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%{  
name: Nicholas McGuire  
*minor changes by Caroline Liron  
section: 04  
description: Test 2 - Pulley Acceleration  
%}
```

%1) Given/Need/Find

```
%{  
Given/need:  
    user input number of weights  
    random mass of weights  
    random side of weights (0=L or 1=R)  
Find:  
    total mass of weights on both sides  
    which direction the pulley is accelerating  
    how fast the puuley is accelerating  
%}
```

This is not required. But given you have 2hrs, you have time to do it. Nicholas did it on every lab, assignments, so it makes sense he was consistent and did it on exams!

%2) Diagram - See top right of cover sheet (little black picture)

%3) Equations/Background info

```
%{  
Acceleration Equation:  
     $a = (\text{sum of masses on right} - \text{sum of masses on left}) / \text{sum of all masses}$  ✓  
*  
    9.81  
Acceleration Direction:  
    Positive Acceleration = clockwise rotation  
    Negative Acceleration = counter-clockwise rotation  
    Zero Acceleration = no rotation (equilibrium)  
%}
```

%4) Assumptions - Assume user only enters numbers (or nothing at all), ✓
but
% no letters

%5) Solve -

%6) Check -

%7a/b) Algorithm/Code

%Clean up commands

```
clc;
clear;
rng('shuffle');
close all;
```

%Welcome message

```
fprintf('    Welcome to the Random Pulley Accelerator!\n');
fprintf('(You decide the number of weights in the system,\n
the system does the rest!)\n');
fprintf('-----\n\n');
```

%define how many weights in the system

```
numWeights=input('Please enter the total number of weights in the system
(whole number >3): '); %if more than 99, will still work, but the
fprintf later on won't be as pretty. (after 99 the table will shift
right 1 place
```

%check for decimal inputs

```
numWeightsRound=floor(numWeights);
decimalTest=numWeights-numWeightsRound; %can be simplified a lot. see
lab9 solution
```

%trap number of weights errors

```
while isempty(numWeights) || ~(numWeights>3) || ~(decimalTest==0)
    numWeights=input('ERROR: Please enter the total number of weights in
the system (>3): ');
    %Recheck for decimals with new values
    numWeightsRound=floor(numWeights);
    decimalTest=numWeights-numWeightsRound;
end
```

```

%*set up sums to zero to start
sumTotalLeft=0;
sumTotalRight=0;

%*Loops to generate weight masses and side of pulley
for k=1:numWeights
    mass=190*rand+10; %*float. can't possible include borders.
    leftorright=randi([0 1]); %weight side
    if leftorright==0 %left
        sumTotalLeft=sumTotalLeft+mass; %adds total of left side
        fprintf('\nMass #%2d: (Left side) %6.2f kg',k,mass);
    else %right
        sumTotalRight=sumTotalRight+mass; %adds total of right side
        fprintf('\nMass #%2d: %6.2f kg (Right side)',k,
mass);
    end
end

%display totals
fprintf('\n\n          TOTAL\n');
fprintf('\n          (%6.2fkg)          (%6.2fkg) ',
sumTotalLeft,sumTotalRight);

%determine acceleration and direction of rotation
accel=(sumTotalRight-sumTotalLeft)/(sumTotalRight+sumTotalLeft)*9.81; %
if negative, left. if positive, right.

%display acceleration and direction of rotation
superscript=178; %will need later for m/s^2
if accel>0 %positive, so right (clockwise)
    fprintf('\n\nThe system is rotating clockwise with an acceleration
of %.2fm/s%s.\n',accel,superscript);
elseif accel<0 %negative, so left (counterclockwise)
    negAccel=abs(accel);
    fprintf('\n\nThe system is rotating counter-clockwise with an
acceleration of %.2fm/s%s.\n',negAccel,superscript);
else %zero, so equilibrium
    fprintf('\n\nThe system is in equilibrium with an acceleration of %.
2fm/s%s, and is not rotating at all.\n',accel,superscript);
end

```

```

%Create bar graph
y_bar=[sumTotalLeft sumTotalRight]; %different heights
bar(y_bar);%*

%Make pretty
axis on;
axis off;
title(sprintf('Your system has %.2fkg on the left side, and %.2fkg on
the right side. '),sumTotalLeft,sumTotalRight)); %*

%7c) Testing
%{
    Welcome to the Random Pulley Accelerator!
    (You decide the number of weights in the system,
        the system does the rest!)
    -----

Please enter the total number of weights in the system (whole number
>3):
ERROR: Please enter the total number of weights in the system (>3): 0
ERROR: Please enter the total number of weights in the system (>3): -4
ERROR: Please enter the total number of weights in the system (>3): 6.8
ERROR: Please enter the total number of weights in the system (>3): 5

Mass # 1:    (Left side)  152.38 kg
Mass # 2:           148.80 kg (Right side)
Mass # 3:    (Left side)   88.62 kg
Mass # 4:           36.94 kg (Right side)
Mass # 5:    (Left side)   44.56 kg

                TOTAL
    _____
(285.56kg)      (185.74kg)

The system is rotating counter-clockwise with an acceleration of 2.08
m/s2.
%}

%{
    Welcome to the Random Pulley Accelerator!
    (You decide the number of weights in the system,

```

the system does the rest!)

Please enter the total number of weights in the system (whole number ✓
>3): 3

ERROR: Please enter the total number of weights in the system (>3): 2.9

ERROR: Please enter the total number of weights in the system (>3): -4

ERROR: Please enter the total number of weights in the system (>3):

ERROR: Please enter the total number of weights in the system (>3): 0

ERROR: Please enter the total number of weights in the system (>3): 10

Mass # 1:		138.96 kg	(Right side)
Mass # 2:		162.03 kg	(Right side)
Mass # 3:	(Left side)	199.34 kg	
Mass # 4:		39.01 kg	(Right side)
Mass # 5:	(Left side)	55.03 kg	
Mass # 6:		72.50 kg	(Right side)
Mass # 7:	(Left side)	173.02 kg	
Mass # 8:	(Left side)	87.64 kg	
Mass # 9:		140.28 kg	(Right side)
Mass #10:		77.92 kg	(Right side)

	TOTAL	
(515.04kg)		(630.70kg)

The system is rotating clockwise with an acceleration of 0.99m/s^2 .
%}