```
 1 % NAME: ADITYA BARMAN
 2 % ROLL: 002320601024
 3 % PROBLEM 1. Mean without Frequency
 4
 5
 6 clc, clearvars, close all
 7
 8 weights_pounds = [122, 173, 179, 176, 159, 175, 160, 102, 133
 9 159, 176, 151, 115, 105, 72, 170, 128, 112
10 101, 123, 117, 93, 117, 99, 90, 113, 128
11 129, 134, 178, 105, 107, 147, 157, 155, 95
12 177, 98, 174, 135, 97, 168, 160, 144, 174];
13
14 matrix_length = size(weights_pounds);
15 length_weights_pounds = matrix_length(1) * matrix_length(2);
16 sum_wts_pds = 0;
17
18 for i = 1:matrix_length(1)
19     for j = 1:matrix_length(2)
20         sum_wts_pds = (sum_wts_pds + weights_pounds(i, j));
21     end
22 end
23
24 fprintf('The weights of %d persons in pounds is given below\n\n',↙
length_weights_pounds);
25 disp(weights_pounds)
26
27 mean_weight = (sum_wts_pds/length_weights_pounds);
28 fprintf('Mean of the data is: %.4f\n', mean_weight);
29
30
31 % ======================= OUTPUT ============================
32
33 % The weights of 45 persons in pounds is given below
34
35 %    122   173   179   176   159   175   160   102   133
36 %    159   176   151   115   105    72   170   128   112
37 %    101   123   117    93   117    99    90   113   128
38 %    129   134   178   105   107   147   157   155    95
39 %    177    98   174   135    97   168   160   144   174
40
41 % Mean of the data is: 135.1556
42
43 % ==========================================================
```

```m
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 2. Mean with Frequency


clc, clearvars, close all

f = [15, 20, 30, 18, 12, 5];
f_total = 0;
f_m_total = 0;

up_bd = [23, 28, 33, 38, 43, 48];
lw_bd = [19, 24, 29, 34, 39, 44];
midpts = ((up_bd + lw_bd)/2);
f_m = f .* midpts;

for i = 1:length(f)
    f_total = f_total + f(i);
    f_m_total = f_m_total + f_m(i);
end

mean_value = (f_m_total/f_total);

fprintf('The age of persons and number of persons is given below\n\n');
% Print the table headers
fprintf('%-10s %-20s\n', 'Age of Persons', 'Number of Persons');

% Print the table values
for i = 1:length(lw_bd)
    fprintf('%-2d - %-2d\t\t\t%-10d\n', lw_bd(i), up_bd(i), f(i));
end

fprintf('\nMean of the data is: %.4f\n', mean_value);


% ============================ OUTPUT ========================

% The age of persons and number of persons is given below
%
% Age of Persons Number of Persons
% 19 - 23           15
% 24 - 28           20
% 29 - 33           30
% 34 - 38           18
% 39 - 43           12
% 44 - 48           5
%
```

```
48 % Mean of the data is: 31.3500
49
50 % ============================================================
```

```
 1 % NAME: ADITYA BARMAN
 2 % ROLL: 002320601024
 3 % PROBLEM 3. Variance without Frequency
 4
 5
 6 clc, clearvars, close all
 7
 8 weights_pounds = [122, 173, 179, 176, 159, 175, 160, 102, 133
 9 159, 176, 151, 115, 105, 72, 170, 128, 112
10 101, 123, 117, 93, 117, 99, 90, 113, 128
11 129, 134, 178, 105, 107, 147, 157, 155, 95
12 177, 98, 174, 135, 97, 168, 160, 144, 174];
13
14 sum_wts_pds = 0;
15 matrix_length = size(weights_pounds);
16 length_weights_pounds = matrix_length(1) * matrix_length(2);
17
18 for i = 1:matrix_length(1)
19     for j = 1:matrix_length(2)
20         sum_wts_pds = (sum_wts_pds + weights_pounds(i, j));
21     end
22 end
23
24 mean_weight = (sum_wts_pds/length_weights_pounds);
25
26 sum_dist_mean = 0;
27
28 for x = 1:matrix_length(1)
29     for y = 1:matrix_length(2)
30         dist_mean = ((weights_pounds(x, y) - mean_weight)^2);
31         sum_dist_mean = (sum_dist_mean + dist_mean);
32     end
33 end
34
35
36 fprintf('The weights of %d persons in pounds is given below\n\n',↙
length_weights_pounds);
37 disp(weights_pounds)
38
39 variance = (sum_dist_mean/length_weights_pounds);
40 fprintf('Variance of the data is: %.4f\n', variance);
41
42
43 % ======================= OUTPUT ========================
44
45 % The weights of 45 persons in pounds is given below
46 %
```

```
47 %    122   173   179   176   159   175   160   102   133
48 %    159   176   151   115   105    72   170   128   112
49 %    101   123   117    93   117    99    90   113   128
50 %    129   134   178   105   107   147   157   155    95
51 %    177    98   174   135    97   168   160   144   174
52 %
53 % Variance of the data is: 930.7980
54
55 % ========================================================
```

```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 4. Variance with Frequency


clc, clearvars, close all

f = [15, 20, 30, 18, 12, 5];
f_total = 0;
f_m_total = 0;

up_bd = [23, 28, 33, 38, 43, 48];
lw_bd = [19, 24, 29, 34, 39, 44];
midpts = ((up_bd + lw_bd)/2);
f_m = f .* midpts;

for i = 1:6
    f_total = f_total + f(i);
    f_m_total = f_m_total + f_m(i);
end

mean_value = (f_m_total/f_total);

midpt_x = zeros(1, 6);

for j = 1:6
    m_sub_x = (midpts(j) - mean_value);
    midpt_x(j) = m_sub_x;
end

midpt_x_sq = midpt_x .* midpt_x;
f_m_x = zeros(1, 6);

for k = 1:6
    f_m_x_val = f(k)*midpt_x_sq(k);
    f_m_x(k) = f_m_x_val;
end

f_m_x_total = 0;

for z = 1:6
    f_m_x_total = f_m_x_total + f_m_x(z);
end

variance = (f_m_x_total/f_total);

fprintf('The age of persons and number of persons is given below\n\n');
```

```
48 % Print the table headers
49 fprintf('%-10s %-20s\n', 'Age of Persons', 'Number of Persons');
50
51 % Print the table values
52 for i = 1:length(lw_bd)
53     fprintf('%-2d - %-2d\t\t\t%-10d\n', lw_bd(i), up_bd(i), f(i));
54 end
55
56 fprintf('\nVariance of the data is: %.4f\n', variance);
57
58
59 % ============================ OUTPUT =====================
60
61 % The age of persons and number of persons is given below
62 %
63 % Age of Persons Number of Persons
64 % 19 - 23           15
65 % 24 - 28           20
66 % 29 - 33           30
67 % 34 - 38           18
68 % 39 - 43           12
69 % 44 - 48           5
70 %
71 % Variance of the data is: 47.6275
72
73 % ========================================================
```

```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 5. Co-variance without Frequency


clc, clearvars, close all

n_women = 12;
x_ages = [56, 42, 72, 36, 63, 47, 55, 49, 38, 42, 68, 60];
y_BP = [147, 125, 160, 118, 149, 128, 150, 145, 115, 140, 152, 155];

x_y = zeros(1, 12);
x_ages_sum = 0;
y_BP_sum = 0;
xy_sum = 0;

for i = 1:12
    x_ages_sum = x_ages_sum + x_ages(i);
    y_BP_sum = y_BP_sum + y_BP(i);
    x_y(i) = (x_ages(i) * y_BP(i));
end

for j = 1:12
    xy_sum = xy_sum + x_y(j);
end

x_mean = x_ages_sum / n_women;
y_mean = y_BP_sum / n_women;

covariance = (xy_sum - n_women * x_mean * y_mean) / n_women;

fprintf('Covariance between x and y: %.4f\n', covariance);


% ============== OUTPUT ===============

% Covariance between x and y: 147.0556

% ====================================
```

```
 1 % NAME: ADITYA BARMAN
 2 % ROLL: 002320601024
 3 % PROBLEM 6. Co-variance with Frequency
 4
 5
 6 clc, clearvars, close all
 7
 8 n = 100;
 9 f_vals = [0 0 0 2 4 4
10 0 0 1 4 6 5
11 0 0 5 10 8 1
12 1 4 9 5 2 0
13 3 6 6 2 0 0
14 3 5 4 0 0 0];
15
16 % initializing upper and lower bounds for x & y
17 up_bd_x = [49 59 69 79 89 99];
18 up_bd_y = [99 89 79 69 59 49];
19 lw_bd_x = [40 50 60 70 80 90];
20 lw_bd_y = [90 80 70 60 50 40];
21
22 % initialiazing midpts and assumed means (same for x & y)
23 midpts_x = (up_bd_x + lw_bd_x) / 2;
24 midpts_y = (up_bd_y + lw_bd_y) / 2;
25 mean_asmd_xy = 74.5;
26 % obtaining factor from subtraction from assumed mean
27 diff_factor = 10;
28
29 % calculating u & v vals
30 u_vals = zeros(1, 6);
31
32 for i = 1:6
33     u_vals(i) = ((midpts_x(i) - mean_asmd_xy) / diff_factor);
34 end
35
36 v_vals = u_vals(end:-1:1);
37
38 % initializing a 6x6 zero matrix to store fuv values
39 fuv = zeros(6, 6);
40 % following loop traverses through each cell and stores the required value
41 for j = 1:6
42     for k = 1:6
43         fuv(j, k) = f_vals(j, k) * v_vals(j) * u_vals(k);
44     end
45 end
46
47
```

```
48 % initializing required matrices
49 % for v
50 f_v = [10 16 24 21 17 12]; % given
51 fv = zeros(1, 6);
52 fv_sq = zeros(1, 6);
53 f_uv = 0;
54
55 %for u
56 f_u = [7 15 25 23 20 10]; % given
57 fu = zeros(1, 6);
58 fu_sq = zeros(1, 6);
59
60 % calculating fu, fv, fu^2, fv^2
61 for a = 1:6
62     fv(a) = f_v(a) .* v_vals(a);
63     fv_sq(a) = f_v(a) .* (v_vals(a)^2);
64     fu(a) = f_u(a) .* u_vals(a);
65     fu_sq(a) = f_u(a) .* (u_vals(a)^2);
66 end
67
68 % calculating f_uv
69 for m = 1:36
70     f_uv = f_uv + fuv(m);
71 end
72 % calculating respective sums
73 fv_sum = 0;
74 fv_sq_sum = 0;
75 fu_sum = 0;
76 fu_sq_sum = 0;
77
78 for d = 1:6
79     fv_sum =fv_sum + fv(d);
80     fv_sq_sum =fv_sq_sum + fv_sq(d);
81     fu_sum =fu_sum + fu(d);
82     fu_sq_sum =fu_sq_sum + fu_sq(d);
83 end
84
85 % calculating square of summation of fu & fv respectively
86 fu_sum_sq = fu_sum ^ 2;
87 fv_sum_sq = fv_sum ^ 2;
88
89 % calculating co-variance between x & y
90 corr_coeff_num = (n*f_uv) - (fu_sum*fv_sum);
91 covar_xy = corr_coeff_num/100;
92 % corr_coeff_denom = (sqrt((n*fu_sq_sum)-fu_sum_sq))*(sqrt((n*fv_sq_sum)-
fv_sum_sq));
93 % corr_coeff = corr_coeff_num / corr_coeff_denom;
```

```
 94
 95 fprintf('Co-variance between the marks in Mathematics and the marks in Physics is: ↵
%.4f\n', covar_xy);
 96
 97 % ====================== OUTPUT ==============================
 98
 99 % Co-variance between the marks in Mathematics and the marks in Physics is: ↵
160.2000
100
101 % ============================================================
```

```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 7. Correlation without Frequency


clc, clearvars, close all

n_women = 12;
x_ages = [56, 42, 72, 36, 63, 47, 55, 49, 38, 42, 68, 60];
y_BP = [147, 125, 160, 118, 149, 128, 150, 145, 115, 140, 152, 155];

x_y = zeros(1, 12);
x_sq = zeros(1, 12);
y_sq = zeros(1, 12);

for i = 1:12
    x_y(i) = (x_ages(i) * y_BP(i));
    x_sq(i) = (x_ages(i) ^ 2);
    y_sq(i) = (y_BP(i) ^ 2);
end

x_ages_sum = 0;
y_BP_sum = 0;
x_y_sum = 0;
x_sq_sum = 0;
y_sq_sum = 0;

for j = 1:12
    x_ages_sum = x_ages_sum + x_ages(j);
    y_BP_sum = y_BP_sum + y_BP(j);
    x_y_sum = x_y_sum + x_y(j);
    x_sq_sum = x_sq_sum + x_sq(j);
    y_sq_sum = y_sq_sum + y_sq(j);
end

r_numerator = (n_women*(x_y_sum)) - (x_ages_sum * y_BP_sum);
r_denominator_1 = (n_women*x_sq_sum) - (x_ages_sum^2);
r_denominator_2 = (n_women*y_sq_sum) - (y_BP_sum^2);
r = r_denominator_1*r_denominator_2;
r = r^0.5;
r = r_numerator / r;

fprintf('Correlation coefficient between x and y: %.4f\n', r);


% ==================== OUTPUT ====================

```

```
48 % Correlation coefficient between x and y: 0.8961
49
50 % ================================================
```

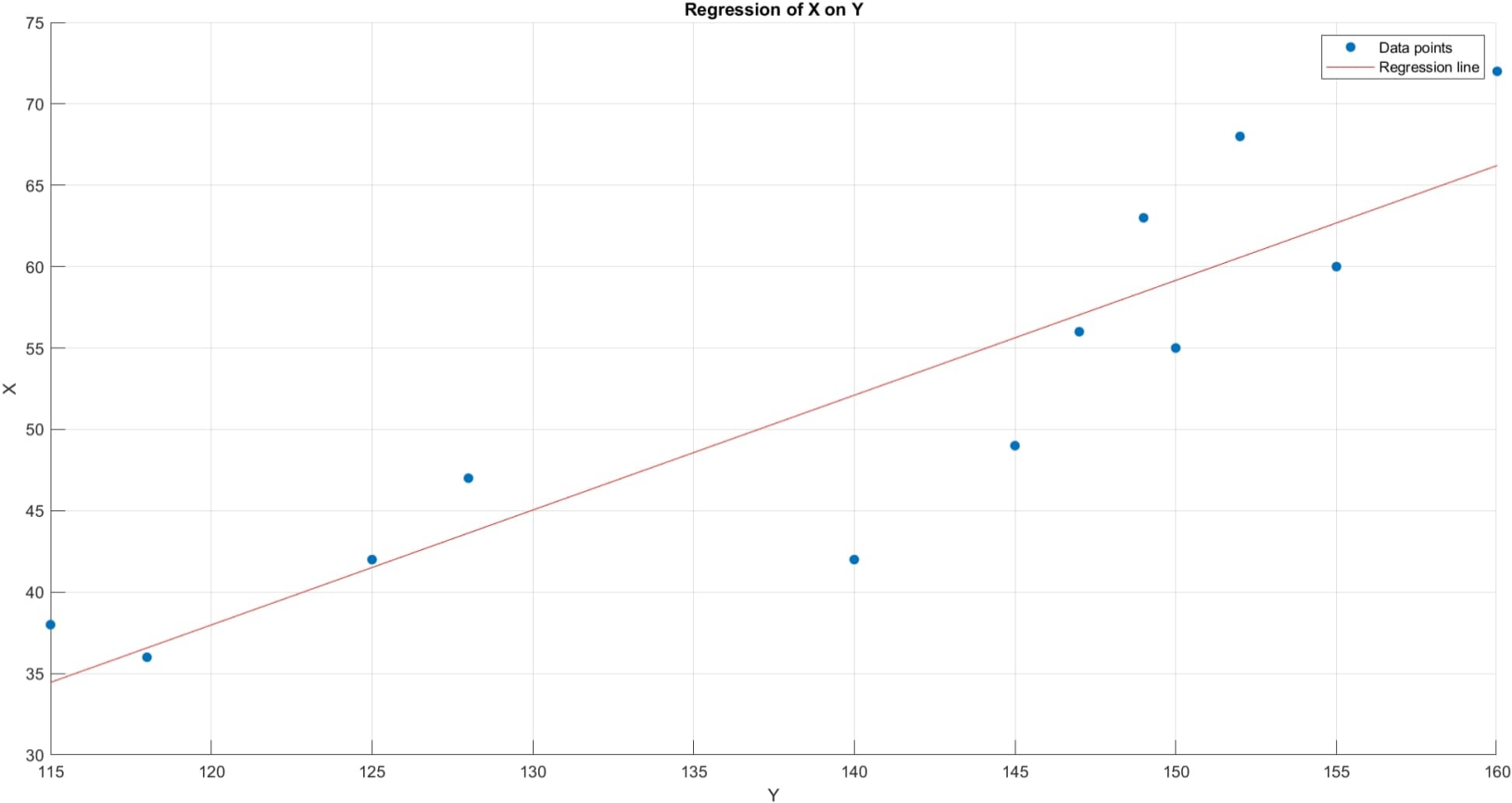
```m
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 8. Correlation with Frequency


clc, clearvars, close all

n = 100;
f_vals = [0 0 0 2 4 4
0 0 1 4 6 5
0 0 5 10 8 1
1 4 9 5 2 0
3 6 6 2 0 0
3 5 4 0 0 0];

% initializing upper and lower bounds for x & y
up_bd_x = [49 59 69 79 89 99];
up_bd_y = [99 89 79 69 59 49];
lw_bd_x = [40 50 60 70 80 90];
lw_bd_y = [90 80 70 60 50 40];

% initialiazing midpts and assumed means (same for x & y)
midpts_x = (up_bd_x + lw_bd_x) / 2;
midpts_y = (up_bd_y + lw_bd_y) / 2;
mean_asmd_xy = 74.5;
% obtaining factor from subtraction from assumed mean
diff_factor = 10;

% calculating u & v vals
u_vals = zeros(1, 6);

for i = 1:6
    u_vals(i) = ((midpts_x(i) - mean_asmd_xy) / diff_factor);
end

v_vals = u_vals(end:-1:1);

% initializing a 6x6 zero matrix to store fuv values
fuv = zeros(6, 6);
% following loop traverses through each cell and stores the required value
for j = 1:6
    for k = 1:6
        fuv(j, k) = f_vals(j, k) * v_vals(j) * u_vals(k);
    end
end


```

```
 48 % initializing required matrices
 49 % for v
 50 f_v = [10 16 24 21 17 12]; % given
 51 fv = zeros(1, 6);
 52 fv_sq = zeros(1, 6);
 53 f_uv = 0;
 54
 55 %for u
 56 f_u = [7 15 25 23 20 10]; % given
 57 fu = zeros(1, 6);
 58 fu_sq = zeros(1, 6);
 59
 60 % calculating fu, fv, fu^2, fv^2
 61 for a = 1:6
 62     fv(a) = f_v(a) .* v_vals(a);
 63     fv_sq(a) = f_v(a) .* (v_vals(a)^2);
 64     fu(a) = f_u(a) .* u_vals(a);
 65     fu_sq(a) = f_u(a) .* (u_vals(a)^2);
 66 end
 67
 68 % calculating f_uv
 69 for m = 1:36
 70     f_uv = f_uv + fuv(m);
 71 end
 72 % calculating respective sums
 73 fv_sum = 0;
 74 fv_sq_sum = 0;
 75 fu_sum = 0;
 76 fu_sq_sum = 0;
 77
 78 for d = 1:6
 79     fv_sum =fv_sum + fv(d);
 80     fv_sq_sum =fv_sq_sum + fv_sq(d);
 81     fu_sum =fu_sum + fu(d);
 82     fu_sq_sum =fu_sq_sum + fu_sq(d);
 83 end
 84
 85 % calculating square of summation of fu & fv respectively
 86 fu_sum_sq = fu_sum ^ 2;
 87 fv_sum_sq = fv_sum ^ 2;
 88
 89 % calculating correlation coefficient between x & y
 90 corr_coeff_num = (n*f_uv) - (fu_sum*fv_sum);
 91 corr_coeff_denom = (sqrt((n*fu_sq_sum)-fu_sum_sq))*(sqrt((n*fv_sq_sum)-↙
fv_sum_sq));
 92 corr_coeff = corr_coeff_num / corr_coeff_denom;
 93
```

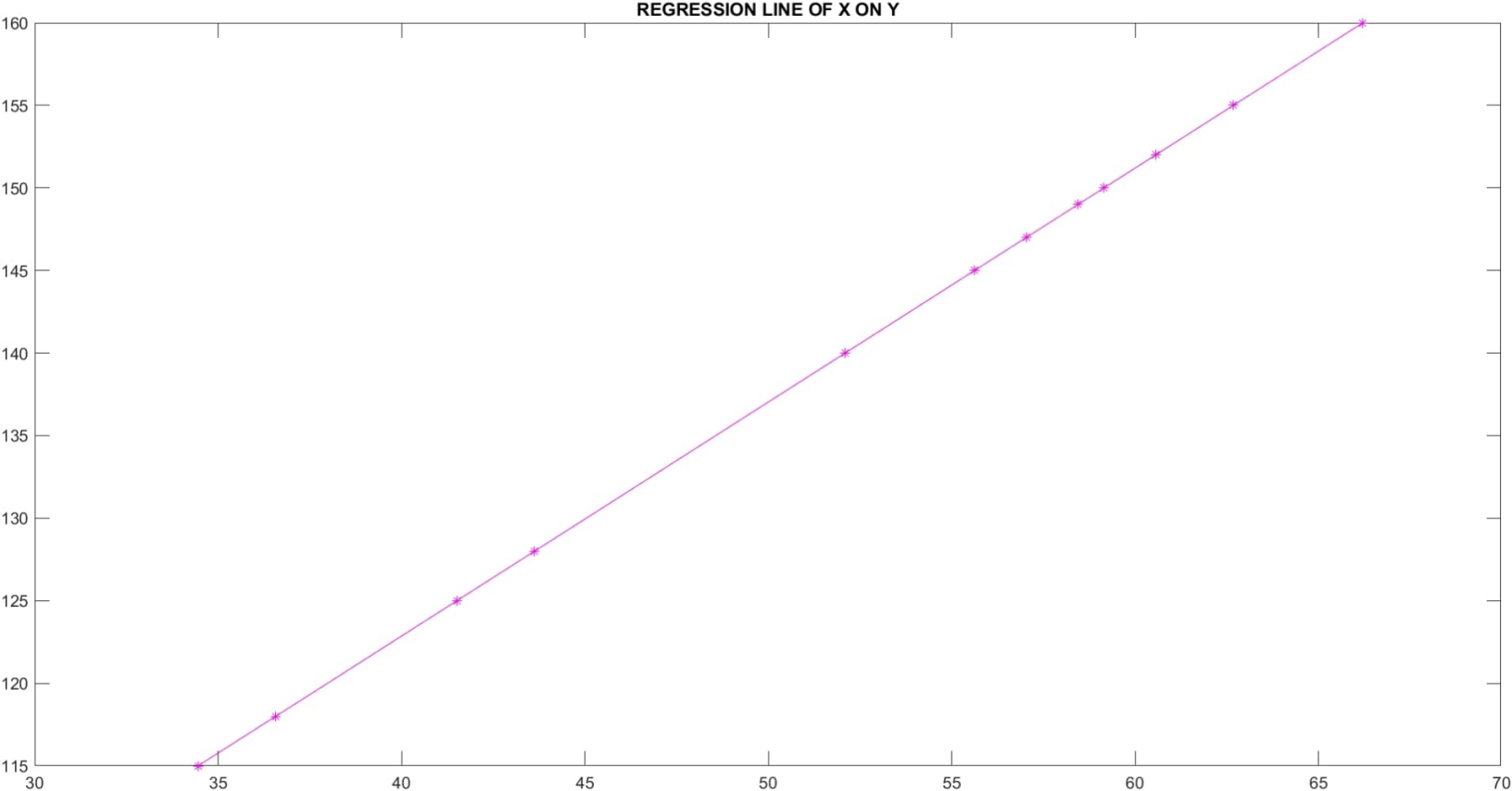
```
 94 fprintf('Correlation coefficient between the marks in Mathematics and the marks in Physics is: %.4f\n', corr_coeff);
 95
 96 % ====================== OUTPUT ==============================
 97
 98 % Correlation coefficient between the marks in Mathematics and the marks in Physics is: 0.7686
 99
100 % ============================================================
```

```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 9. Regression of X on Y (with plot)


clc, clearvars, close all

X = [56 42 72 36 63 47 55 49 38 42 68 60];
Y = [147 125 160 118 149 128 150 145 115 140 152 155];

n = length(Y);
Y_sq = Y .^ 2;
X_sq = X .^ 2;
YX = zeros(1, n);

for i = 1:n
    YX(i) = Y(i) * X(i);
end

Y_sum = 0;
X_sum = 0;
Y_sq_sum = 0;
X_sq_sum = 0;
YX_sum = 0;

for j = 1:n
    Y_sum = Y_sum + Y(j);
    X_sum = X_sum + X(j);
    Y_sq_sum = Y_sq_sum + Y_sq(j);
    X_sq_sum = X_sq_sum + X_sq(j);
    YX_sum = YX_sum + YX(j);
end

a_num = (n * YX_sum) - (Y_sum * X_sum);
a_denom = (n * Y_sq_sum) - (Y_sum ^ 2);

b_num = (X_sum * Y_sq_sum) - (Y_sum * YX_sum);
b_denom = (n * Y_sq_sum) - (Y_sum ^ 2);

a_eqn = a_num / a_denom;
b_eqn = b_num / b_denom;

fprintf('The regression equation is X = %.2fY + %.2f\n', a_eqn, b_eqn);

%
% Plotting the data points
scatter(Y, X, 'filled');
```

```
48 hold on;
49
50 % Plotting the regression line
51 y_line = min(Y):0.01:max(Y);
52 x_line = a_eqn * y_line + b_eqn;
53 plot(y_line, x_line, 'r');
54
55 % Formatting the plot
56 xlabel('Y');
57 ylabel('X');
58 title('Regression of X on Y');
59 legend('Data points', 'Regression line');
60 grid on;
61 hold off;
62
63
64
65 % ================== OUTPUT =====================
66
67 % The regression equation is X = 0.71Y + -46.70
68
69 % ================================================
```

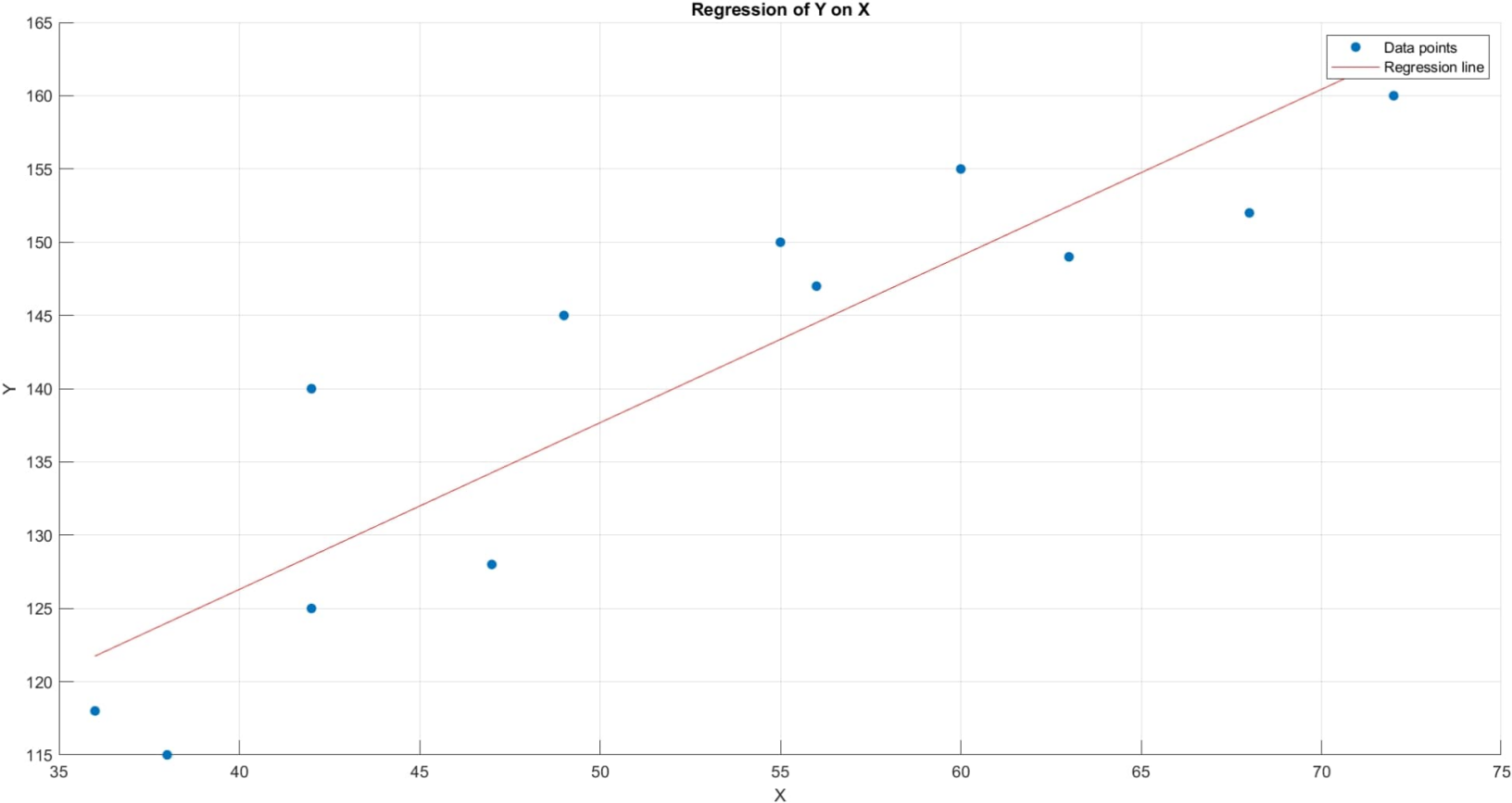

Regression of X on Y
Data points
Regression line
X
Y
75
70
65
60
55
50
45
40
35
30
115
120
125
130
135
140
145
150
155
160

```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 9. Regression of X on Y (with plot)


clc, clearvars, close all

x = [56 42 72 36 63 47 55 49 38 42 68 60];
y = [147 125 160 118 149 128 150 145 115 140 152 155];
n = length(x);

sumx = 0;
sumy = 0;

for i = 1:n
    sumx = sumx + x(i);
    sumy = sumy + y(i);
end

sumxx = sum(x .^ 2);
sumyy = sum(y .^ 2);
sumxy = sum(x .* y);
mean_x = sumx / n;
mean_y = sumy / n;
Sx = n * (sumxy) - ((sumx) * (sumy));
Sy = n * (sumyy) - (sumy) ^ 2;
bxy = Sx / Sy;
x = mean_x + bxy * (y - mean_y);

fprintf('Equation of the given regression line of x on y is: \n');
fprintf('x-%f=%f(y-%f) \n',mean_x,bxy,mean_y);
plot(x, y, 'm-*')
title('REGRESSION LINE OF X ON Y')


% ==================== OUTPUT ========================

% Equation of the given regression line of x on y is:
% x-52.333333=0.705678(y-140.333333)

% ====================================================
```


REGRESSION LINE OF X ON Y
160
155
150
145
140
135
130
125
120
115
30
35
40
45
50
55
60
65
70

```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 10. Regression of Y on X (with plot)


clc, clearvars, close all

X = [56 42 72 36 63 47 55 49 38 42 68 60];
Y = [147 125 160 118 149 128 150 145 115 140 152 155];

n = length(X);
X_sq = X .^ 2;
Y_sq = Y .^ 2;
XY = zeros(1, n);

for i = 1:n
    XY(i) = X(i) * Y(i);
end

X_sum = 0;
Y_sum = 0;
X_sq_sum = 0;
Y_sq_sum = 0;
XY_sum = 0;

for j = 1:n
    X_sum = X_sum + X(j);
    Y_sum = Y_sum + Y(j);
    X_sq_sum = X_sq_sum + X_sq(j);
    Y_sq_sum = Y_sq_sum + Y_sq(j);
    XY_sum = XY_sum + XY(j);
end

a_num = (n * XY_sum) - (X_sum * Y_sum);
a_denom = (n * X_sq_sum) - (X_sum ^ 2);

b_num = (Y_sum * X_sq_sum) - (X_sum * XY_sum);
b_denom = (n * X_sq_sum) - (X_sum ^ 2);

a_eqn = a_num / a_denom;
b_eqn = b_num / b_denom;

fprintf('The regression equation is Y = %.2fX + %.2f\n', a_eqn, b_eqn);

%
% Plotting the data points
scatter(X, Y, 'filled');
```

```
48 hold on;
49
50 % Plotting the regression line
51 x_line = min(X):0.01:max(X);
52 y_line = a_eqn * x_line + b_eqn;
53 plot(x_line, y_line, 'r');
54
55 % Formatting the plot
56 xlabel('X');
57 ylabel('Y');
58 title('Regression of Y on X');
59 legend('Data points', 'Regression line');
60 grid on;
61 hold off;
62
63
64
65 % ==================== OUTPUT =================
66
67 % The regression equation is Y = 1.14X + 80.78
68
69 % ============================================
```


Regression of Y on X
Data points
Regression line
Y
X
165
160
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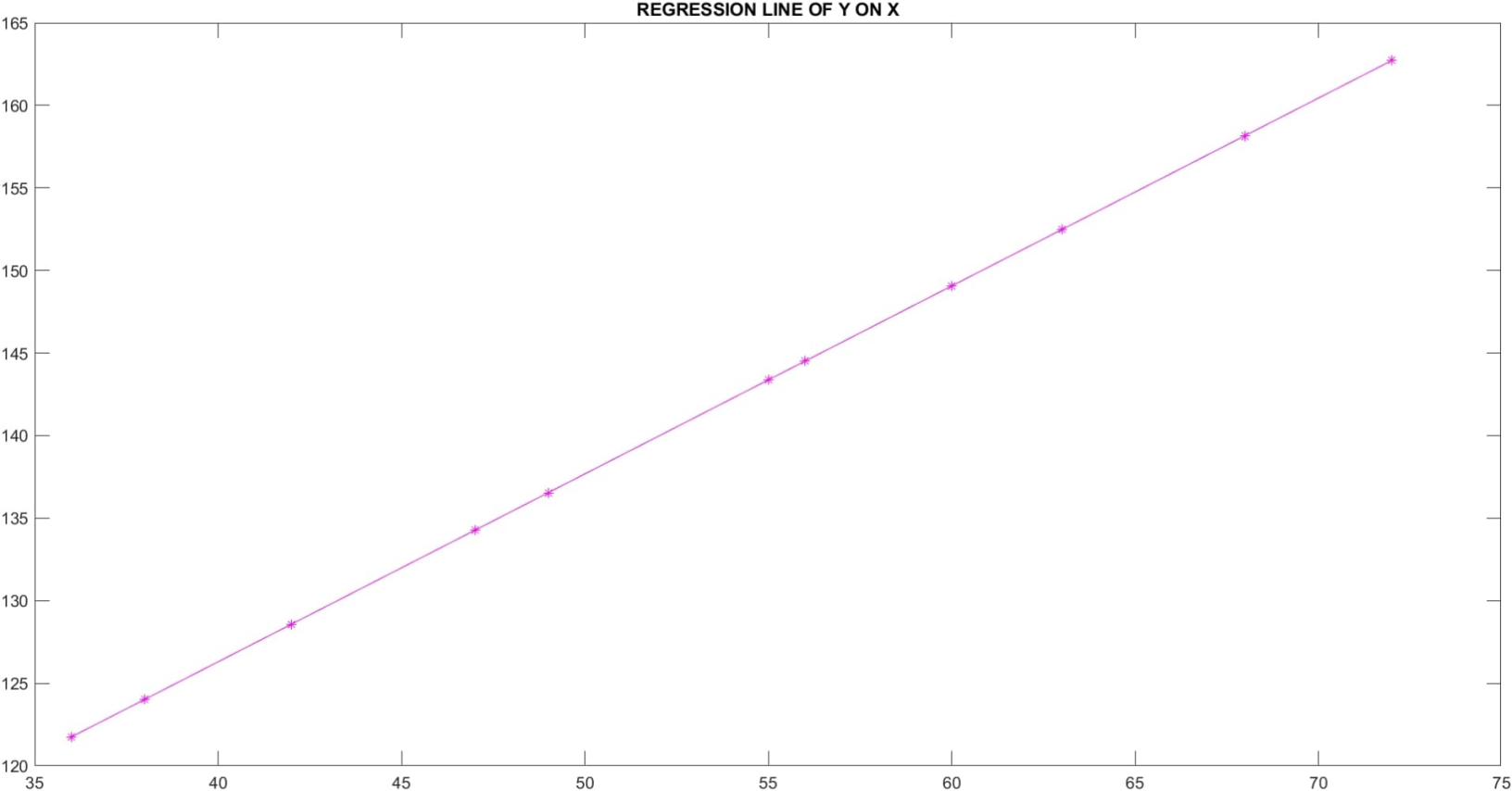
```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 10. Regression of Y on X (with plot)


clc, clearvars, close all

x = [56 42 72 36 63 47 55 49 38 42 68 60];
y = [147 125 160 118 149 128 150 145 115 140 152 155];
n = length(x);

sumx = 0;
sumy = 0;

for i = 1:n
    sumx = sumx+x(i);
    sumy = sumy+y(i);
end

sumxx = sum(x .^ 2);
sumyy = sum(y .^ 2);
sumxy = sum(x .* y);
mean_x = sumx / n;
mean_y = sumy / n;
Sx = n * (sumxy) - ((sumx) * (sumy));
Sy = n * (sumxx) - (sumx) ^ 2;
byx = Sx / Sy;
y = mean_y + byx * (x-mean_x);

fprintf('Equation of the given regression line of y on x is: \n');
fprintf('y-%f=%f(x-%f) \n',mean_y,byx,mean_x);
plot(x,y,'m-*')
title('REGRESSION LINE OF Y ON X')


% ======================= OUTPUT =====================

% Equation of the given regression line of y on x is:
% y-140.333333=1.138005(x-52.333333)

% ===================================================
```


REGRESSION LINE OF Y ON X
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```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 11. Spearman's Rank Correlation


clc, clearvars, close all

math_x = [43 77 64 96 48 35 86 71];
phys_y = [36 68 49 79 50 41 82 65];
math_x_cp = math_x;
phys_y_cp = phys_y;
n = length(math_x);

R_x = zeros(1, n);
R_y = zeros(1, n);

for i = 1:n
    [valx, idx] = max(math_x);
    math_x(idx) = -Inf;
    R_x(idx) = i;

    [valy, idx] = max(phys_y);
    phys_y(idx) = -Inf;
    R_y(idx) = i;
end

d_sq = (R_x - R_y) .^ 2;
d_sq_sum = sum(d_sq);

sp_num = 6 * d_sq_sum;
sp_denom = n * ((n ^ 2) - 1);

sp = 1 - (sp_num / sp_denom);
table_t = zeros(8,5);
table_t(1:8, 1) = math_x_cp;
table_t(1:8, 2) = phys_y_cp;
table_t(1:8, 3) = R_x;
table_t(1:8, 4) = R_y;
table_t(1:8, 5) = d_sq;

% Print the table headers
fprintf('%-10s %-10s %-10s %-10s %-10s\n', 'X', 'Y', 'R_x', 'R_y', 'd_sq');

% Print the table values
for i = 1:n
    fprintf('%-10d %-10d %-10d %-10d %-10d\n', table_t(i, 1), table_t(i, 2), ↵
table_t(i, 3), table_t(i, 4), table_t(i, 5));
```

```
47 end
48
49 fprintf('\nThe Spearman Rank Correlation is %.4f\n', sp);
50
51
52
53 % ====================== OUTPUT =========================
54
55
56 % X          Y          R_x        R_y        d_sq
57 % 43         36         7          8          1
58 % 77         68         3          3          0
59 % 64         49         5          6          1
60 % 96         79         1          2          1
61 % 48         50         6          5          1
62 % 35         41         8          7          1
63 % 86         82         2          1          1
64 % 71         65         4          4          0
65
66 % The Spearman Rank Correlation is 0.9286
67
68
69 % ========================================================
70
```

```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 12. Spearman's Rank Correlation with Perfect agreement


clc, clearvars, close all

math_x = [43 77 64 96 48 35 86 71];
stat_y = [41 68 50 82 49 36 79 65];
math_x_cp = math_x;
stat_y_cp = stat_y;
n = length(math_x);

R_x = zeros(1, n);
R_y = zeros(1, n);

for i = 1:n
    [valx, idx] = max(math_x);
    math_x(idx) = -Inf;
    R_x(idx) = i;

    [valy, idx] = max(stat_y);
    stat_y(idx) = -Inf;
    R_y(idx) = i;
end

d_sq = (R_x - R_y) .^ 2;
d_sq_sum = sum(d_sq);

sp_num = 6 * d_sq_sum;
sp_denom = n * ((n ^ 2) - 1);

sp = 1 - (sp_num / sp_denom);
table_t = zeros(8,5);
table_t(1:8, 1) = math_x_cp;
table_t(1:8, 2) = stat_y_cp;
table_t(1:8, 3) = R_x;
table_t(1:8, 4) = R_y;
table_t(1:8, 5) = d_sq;

% Print the table headers
fprintf('%-10s %-10s %-10s %-10s %-10s\n', 'X', 'Y', 'R_x', 'R_y', 'd_sq');

% Print the table values
for i = 1:n
    fprintf('%-10d %-10d %-10d %-10d %-10d\n', table_t(i, 1), table_t(i, 2), ↵
table_t(i, 3), table_t(i, 4), table_t(i, 5));
```

```
47 end
48
49 fprintf('\nThe Spearman Rank Correlation is %.4f\n', sp);
50
51
52
53 % ====================== OUTPUT ========================
54
55
56 % X          Y          R_x        R_y        d_sq
57 % 43         41         7          7          0
58 % 77         68         3          3          0
59 % 64         50         5          5          0
60 % 96         82         1          1          0
61 % 48         49         6          6          0
62 % 35         36         8          8          0
63 % 86         79         2          2          0
64 % 71         65         4          4          0
65
66 % The Spearman Rank Correlation is 1.0000
67
68
69 % ======================================================
70
```

```
% NAME: ADITYA BARMAN
% ROLL: 002320601024
% PROBLEM 13. Spearman's Rank Correlation with Perfect disagreement


clc, clearvars, close all

math_x = [43 77 64 96 48 35 86 71];
beng_y = [79 49 65 36 68 82 41 50];
math_x_cp = math_x;
beng_y_cp = beng_y;
n = length(math_x);

R_x = zeros(1, n);
R_y = zeros(1, n);

for i = 1:n
    [valx, idx] = max(math_x);
    math_x(idx) = -Inf;
    R_x(idx) = i;

    [valy, idx] = max(beng_y);
    beng_y(idx) = -Inf;
    R_y(idx) = i;
end

d_sq = (R_x - R_y) .^ 2;
d_sq_sum = sum(d_sq);

sp_num = 6 * d_sq_sum;
sp_denom = n * ((n ^ 2) - 1);

sp = 1 - (sp_num / sp_denom);
table_t = zeros(8,5);
table_t(1:8, 1) = math_x_cp;
table_t(1:8, 2) = beng_y_cp;
table_t(1:8, 3) = R_x;
table_t(1:8, 4) = R_y;
table_t(1:8, 5) = d_sq;

% Print the table headers
fprintf('%-10s %-10s %-10s %-10s %-10s\n', 'X', 'Y', 'R_x', 'R_y', 'd_sq');

% Print the table values
for i = 1:n
    fprintf('%-10d %-10d %-10d %-10d %-10d\n', table_t(i, 1), table_t(i, 2), ↵
table_t(i, 3), table_t(i, 4), table_t(i, 5));
```

```
47 end
48
49 fprintf('\nThe Spearman Rank Correlation is %.4f\n', sp);
50
51
52
53 % ====================== OUTPUT ========================
54
55
56 % X          Y          R_x        R_y        d_sq
57 % 43         79         7          2          25
58 % 77         49         3          6          9
59 % 64         65         5          4          1
60 % 96         36         1          8          49
61 % 48         68         6          3          9
62 % 35         82         8          1          49
63 % 86         41         2          7          25
64 % 71         50         4          5          1
65
66 % The Spearman Rank Correlation is -1.0000
67
68
69 % ======================================================
70
```