.00

a) P(needs warranty repair) = 0.04

b) P(needs warranty repair and manufacturer based in U.S.) = 0.025

c) P(needs warranty repair or manufacturer based in U.S.)
    $=P$(needs warranty repair) + P(manufacturer based in U.S.)
    - P(needs warranty repair and manufacturer based in U.S.)
    = 0.04 + 0.6 – 0.025 = 0.615

d) P(needs warranty repair or manufacturer not based in U.S.)
    $=P$(needs warranty repair) + P(manufacturer not based in U.S.)
    - P(needs warranty repair and manufacturer not based in U.S.)
    = 0.04 + 0.4 - 0.015 = 0.425

Q2

a) $P(\textit{not enjoy} \mid \textit{female}) = \dfrac{P(\textit{not enjoy and female})}{P(\textit{female})} = \dfrac{36/500}{270/500} = 0.1333$

b) $P(\textit{male} \mid \textit{enjoy}) = \dfrac{P(\textit{male and enjoy})}{P(\textit{enjoy})} = \dfrac{126/500}{360/500} = 0.35$

c) $P(\textit{male}) = \dfrac{230}{500} = 0.46$

    From part (b), $P(\textit{male} \mid \textit{enjoy}) = 0.35$
    $P(\textit{male}) \neq P(\textit{male} \mid \textit{enjoy})$
    => enjoy shopping and gender are not independent

Q3

a) Let H: husband watch TV, $\overline{H}$: husband do not watch TV
    W: wife watch TV, $\overline{W}$ wife do not watch TV
    ∵ P(H) = 0.6 , P(W | H) = 0.4,
    $$P(W/H) = \frac{P(W \cap H)}{P(H)}$$
    ∴ P(W ∩ H) = P(W | H)P(H) = (0.4)(0.6) = 0.24

b) ∵ P(W | $\overline{H}$) = 0.3 , P($\overline{H}$) = 1-0.6 =0.4
    P(W ∩ $\overline{H}$) = P(W | $\overline{H}$) P($\overline{H}$) = (0.3)(0.4) = 0.12
    ∴ P(W) = P(W ∩ H) + P(W ∩ $\overline{H}$) = 0.24 + 0.12 = 0.36

Q4

a) P(do not enjoy shopping | F) = $\dfrac{36}{260}$

b) P(M | enjoy shopping) = $\dfrac{136}{360}$

c) ∵ P(do not enjoy shopping) = $\dfrac{140}{500}$ ≠ P(do not enjoy shopping | F)

    Also, P(M) = $\dfrac{240}{500}$ ≠ P(M | enjoy shopping)

    ∴ Whether one enjoy shopping for clothing and their gender are not statistically independent.

Q5
3^{10} = 59049 sequences

Q6
(5)(7)(4)(5) = 700 burgers

Q7
$\dfrac{10!}{4!(10-4)!}$ = 210 ways