

Name: _____ section: _____

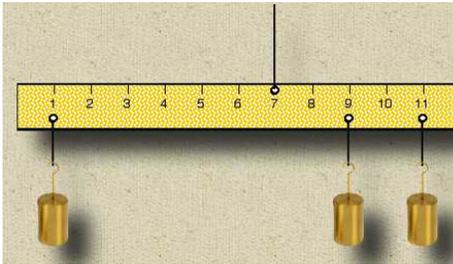
Submit script. Turn in cover sheet.

Practice for Exam2 – Extra Credit Assignment

_____/20pts Under the class' link 3. Exam, complete the link with the Practice Questions. DO NOT USE MATLAB FOR ANSWERING THE QUESTIONS. DO NOT LOOK AT OLD SOLUTIONS. YOU MAY USE YOUR NOTES ONLY.

_____/80pts Complete steps 7a,b, and c as done in class for the following problem:

Weights are attached to a ruler that is 1 meter long, as show in the picture. Develop a program that calculates the location, in centimeter, of the center of mass (in other word, the center of gravity) regardless of how many weights attached. At this location, a string can be attached to hold the ruler so that the ruler remains horizontal.



Neglecting the weight of the ruler itself, the equation to determine the location of the center of mass, for n weights, is simple:

$$x_{cg} = \frac{m_1 * d_1 + m_2 * d_2 + \dots + m_n * d_n}{m_1 + m_2 + \dots + m_n}$$

Where m_k are the mass in kilograms of each weight, and d_k is the distance at which each weight is attached, as indicated on the ruler. (For example, on the

picture, $d_1=1\text{cm}$, $d_2=9\text{cm}$... etc.

Requirements for the program (name the file: centerGravity.m)

Prompt the user for the number of weights. The program should trap the user when an invalid entry is entered.

Using a loop, populate two vectors:

- The first vector will contain the mass (kg) of each weight. Each mass should be generated randomly by MATLAB. The value should be a float from 0 to 25 kg (both excluded). This mass (2 decimals) should be displayed each time, with the weight's number. For example:
Mass #1: 20.47 kg.
- The second vector is the position of each weight (cm). This value should be entered by the user. Do not code an error check for this part.

The same loop should calculate the sum at the numerator, and the sum at the denominator as each value is entered.

Calculate the x-location for the center of mass (x_{cg}). Display it in a formatted sentence using 3 decimal places.

Plot the graph of the mass vs. the position of each weight. There should be no line connecting the weights, just a marker of your choice for each data point. Label properly the figure.

Note: The plot should visually help determine whether your x_{cg} is correct. Remember that if you hold the ruler at this location, the ruler should remain horizontal. This is the same process used to calculate the CG of airplanes and rockets!

Rubric:

clean up commands (5%)

comments (7a) (5%)

indent (5%)

gather input (5%)

validity loop (10%)

loop to populate vectors (10%)

vector of masses (5%)

display masses (5%)

random number (5%)

vector of locations (5%)

numerator (5%)

denominator (5%)

center of mass (5%)

formatted sentence (5%)

plot (5%)

labels (5%)

other (10%)