```
% Matlab Assignment #2
% MCET-220: Principle of Statics
% Matheus Laurentys
clc;clear all;close all;
```

Problem 1

```
disp("Problem #1");
```

```
Problem #1
```

```
% Position values from sketch (m)
rA = [0,0.25,0.18];
rB = [0.16,0.25,0];
rC = [0.18,0,0.8];
% Unit vectors vec/|vec|
eAB = (rB - rA)/norm(rB - rA);
eOC = rC/norm(rC);
% Computations from assignment sheet (N)
FAB = 750*eAB;
Mo = cross(rA, FAB);
Moc_mag = dot(Mo, eOC);
Moc = Moc_mag * eOC;
% Display results
fprintf('FAB = [%f, %f, %f]', FAB);
```

```
FAB = [498.272879, 0.000000, -560.556989]
```

```
fprintf('Mo = [%f, %f, %f]', Mo);
```

```
Mo = [-140.139247, 89.689118, -124.568220]
```

```
fprintf('|Moc| = %f', Moc_mag);
```

```
|Moc| = -152.292244
```

```
fprintf('Moc = [%f, %f, %f]', Moc);
```

```
Moc = [-33.430005, -0.000000, -148.577799]
```

Problem 2

```
disp("Problem #2");
```

```
Problem #2
```

```
% Creates variables used for tests
u1 = [2,3,0];
v1 = [1,-2,0];
[w1,w2] = proj(u1,v1);
fprintf("Projection: [%f, %f, %f]", w1)
```

```
Projection: [-0.615385, -0.923077, -0.000000]
```

```
fprintf("Perpendicular: [%f, %f, %f]", w2)
```

```
Perpendicular: [1.615385, -1.076923, 0.000000]
```

```
% Constant needed for part 2
euler = 2.71828;
% Variables for second set of tests
t = transpose(0:0.1:2);
x = 10*sin(4*t);
y = t-t.^2;
z = (euler.^t)./(t.^2-2);
u = [x y z];
v = [2 -1 3];
% Variables to store results of tests
res1 = zeros(20,3);
res2 = zeros(20,3);
% Run sencond set of tests
for n = 1:length(u)
    [w1, w2] = proj(u(n,:),v);
    res1(n,:) = w1;
    res2(n,:) = w2;
end
fprintf("w1 = ");
```

```
w1 =
```

```
disp(res1);
```

```
         0         0    3.0000
    1.5174    0.0351   -0.2164
    1.7034    0.0380   -0.1480
    1.7391    0.0392   -0.1319
    1.7203    0.0413   -0.1395
    1.6428    0.0452   -0.1702
    1.4305    0.0508   -0.2353
    0.6392    0.0401   -0.2545
    1.1959   -0.3278    3.3526
    2.8078   -0.0571    1.3115
    2.7259         0    0.9791
    2.7481    0.0318    1.0982
    2.7764    0.0669    1.6524
    2.1363    0.0943    2.8622
    0.1935    0.0172    3.1069
   -0.4147   -0.1113    2.6608
    0.4318   -0.3556    3.2766
    2.2916   -0.5519    2.8525
    2.8534   -0.5177    1.7540
    2.8502   -0.5035    1.2228
    2.8149   -0.5690    1.0511
```

```
fprintf("w2 = ");
```

```
w2 =
```

```
disp(res2);
```

```
    2.0000   -1.0000         0
    0.4826   -1.0351    3.2164
    0.2966   -1.0380    3.1480
    0.2609   -1.0392    3.1319
    0.2797   -1.0413    3.1395
```

```
    0.3572   -1.0452    3.1702
    0.5695   -1.0508    3.2353
    1.3608   -1.0401    3.2545
    0.8041   -0.6722   -0.3526
   -0.8078   -0.9429    1.6885
   -0.7259   -1.0000    2.0209
   -0.7481   -1.0318    1.9018
   -0.7764   -1.0669    1.3476
   -0.1363   -1.0943    0.1378
    1.8065   -1.0172   -0.1069
    2.4147   -0.8887    0.3392
    1.5682   -0.6444   -0.2766
   -0.2916   -0.4481    0.1475
   -0.8534   -0.4823    1.2460
   -0.8502   -0.4965    1.7772
   -0.8149   -0.4310    1.9489
```

Problem 3

```
disp("Problem 3");
```

```
Problem 3
```

```
% Variables for the problem 3.1
forces1 = [[82.085,-225.526,0];[0,-180,0];[0,-160,0];[-229.813,192.836,0]];
pos1 = [[4,6,0];[8,0,0];[12,6,0];[20,6,0]];
[f1,m1,af1,am1,fm1,d] = ForceCoupleRes(forces1, pos1);
% Display results for problem 3.1
disp("3.1");
```

```
3.1
```

```
fprintf("Fr = [%f %f %f]", f1)
```

```
Fr = [-147.728000 -372.690000 0.000000]
```

```
fprintf("Mr = [%f %f %f]", m1)
```

```
Mr = [0.000000 0.000000 -480.984000]
```

```
fprintf("Angle F = [%f %f %f]", af1)
```

```
Angle F = [1.193412 0.377384 1.570796]
```

```
fprintf("Angle M = [%f %f %f]", am1)
```

```
Angle M = [1.570796 1.570796 0.000000]
```

```
fprintf("Angle between M and F = %f", fm1)
```

```
Angle between M and F = 1.570796
```

```
fprintf("d = %f", d)
```

```
d = 1.199758
```

```

% Variables for the problem 3.2
forces2 = [[0,-136.255,49.593];[0,-215,0];[0,-26.916,-152.645];[0,-41.675,236.354]];
```

```
pos2 =  [[0.225,0.075,0];[0.225,-0.075,0];[0.45,0.075,0];[0.45,-0.075,0]];
[f2,m2,af2,am2,fm2,d] = ForceCoupleRes(forces2, pos2);
% Display results for problem 3.2
disp("3.2");
```

```
3.2
```

```
fprintf("Fr = [%f %f %f]", f2)
```

```
Fr = [0.000000 -419.846000 133.302000]
```

```
fprintf("Mr = [%f %f %f]", m2)
```

```
Mr = [25.455450 48.827475 109.898325]
```

```
fprintf("Angle F = [%f %f %f]", af2)
```

```
Angle F = [1.570796 0.307435 1.263361]
```

```
fprintf("Angle M = [%f %f %f]", am2)
```

```
Angle M = [1.362200 1.162306 0.464487]
```

```
fprintf("Angle between M and F = %f", fm2)
```

```
Angle between M and F = 1.679053
```

```
fprintf("d = %f", d)
```

```
d = 0.279051
```