```
% Name: Saleh Al Alsheikh
% KSU ID: 445102564
% Date: 17/2/2026
% clear;
% clc;
format short g
```

```
% Question 1
```

```
% a)
production = [245 258 240 252 248;
              230 235 245 238 242;
              260 255 250 258 262;
              220 225 228 223 230;
              248 252 255 250 246]
```

```
production = 5×5
   245   258   240   252   248
   230   235   245   238   242
   260   255   250   258   262
   220   225   228   223   230
   248   252   255   250   246
```

```
MachineID = ["M01";"M02";"M03";"M04";"M05"]
```

```
MachineID = 5×1 string
"M01"
"M02"
"M03"
"M04"
"M05"
```

```
% b)
avg_values = mean(production,2)
```

```
avg_values = 5×1
       248.6
         238
         257
       225.2
       250.2
```

```
AVG = [MachineID num2cell(avg_values)]
```

```
AVG = 5×2 string
"M01"        "248.6"
"M02"        "238"
"M03"        "257"
"M04"        "225.2"
"M05"        "250.2"
```

```
% c)
[max_avg, idx_max] = max(avg_values)
```

```
max_avg =
   257
idx_max =
     3
```

```
max_machine = MachineID(idx_max)
```

```
max_machine =
"M03"
```

```
% d)
[min_avg, idx_min] = min(avg_values)
```

```
min_avg =
        225.2
idx_min =
     4
```

```
min_machine = MachineID(idx_min)
```

```
min_machine =
"M04"
```

```
% Question 2
```

```
P = [2 5 3 4 6;
     1 8 7 9 2;
     4 1 5 2 3;
     3 6 8 4 5;
     7 9 2 1 6]
```

```
P = 5×5
     2     5     3     4     6
     1     8     7     9     2
     4     1     5     2     3
     3     6     8     4     5
     7     9     2     1     6
```

```
% a)
Q = P([1 3 4],[2 3 4])
```

```
Q = 3×3
     5     3     4
     1     5     2
     6     8     4
```

```
R = P([1 4],[3 2])
```

```
R = 2×2
     3     5
     8     6
```

```
S = P([1 4],[1 5 4 3 1])
```

```
S = 2×5
     2     6     4     3     2
     3     5     4     8     3
```

```
% b)
T = P([3 2 1 4 5],[1 4 3 2 5])
```

```
T = 5×5
     4     2     5     1     3
     1     9     7     8     2
     2     4     3     5     6
     3     4     8     6     5
     7     1     2     9     6
```

```
% c)
U = eye(4); U(3,3)=8
```

```
U = 4×4
     1     0     0     0
     0     1     0     0
     0     0     8     0
     0     0     0     1
```

```
M = [6*eye(3) 2*ones(3,2); P(4:5,:)]
```

```
M = 5×5
     6     0     0     2     2
     0     6     0     2     2
     0     0     6     2     2
     3     6     8     4     5
     7     9     2     1     6
```

```
N = [5*ones(5,1) P(:,2:5)]
```

```
N = 5×5
     5     5     3     4     6
     5     8     7     9     2
     5     1     5     2     3
     5     6     8     4     5
     5     9     2     1     6
```

```
% Question 3
X = [5 2 9;
     6 1 4;
     7 8 3]
```

```
X = 3×3
     5     2     9
```

```
     6     1     4
     7     8     3
```

```
% a)
Y = [2 9 9 0 0 5;
     1 4 0 9 0 6;
     8 3 0 0 9 7;
     5 0 0 3 3 3;
     0 1 0 3 3 3;
     0 0 3 3 3 3]
```

```
Y = 6×6
     2     9     9     0     0     5
     1     4     0     9     0     6
     8     3     0     0     9     7
     5     0     0     3     3     3
     0     1     0     3     3     3
     0     0     3     3     3     3
```

```
% b)
Z = [3 0 1;
     3 0 0;
     0 0 3]
```

```
Z = 3×3
     3     0     1
     3     0     0
     0     0     3
```

```
% c)
W = [4 0 9 0;
     3 0 0 9;
     0 0 3 3;
     1 0 3 3]
```

```
W = 4×4
     4     0     9     0
     3     0     0     9
     0     0     3     3
     1     0     3     3
```

```
% d)
V = X([2 1 3],[1 3 2])
```

```
V = 3×3
     6     4     1
     5     9     2
     7     3     8
```

```
% Question 4
Y = [1 68.5 82.3 55.8 85.4;
     2 72.8 78.6 64.2 75.8;
     3 78.4 85.2 80.5 88.6;
     4 82.6 87.4 58.3 78.2;
     5 75.9 90.3 68.7 90.8]
```

```
Y = 5×5
     1     68.5     82.3     55.8     85.4
     2     72.8     78.6     64.2     75.8
     3     78.4     85.2     80.5     88.6
     4     82.6     87.4     58.3     78.2
     5     75.9     90.3     68.7     90.8
```

```
% b)
avg_perf_R1_t3 = (Y(3,2) + Y(3,3))/2
```

```
avg_perf_R1_t3 =
    81.8
```

```
% c)
second_time_measurements = Y(2,2:5)
```

```
second_time_measurements = 1×4
    72.8    78.6    64.2    75.8
```

```
% d)
[max_R1_conv, idx1] = max(Y(:,2))
```

```
max_R1_conv =
    82.6
idx1 =
     4
```

```
time_R1 = Y(idx1,1)
```

```
time_R1 =
     4
```

```
[max_R2_conv, idx2] = max(Y(:,4))
```

```
max_R2_conv =
    80.5
idx2 =
     3
```

```
time_R2 = Y(idx2,1)
```

```
time_R2 =
     3
```

```
% e)
perf_R1 = (Y(:,2).*Y(:,3))/100
```

```
perf_R1 = 5×1
       56.376
       57.221
       66.797
       72.192
       68.538
```

```
perf_R2 = (Y(:,4).*Y(:,5))/100
```

```
perf_R2 = 5×1
       47.653
       48.664
       71.323
       45.591
        62.38
```

```
Y_new = [Y perf_R1 perf_R2]
```

```
Y_new = 5×7
           1        68.5        82.3        55.8        85.4      56.376 ···
           2        72.8        78.6        64.2        75.8      57.221
           3        78.4        85.2        80.5        88.6      66.797
           4        82.6        87.4        58.3        78.2      72.192
           5        75.9        90.3        68.7        90.8      68.538
```

```
% Question 5
```

```
time = [5 10 15 20 25 30]'
```

```
time = 6×1
     5
    10
    15
    20
    25
    30
```

```
flow = [42.3 45.8 44.2;
        43.7 44.9 45.6;
        44.5 43.8 43.1;
        42.8 46.2 44.7;
        45.9 44.6 42.5;
        43.4 46.5 43.9]
```

```
flow = 6×3
        42.3        45.8        44.2
```

```
        43.7        44.9        45.6
        44.5        43.8        43.1
        42.8        46.2        44.7
        45.9        44.6        42.5
        43.4        46.5        43.9
```

```
% a)
[max_flow, idx_max] = max(flow)
```

```
max_flow = 1×3
        45.9        46.5        45.6
idx_max = 1×3
     5     6     2
```

```
time_max = time(idx_max)
```

```
time_max = 3×1
    25
    30
    10
```

```
% b)
[min_flow, idx_min] = min(flow)
```

```
min_flow = 1×3
        42.3        43.8        42.5
idx_min = 1×3
     1     3     5
```

```
time_min = time(idx_min)
```

```
time_min = 3×1
     5
    15
    25
```

```
% c)
avg_flow = mean(flow)
```

```
avg_flow = 1×3
       43.767        45.3          44
```

```
% d)
time_avg_flow = mean(flow(:))
```

```
time_avg_flow =
       44.356
```

```
% e)
std_flow = std(flow)
```

```
std_flow = 1×3
       1.2894       1.0392         1.11
```

```
% f)
[best_std, best_meter] = min(std_flow)
```

```
best_std =
       1.0392
best_meter =
     2
```