Example - LR

Estimation of Mean Response

- Fitted regression line can be used to estimate the mean value of y for a given value of x.
- Example
  - The weekly advertising expenditure (x) and weekly sales (y) are presented in the following table.

y	x
1250	41
1380	54
1425	63
1425	54
1450	48
1300	46
1400	62
1510	61
1575	64
1650	71

Point Estimation of Mean Response

- From previous table we have:

$$n = 10 \qquad \sum x = 564 \qquad \sum x^2 = 32604$$
$$\sum y = 14365 \qquad \sum xy = 818755$$

- The least squares estimates of the regression coefficients are:

$$b_1 = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2} = \frac{10(818755) - (564)(14365)}{10(32604) - (564)^2} = 10.8$$

$$b_0 = 1436.5 - 10.8(56.4) = 828$$

Point Estimation of Mean Response

- The estimated regression function is:

$$\hat{y} = 828 + 10.8x$$

$$\text{Sales} = 828 + 10.8\ \text{Expenditur e}$$

- This means that if the weekly advertising expenditure is increased by $1 we would expect the weekly sales to increase by $10.8.