PART-3(Finding the Equation of the Regression Line)

Given Data

The given data is as follows:

x	y
3	15
6	30
10	55
15	85
18	100

The number of data points $n = 5$.

Step 1: Calculate the Required Sums

We need to calculate the following sums:

$$\sum x = 3 + 6 + 10 + 15 + 18 = 52$$

$$\sum y = 15 + 30 + 55 + 85 + 100 = 285$$

$$\sum xy = (3 \times 15) + (6 \times 30) + (10 \times 55) + (15 \times 85) + (18 \times 100) = 45 + 180 + 550 + 1275 + 1800 = 3850$$

$$\sum x^2 = (3^2) + (6^2) + (10^2) + (15^2) + (18^2) = 9 + 36 + 100 + 225 + 324 = 694$$

Step 2: Calculate the Slope (m) and Intercept (c)

The slope m of the regression line is given by:

$$m = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}$$

Substituting the values:

$$m = \frac{5 \times 3850 - 52 \times 285}{5 \times 694 - 52^2}$$

$$m = \frac{19250 - 14820}{3470 - 2704} = \frac{4430}{766} \approx 5.78$$

The y-intercept c is calculated using the formula:

$$c = \frac{\sum y - m \sum x}{n}$$

Substituting the values:

$$c = \frac{285 - 5.78 \times 52}{5} = \frac{285 - 300.56}{5} = \frac{-15.56}{5} \approx -3.11$$

Step 3: The Equation of the Regression Line

Thus, the equation of the regression line is:

$$y = 5.78x - 3.11$$

Step 4: Using the Regression Line

To predict the value of y for a given x, substitute the value of x into the regression line equation. For example, for $x = 12$:

$$y = 5.78 \times 12 - 3.11 = 69.36 - 3.11 = 66.25$$

Thus, the predicted value of y when $x = 12$ is approximately 66.25.