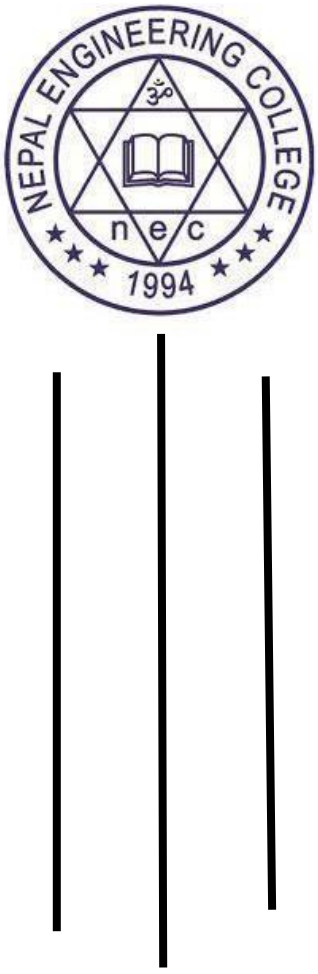
NEPAL ENGINEERING COLLEGE

(AFFILIATED TO POKHARA UNIVERSITY)

Changunarayan, Bhaktapur



REPORT ON:

Linear Regression

SUBMITTED BY:

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CRN: 020-626

SUBMITTED TO:

Electrical and

Electronics

Experiment no:-7

TITLE:-

Linear Regression

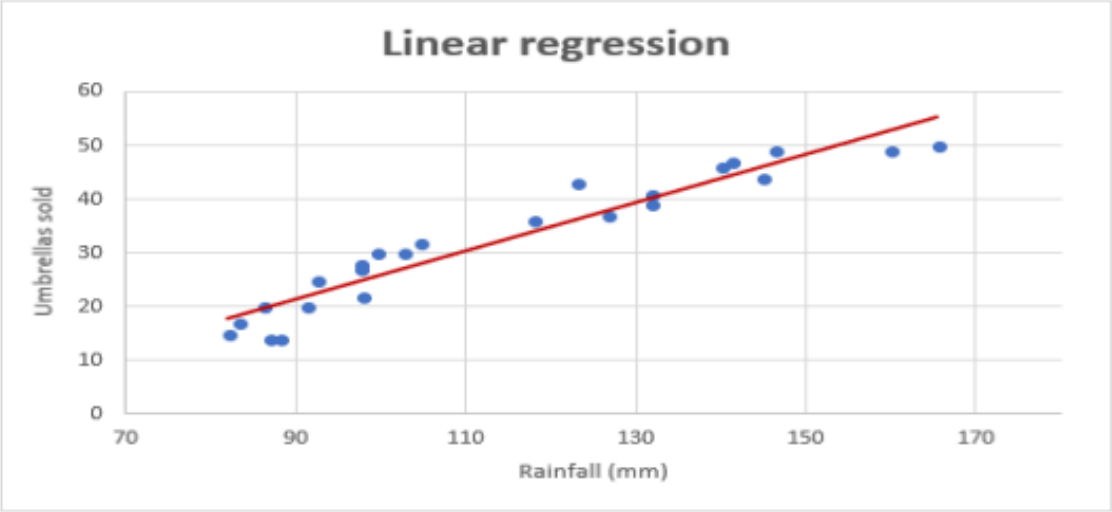
OBJECTIVE:-

To fit the observations of two variables into a linear relationship between them and find slope and $\mathrm{intercept}$ using Matlab and C-programming

THEORY:-

Introduction:

Linear regression is a technique used to model the relationships between observed variables. The idea behind simple linear regression is to "fit" the observations of two variables into a linear relationship between them. Graphically, the task is to draw the line that is "best-fitting" or "closest" to the points(x_i, y_i), where $x_i$and y_i are observations of the two variables which are expected to depend linearly on each other. The linear relationship between x and y can be considered in the form of: $y = a + bx$. Our target is to find the value of a and b such that obtained line best fits the given data.



Algorithm:

1. Start
2. Read number of data sets (n)
3. Read data x and y for i=1 to n
4. Compute $\sum x, \sum y, \sum xy, \sum x^2,$
5. Compute the value of a and b
6. Print out the equation
7. Stop

Question:-

Implement above algorithm to fit a straight line to the following set of data:

x	1	2	3	4	5
y	3	4	5	6	8

Using C-programming

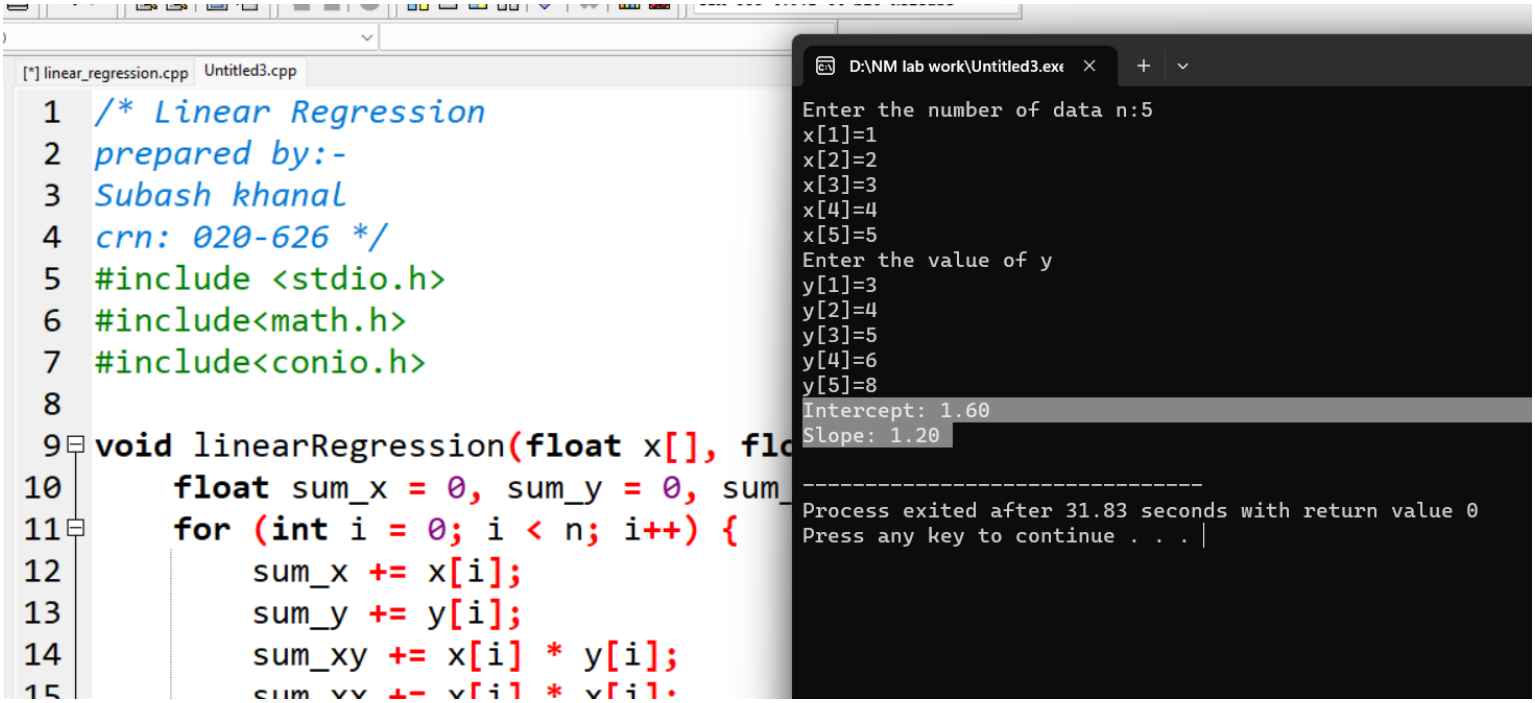
Syntax:-

```c
/* Linear Regression
prepared by:-
Subash khanal
crn: 020-626 */
#include <stdio.h>
#include<math.h>
#include<conio.h>
// function linearRegression
void linearRegression(float x[], float y[],
int n, float* slope, float* intercept) {
    float sum_x = 0, sum_y = 0, sum_xy = 0,
sum_xx = 0;
    for (int i = 0; i < n; i++) {
        sum_x += x[i];
        sum_y += y[i];
        sum_xy += x[i] * y[i];
        sum_xx += x[i] * x[i];
    }
    *slope = (n * sum_xy - sum_x * sum_y) / (n
* sum_xx - sum_x * sum_x);
    *intercept = (sum_y - *slope * sum_x) / n;
}

int main() {
    float x[100],y[100];
    int i,n;
```

```
    printf("Enter the number of data
n:");  //number of data in question
    scanf("%d",&n);
    for(i=0;i<n;i++)     // for x
    {
        printf("x[%d]=",i+1);
        scanf("%f",&x[i]);
    }
    printf("Enter the value of y\n");
    for(i=0;i<n;i++)
    {
        printf("y[%d]=",i+1);
        scanf("%f",&y[i]);
    }
    float slope, intercept;
    linearRegression(x, y, n, &slope,
&intercept);
    //printing slope and intercept
    printf("Intercept: %.2f\n", intercept);
//intercept
    printf("Slope: %.2f\n", slope);   //slope
    printf(" Linear Regression by:-\n Subash
khanal\n\n"); //Programmer details
    return 0;
    getch();
}
```

Output:-



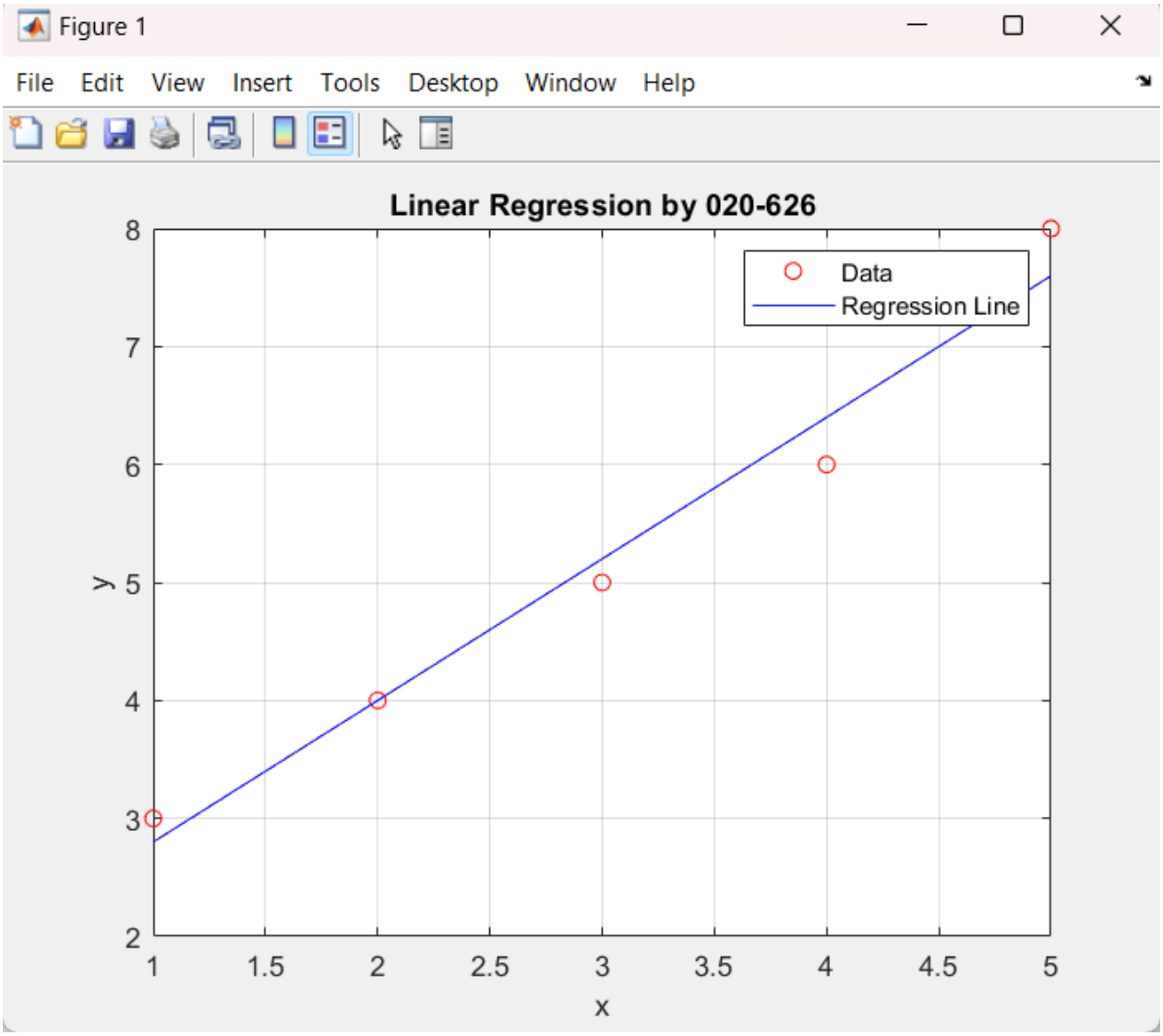
The value of Intercept and slope are found by using C-programming i.e. 1.60, 1.20 respectively which was highlighted on output screen.

Using Matlab.

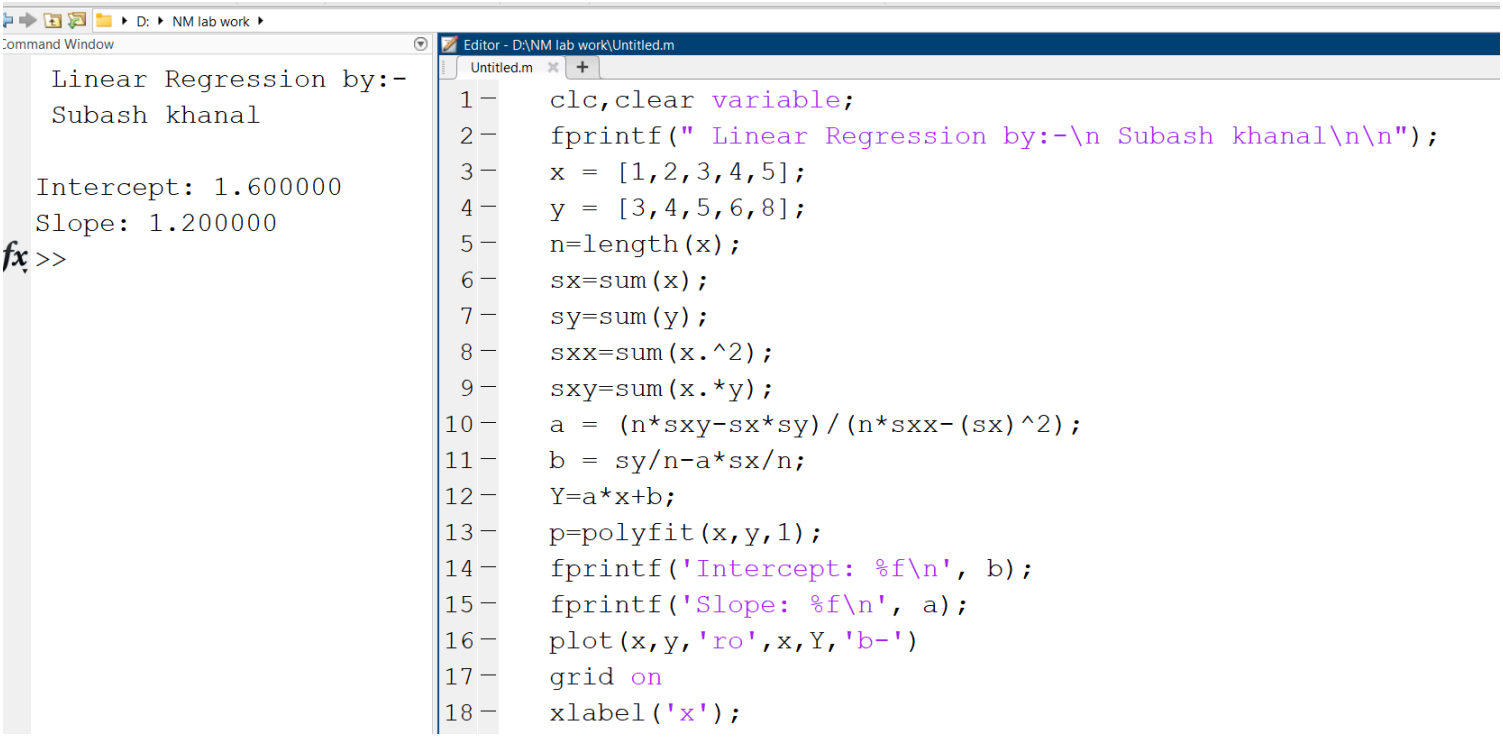
Syntax:-

```
clc,clear variable;
%programmer details
fprintf(" Linear Regression by:-\n
Subash khanal\n\n");
x = [1,2,3,4,5];
y = [3,4,5,6,8];
n=length(x);
sx=sum(x);
sy=sum(y);
sxx=sum(x.^2);
sxy=sum(x.*y);
a = (n*sxy-sx*sy)/(n*sxx-(sx)^2);
b = sy/n-a*sx/n;
Y=a*x+b;
p=polyfit(x,y,1);
fprintf('Intercept: %f\n', b);
fprintf('Slope: %f\n', a);
plot(x,y,'ro',x,Y,'b-')
grid on
xlabel('x');
ylabel('y');
legend('Data', 'Regression Line');
title('Linear Regression by 020-
626');
```

Graph from Matlab:-



Output:-



Using Matlab the value of Intercept, Slope are found to 1.60, 1.20respectively.

Description:-

From above program of c-programming and Matlab it was clear that value of slope and intercept are same using linear Regression method.

Conclusion:-

Hence, from above we can implement, fit and calculate the value of intercept and slope using the linear Regression method on Matlab and C-programming.