```
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% PROBLEM 6. Co-variance 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_xy = [99 89 79 69 59 49];
lw_bd_xy = [90 80 70 60 50 40];

% initialiazing midpts and assumed means (both same for x & y)
midpts_xy = (up_bd_xy + lw_bd_xy) / 2;
mean_asmd_xy = 74.5;
% obtaining factor from subtraction from assumed mean
diff_factor = 10;

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

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

v_vals = u_vals;

% 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);
```

```
41      end
42  end
43
44
45  % initializing required matrices
46  % for v
47  f_v = [10 16 24 21 17 12]; % given
48  fv = zeros(1, 6);
49  fv_sq = zeros(1, 6);
50  f_uv = 0;
51
52  %for u
53  f_u = [7 17 25 23 20 10]; % given
54  fu = zeros(1, 6);
55  fu_sq = zeros(1, 6);
56
57  % calculating fu, fv, fu^2, fv^2
58  for a = 1:6
59      fv(a) = f_v(a) .* v_vals(a);
60      fv_sq(a) = f_v(a) .* (v_vals(a)^2);
61      fu(a) = f_u(a) .* u_vals(a);
62      fu_sq(a) = f_u(a) .* (u_vals(a)^2);
63  end
64
65  % calculating f_uv
66  for m = 1:36
67      f_uv = f_uv + fuv(m);
68  end
69  % calculating respective sums
70  fv_sum = 0;
71  fv_sq_sum = 0;
72  fu_sum = 0;
73  fu_sq_sum = 0;
74
75  for d = 1:6
76      fv_sum =fv_sum + fv(d);
77      fv_sq_sum =fv_sq_sum + fv_sq(d);
78      fu_sum =fu_sum + fu(d);
79      fu_sq_sum =fu_sq_sum + fu_sq(d);
80  end
81
```

```
% calculating square of summation of fu & fv respectively
fu_sum_sq = fu_sum ^ 2;
fv_sum_sq = fv_sum ^ 2;

% calculating co-variance between x & y
covariance = (n*f_uv) - (fu_sum*fv_sum);
% corr_coeff_denom = (sqrt((n*fu_sq_sum)-fu_sum_sq))*(sqrt((n*fv_sq_sum)-fv_sum_sq));
% corr_coeff = corr_coeff_num / corr_coeff_denom;

fprintf('Co-variance between the marks in Mathematics and the marks in Physics is: %.f\n', covariance);

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

% Correlation coefficient between the marks in Mathematics and the marks in Physics is: -0.7546

% ==========================================================================
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