EXPERIMENT NO 2

Aim: To write the implementation of linear regression.

Objective:- Tounderstand the use of simple linear regression techniques by implementing user define dataset and importing dataset

Description:

Regression analysis is a very widely used statistical tool to establish a relationship model between two variables. One of these variables is called a predictor variable whose value is gathered through experiments. The other variable is called response variable whose value is derived from the predictor variable.

In Linear Regression these two variables are related through an equation, where the exponent (power) of both these variables is 1. Mathematically a linear relationship represents a straight line when plotted as a graph. A non-linear relationship where the exponent of any variable is not equal to1 creates a curve.

The general mathematical equation for a linear regression is

$$y = ax + b$$

Following is the description of theparameters used-

y is the response variable. x is the predictor variable.

a and b are constants which are called the coefficients.

Procedure:

The steps to create the relationship is

1. Carry out the experiment of gathering a sample of observed values of height and corresponding weights.
2. Create a relationship model using the lm() functions in R.
3. Find the coefficients from the model created and create the mathematical equation using these Get a summary of the relationship model to know the average error in prediction. Also called residuals.

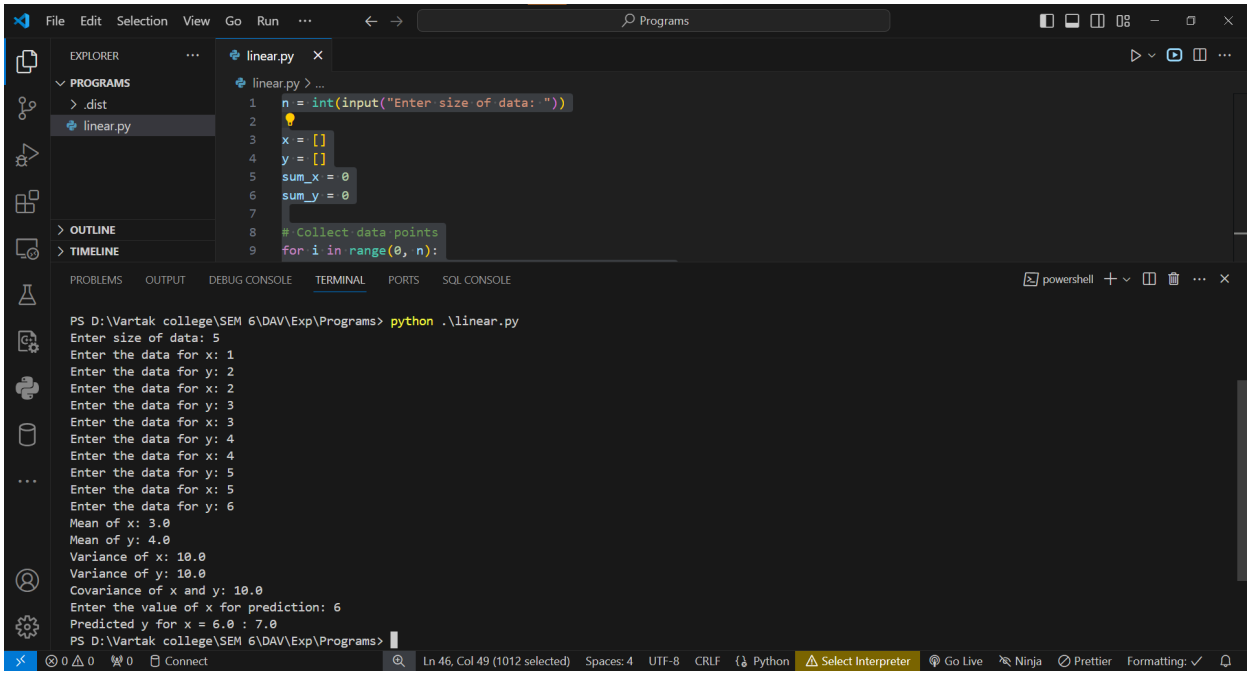
To predict the weight of new persons , use the predict() function in R.

Program:

```
n = int(input("Enter size of data: "))
x = []
y = []
sum_x = 0
sum_y = 0
# Collect data points
for i in range(0, n):
    x.append(float(input("Enter the data for x: ")))
    y.append(float(input("Enter the data for y: ")))
    sum_x += x[i]
    sum_y += y[i]
# Calculate mean
x_bar = sum_x / n
y_bar = sum_y / n
print("Mean of x:", x_bar)
print("Mean of y:", y_bar)
sxx = 0
sxy = 0
syy = 0
# Calculate variances and covariance
for i in range(0, n):
    sxx += (x[i] - x_bar) ** 2
    syy += (y[i] - y_bar) ** 2
    sxy += (y[i] - y_bar) * (x[i] - x_bar)
print("Variance of x:", sxx)
print("Variance of y:", syy)
print("Covariance of x and y:", sxy)
# Calculate slope (b1) and intercept (b0)
b1 = sxy / sxx
b0 = y_bar - (b1 * x_bar)
# Specific value of x for prediction
x_new = float(input("Enter the value of x for prediction: "))
# Calculate predicted y for the specific value of x
```

```
y_pred = b0 + b1 * x_new
print("Predicted y for x =", x_new, ":", y_pred)
```

Output:



Conclusion:

1. **Function used for linear regression in R is**

   The function used for linear regression in R is **lm()**. This function is employed to create a linear regression model based on given data, where it estimates the coefficients (constants) of the linear equation relating the predictor variable (x) to the response variable (y).

2. **Explain use of summary().**

   The **summary()** function in R is utilized to obtain a summary of statistical information about the linear regression model. This includes details such as coefficients, standard errors, t-values, p-values, and the coefficient of determination (R-squared). It provides a comprehensive overview of the model's performance and the significance of each predictor variable in explaining the variation in the response variable.