|  |  |  |
| --- | --- | --- |
| Car Index No: | Miles (X) | Maintenance (Y) |
| 1 | 80,000 | $1200 |
| 2 | 29,000 | $150 |
| 3 | 53,000 | $650 |
| 4 | 13,000 | $200 |
| 5 | 45,000 | $325 |
| 6 | 50,000 | ? |

**Assignment-3**

Due date: 1 week

Exercise-1:

Given: Maintenance expenses of 5 different cars for corresponding recorded miles.

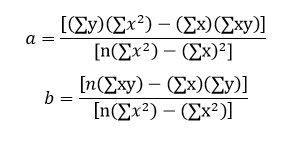
Problem: If a car driven 50,000 miles, how much would be the maintenance cost?

Use Linear Regression equation to find the maintenance cost. Show step by step calculations.

Also, calculate r^2 for the above model. Show step by step calculations.

|  |  |  |  |
| --- | --- | --- | --- |
| **X** | **Y** | **X2** | **X \* Y** |
| 80,000 | 1200 | 6,400,000,000 | 96,000,000 |
| 29,000 | 150 | 841,000,000 | 4,350,000 |
| 53,000 | 650 | 2,809,000,000 | 34,450,000 |
| 13,000 | 200 | 169,000,000 | 2,600,000 |
| 45,000 | 325 | 2,025,000,000 | 14,625,000 |
| ∑X = 220,000 | ∑Y = 2525 | ∑X2 = 12,244,000,000 | ∑XY = 152,025,000 |

Equations to find a and b for the linear regression equation. (Ref: Google Images)



a = [(2525) \* (12,244,000,000) – (220,000) \* (152,025,000)] / [5 \* (12,244,000,000) – (220,000)2]

= - 197.301

b = [5 \* (152,025,000) – (220,000) \* (2525)] / [5 \* (12,244,000,000) – (220,000)2] = 0.01596

**Equation:** y = - 197.301 + 0.0159 \* x

F(50,000) = - 197.301 + 0.0159 \* 50,000 = $597.70 for 50,000 miles driven

To get R2

Y’ = 2525 / 5 = 505. We will be using Y’ to get other parts of the R2 equation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **X** | **Y** | **(Y –** 505**)2** | **Linear Regression Eq** | **Difference** | **Difference Squared** |
| 80,000 | 1200 | 6952 = 483025 | 1,074.699 | 569.699 | 324,556.95 |
| 29,000 | 150 | -3552 = 126025 | 263.799 | - 241.201 | 58,177.92 |
| 53,000 | 650 | 1452 = 21025 | 645.399 | 140.399 | 19,711.88 |
| 13,000 | 200 | -3052 = 93035 | 9.399 | - 495.601 | 245,620.35 |
| 45,000 | 325 | -1802 = 32400 | 518.199 | 13.199 | 174.21 |
|  |  | ∑ = 755,500 |  |  | ∑ = 648,241.31 |

R2 = ∑ Difference / ∑ (Y – Y’)2 = 648,241.31 / 755,500 = 0.86