ENCP 100 WS2020

Assignment 02

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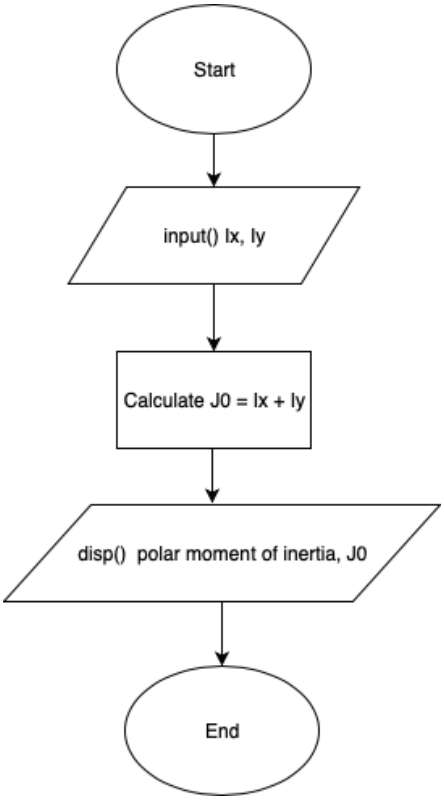
X61L — 01/23/20 at 2:00 P.M.

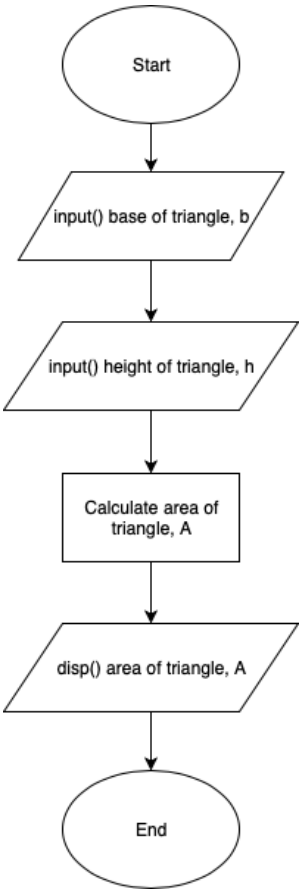
ANSWERS FOR QUESTION 1:

FLOW CHARTS

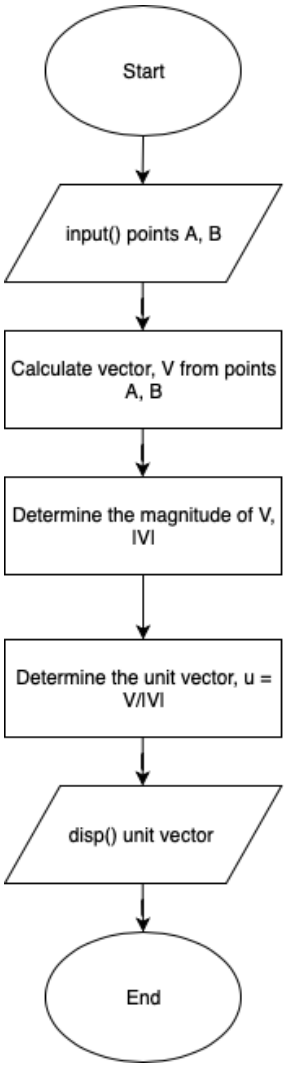
Problem 1 A:



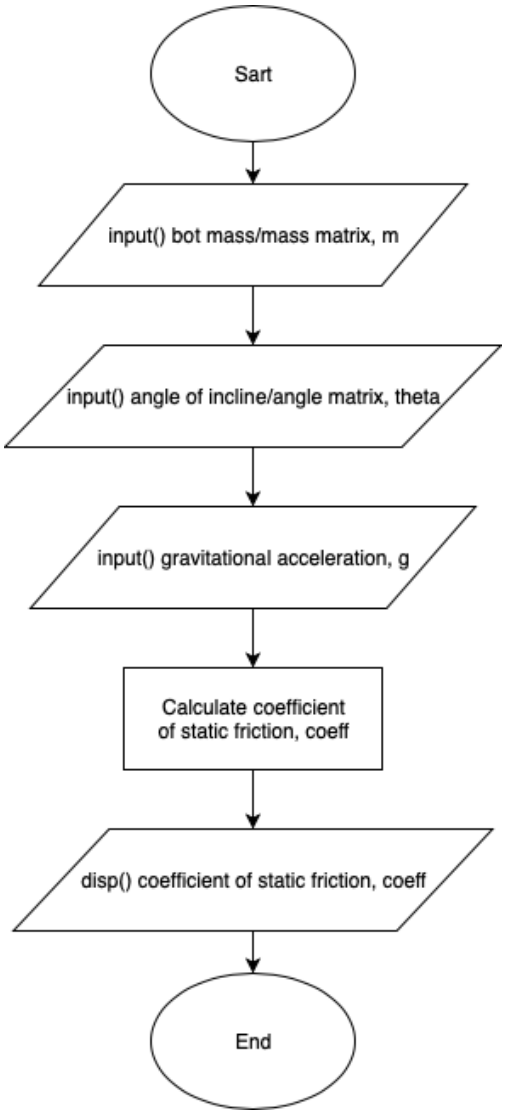
Problem 1 B:



Problem 1 C:



ANSWERS FOR QUESTION 2:



EXPRESSION FOR μ:

$$\mu_s = \frac{mg \sin\theta}{mg \cos\theta} = \tan\theta$$

m [kg]	Theta [°]	μ []
5	15	0.2679
10	20	0.3640
15	25	0.4663

MATLAB CODE FOR QUESTION 2:

```
clear all; clc; close all;

m = input('Input bot mass or mass matrix [kg]: ');
theta = input('Input angle of incline or angle matrix [deg]: ');

coeff = sind(theta)./cosd(theta);

disp(coeff);
```

ANSWERS FOR QUESTION 3:

EXPRESSION FOR CENTER OF MASS:

$$C_x = \frac{(\frac{L_1}{2} * m_1 + \frac{L_2}{2} * m_2)}{(m_1 + m_2)}$$

$$C_y = \frac{(\frac{H_1}{2} * m_1 + \frac{H_2}{2} * m_2)}{(m_1 + m_2)}$$

PSEUDOCODE:

→ Start program
→ Get m1, L1, H1, m2, L2, H2, dx, and dy from user
    → Calculate Cx and Cy
→ Display Cx and Cy on screen
→ End program

m1 [g]	L1 [cm]	H1 [cm]	dy [cm]	dx [cm]	m2 [g]	L2 [cm]	H2 [cm]	Cx [cm]	Cy [cm]
5	15	5	5	5	10	10	15	9.1667	9.1667
10	15	15	10	15	10	5	2	12.5000	9.2500
15	25	10	15	15	20	10	10	16.7857	13.5714

MATLAB CODE FOR QUESTION 3:

```
clear all; clc; close all;

m1 = input('Input m1: ');
L1 = input('Input L1: ');
H1 = input('Input H1: ');
dx = input('Input dx: ');
dy = input('Input dy: ');
m2 = input('Input m2: ');
L2 = input('Input L2: ');
H2 = input('Input H2: ');

x1 = L1./2;
y1 = H1./2;

x2 = dx + L2./2;
y2 = dy + H2./2;

Cx = (x1.*m1 + x2.*m2)./(m1+m2);
Cy = (y1.*m1 + y2.*m2)./(m1+m2);

disp(Cx);
disp(Cy);
```

ANSWERS FOR QUESTION 4:

EXPRESSION FOR RATIO, r:

$$\boldsymbol{r} = \frac{[(W * H) - \left((\pi * {r_1}^2) * n_1 + (\pi * {r_2}^2) * n_2\right)]}{(W * H)}$$

H [m]	W [m]	n1 []	n2 []	d1 [mm]	d2 [mm]	r []
0.5	0.5	23	30	10	30	0.9080
1	2.0	75	25	75	100	0.7362
0.75	1.0	120	76	30	50	0.6879

MATLAB CODE FOR QUESTION 4:

```
clear all; clc; close all;

H = input("Input H [m]: ");
W = input("Input W [m]: ");
n1 = input("Input n1 []: ");
n2 = input("Input n2 []: ");
d1 = input("Input d1 [mm]: ");
d2 = input("Input d2 [mm]: ");

circleArea = (pi.*r1.^2).*n1 + (pi.*r2.^2).*n2;
totalArea = H.*W;
freeArea = totalArea - circleArea;

ratio = freeArea./totalArea;
disp("r = ");
disp(ratio);
```