Assignment :

BEDROOM	2	1	3	5
HOUSE PRICE	45	40	60	75

(i) find m & b

$$X^T \cdot X \begin{pmatrix} m \\ b \end{pmatrix} = X^T \cdot Y$$

$$X = \begin{pmatrix} 2 \\ 1 \\ 3 \\ 5 \end{pmatrix} \qquad Y = \begin{pmatrix} 45 \\ 40 \\ 60 \\ 75 \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 1 \\ 3 & 1 \\ 5 & 1 \end{pmatrix} \begin{pmatrix} m \\ b \end{pmatrix} = \begin{pmatrix} 45 \\ 40 \\ 60 \\ 75 \end{pmatrix}$$

$X^T \cdot X \qquad X^T \cdot Y$

$$\begin{pmatrix} 2 & 1 & 3 & 5 \\ 1 & 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 1 & 1 \\ 3 & 1 \\ 5 & 1 \end{pmatrix} \begin{pmatrix} m \\ b \end{pmatrix} = \begin{pmatrix} 2 & 1 & 3 & 5 \\ 1 & 1 & 1 & 1 \end{pmatrix} \cdot \begin{pmatrix} 45 \\ 40 \\ 60 \\ 75 \end{pmatrix}$$

$$\begin{pmatrix} 4+1+9+25 & 2+1+3+5 \\ 2+1+3+5 & 1+1+1+1 \end{pmatrix} \begin{pmatrix} m \\ b \end{pmatrix} = \begin{pmatrix} 90+40+180+375 \\ 45+40+60+75 \end{pmatrix}$$

$$\begin{pmatrix} 39 & 11 \\ 11 & 4 \end{pmatrix}\begin{pmatrix} m \\ b \end{pmatrix} = \begin{pmatrix} 685 \\ 220 \end{pmatrix}$$

$$A \begin{pmatrix} m \\ b \end{pmatrix} = \begin{pmatrix} 685 \\ 220 \end{pmatrix}$$

$$\begin{pmatrix} m \\ b \end{pmatrix} = A^{-1} \begin{pmatrix} 685 \\ 220 \end{pmatrix}$$

$$A^{-1} = \frac{1}{|A|} \cdot adj(A) \qquad |A| \rightarrow det(A)$$

$$|A| = (39 \times 4) - (11 \times 11)$$
$$= 156 - 121$$
$$= 35$$

$$Adj(A) = \begin{pmatrix} 4 & -11 \\ -11 & 39 \end{pmatrix}$$

$$A^{-1} = \frac{1}{35}\begin{pmatrix} 4 & -11 \\ -11 & 39 \end{pmatrix}$$

$$\begin{pmatrix} m \\ b \end{pmatrix} = \frac{1}{35}\begin{pmatrix} 4 & -11 \\ -11 & 39 \end{pmatrix} \cdot \begin{pmatrix} 685 \\ 220 \end{pmatrix}$$

$$= \frac{1}{35}\begin{pmatrix} (4 \times 685) + (-11 \times 220) \\ (-11 \times 685) + (39 \times 220) \end{pmatrix}$$

$$= \frac{1}{35}\begin{pmatrix} 2740 + (-2420) \\ -7535 + 8580 \end{pmatrix}$$

$$\begin{pmatrix} m \\ b \end{pmatrix} = \frac{1}{35} \begin{pmatrix} 260 \\ 1045 \end{pmatrix}$$

$$\begin{pmatrix} m \\ b \end{pmatrix} = \begin{pmatrix} 260/35 \\ 1045/35 \end{pmatrix}$$

$$= \begin{pmatrix} 7.42 \\ 29.85 \end{pmatrix}$$

$$\boxed{m = 7.42, \quad b = 29.85}$$

$$y = mx + b$$

$$\boxed{y = 7.42x + 29.85}$$

If Find 2 bedroom House price

$x = 2$

$y = 7.42(2) + 29.85$

$= \sim 44.69$

$x = 3$

$y = 7.42(3) + 29.85$

$= \sim 52.11$