P(Price | L = Urban, S = Medium)

Locatio

expensive

$P(E/U,M) = P(E/U \cap M)$

$P(E/U \cap M) = \dfrac{P(U \cap M / E) * P(E)}{P(U \cap M)}$

$n(S) = 10$ $\quad = \dfrac{P(U/E) \times P(M/E) \times P(E)}{P(U) \times P(M)}$

$P(E) = 4/10$, $P(U/E) = 1/2$, $P(M/E) = 0$

$P(U) = 4/10$

* depends on expensive

or

$P(U) = P(E) * P(U/E) + P(E') \times P(U/E')$

$= 4/10 \times 1/2 + 6/10 \times 2/6$

$4/20 + 12/60$

$= 4/10$

$P(M) = 3/10$

depends on expensive

$P(M) = P(E) \times P(M/E) + P(E') + P(M/E')$

$= 4/10 \times 0 + 6/10 * 3/6$

$= 3/10$

$$P(E/U \cap M) = \frac{1/2 \times 0 \times 4/10}{4/10 \times 3/10}$$

$$= \underline{0}$$

<u>affordable</u>

$P(A/U,M) = P(A/U \cap M)$

$$P(A/U \cap M) = \frac{P(U \cap M/A) * P(A)}{P(U \cap M)}$$

$$= \frac{P(U/A) \times P(M/A) \times P(A)}{P(U) \times P(M)}$$

$P(A) = 3/10$, $P(U/A) = 1/3$, $P(M/A) = 3/3 = \underline{1}$

$P(U) = 4/10$

alternatively, urban depends on affordable

$$P(U) = P(A) \times P(U/A) + P(A') \times P(U/A')$$

$$= 3/10 \times 1/3 + 7/10 \times 3/7$$

$$= 1/10 + 3/10$$

$$= 4/10$$

$P(M) = 3/10$

again

$P(M) = P(A) \times P(M/A) + P(A') \times P(M/A')$

$= 3/10 \times 3/3 + 7/10 \times 0$

$= 3/10 + 0$

$= 3/10.$

$P(A/U \cap M) = \dfrac{1/3 \times 1 \times 3/10}{4/10 \times 3/10}$

$= \dfrac{1/10}{3/25} = \underline{5/6}$

<u>Cheap</u>

$P(C/U, M) = P(C/U \cap M)$

$P(C/U \cap M) = \dfrac{P(U \cap M/C) \times P(C)}{P(U \cap M)}$

$= \dfrac{P(U/C) \times P(M/C) \times P(C)}{P(U \cap M)}$

$= \dfrac{P(U/C) \times P(M/C) \times P(C)}{P(U) \times P(M)}$

$P(C) = 3/10, \quad P(U/C) = 1/3. \quad P(M/C) = 0$

$P(U) = 4/10$

or

$$P(U) = P(C) \times P(U/C) + P(C') \times P(U/C')$$
$$= 3/10 \times 1/3 + 7/10 \times 3/7$$
$$1/10 + 3/10$$
$$= 4/10$$

$P(M) = 3/10$

or

$$P(M) = P(C) \times P(M/C) + P(C') \times P(M/C')$$
$$= 3/10 \times 0 + 7/10 \times 3/7$$
$$0 + 3/10$$
$$= 3/10$$

$$P(C/U \cap M) = \frac{1/3 \times 0 \times 3/10}{4/10 \times 3/10} = \underline{\underline{0}}$$

$\Rightarrow$ P(Price | L=Urban, S=Medium) = Affordable.

$$4x_1 - 3x_2 + x_3 = -10 \quad \text{— row (i)}$$
$$2x_1 + x_2 + 3x_3 = 0 \quad \text{— row ii}$$
$$-x_1 + 2x_2 - 5x_3 = 17 \quad \text{— row (iii)}$$

Representing it in matrix form

$$\left[\begin{array}{ccc|c} 4 & -3 & 1 & -10 \\ 2 & 1 & 3 & 0 \\ -1 & 2 & -5 & 17 \end{array}\right]$$

row (i) $\div 4$

$$\left[\begin{array}{ccc|c} 1 & -3/4 & 1/4 & -10/4 \\ 2 & 1 & 3 & 0 \\ -1 & 2 & -5 & 17 \end{array}\right]$$

row (ii) $- 2 \times$ eqn (i)

$$\left(\begin{array}{ccc|c} 1 & -3/4 & 1/4 & -10/4 \\ 0 & 5/2 & 5/2 & 5 \\ -1 & 2 & -5 & 17 \end{array}\right]$$

d row (ii) $\div 5/2$

$$\left(\begin{array}{ccc|c} 1 & -3/4 & 1/4 & -10/4 \\ 0 & 1 & 1 & 2 \\ -1 & 2 & -5 & 17 \end{array}\right]$$

row (iii) + row (i)

$$\left[\begin{array}{ccc|c} 1 & -3/4 & 1/4 & -10/4 \\ 0 & 1 & 1 & 2 \\ 0 & 5/4 & -19/4 & 29/2 \end{array}\right]$$

row (iii) $\div$ 5/4

$$\left[\begin{array}{ccc|c} 1 & -3/4 & 1/4 & -10/4 \\ 0 & \underline{1} & 1 & 2 \\ 0 & 1 & -19/5 & 58/5 \end{array}\right]$$

row (iii) − row (ii)

$$\left[\begin{array}{ccc|c} 1 & -3/4 & 1/4 & -10/4 \\ 0 & \underline{1} & \underline{1} & 2 \\ 0 & 0 & -24/5 & 48/5 \end{array}\right]$$

row iii $\div$ −24/5

$$\left[\begin{array}{ccc|c} \underline{1} & -3/4 & 1/4 & -10/4 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & \underline{1} & -2 \end{array}\right]$$

Row Echelon form

$$x_1 - 3/4\,x_2 + 1/4\,x_3 = -10/4 \quad \text{— (i)}$$

$$x_2 + x_3 = 2 \quad \text{— (ii)}$$

$$x_3 = -2 \quad \text{— (iii)}$$

Substitute x_3 into (ii)

$$x_2 + (-2) = 2$$

$$x_2 = 4.$$

Substitute x_2 & x_3 in (i)

$$x_1 - 3/4(4) + 1/4(-2) = -10/4$$

$$x_1 - 3 - 2/4 = -10/4$$

$$x_1 = 1$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ -2 \end{bmatrix}$$