Name (PRINT neatly): _____

Seat Assignment: _____

Specify your **EXAM ID** on the right. Use 000 if you do not know your exam ID.

Circle your LAB SECTION

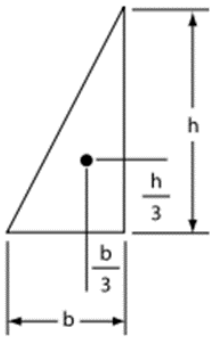
	ZEC 377 (Tickle Side)	ZEC 371 (Stadium Side)
9:50 am	**B377 McKensie**	**B371 Graham**
11:30 am	**C377 McKensie**	**C371 Tyler**
1:10 pm	**D377 Tyler**	**D371 Graham**

Instructions

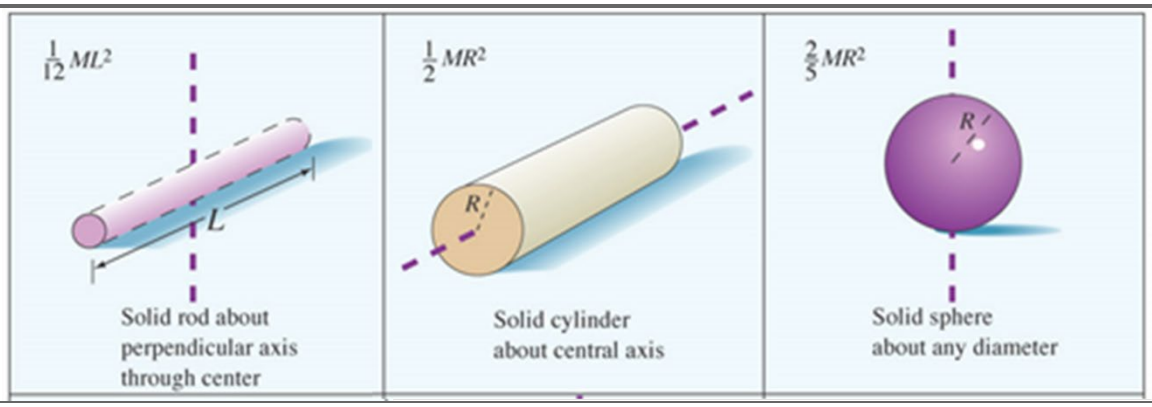
- **Completely color in the dot for your chosen answers on multiple choice.**
- **Assume 3 significant figures** for all given numbers unless otherwise stated
- **Show all of your work – no work, no credit**

0 ○	0 ○	0 ○
1 ○	1 ○	1 ○
2 ○	2 ○	2 ○
3 ○	3 ○	3 ○
4 ○	4 ○	4 ○
5 ○	5 ○	5 ○
6 ○	6 ○	6 ○
7 ○	7 ○	7 ○
8 ○	8 ○	8 ○
9 ○	9 ○	9 ○

Center of Mass:

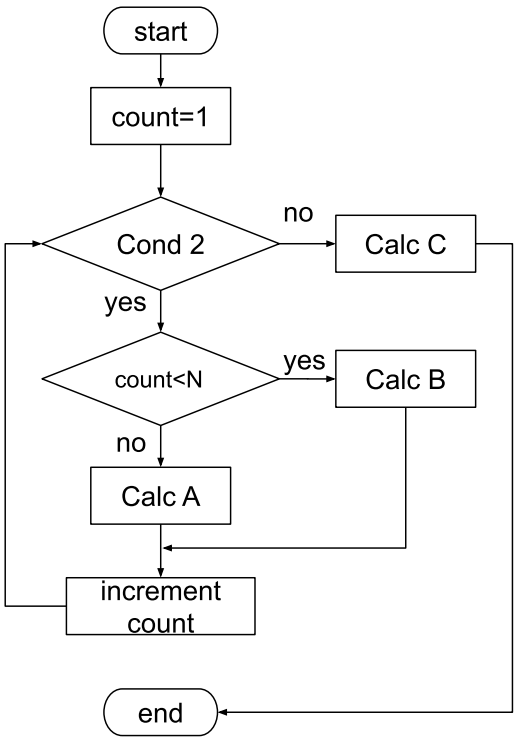


Mass Moment of Inertia:

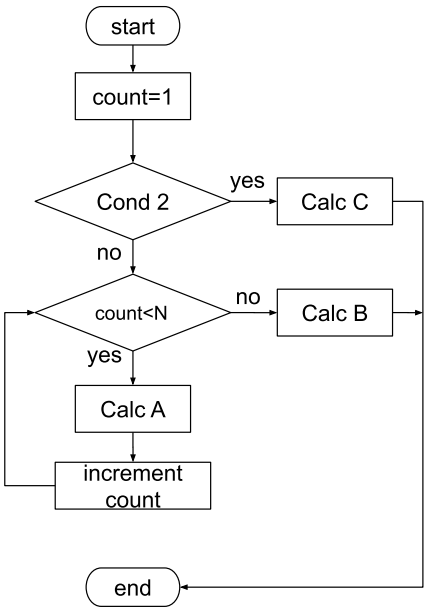


MATLAB: For each code block (on next page), indicate which of the flowcharts below is implemented.

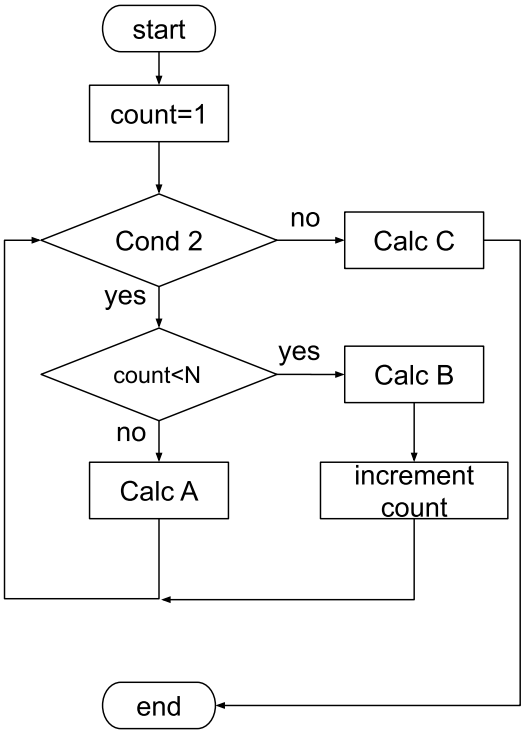
1



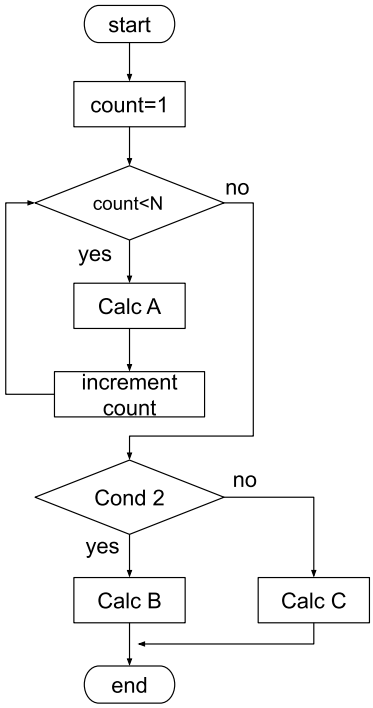
3



2



4



Match the following code to the algorithms provided on the previous page. If a code block implements none of the provided flowcharts, select "None". (2 points for each)

1.

```
for count = 1:N
    {Calc A}
end

if {Cond 2}
    {Calc B}
else
    {Calc C}
end
```

Flow Chart 1	Flow Chart 2	Flow Chart 3	Flow Chart 4	None
○	○	○	○	○

2.

```
count=1
if {Cond 2}
    {Calc C}
else
    while count<N
        {Calc A}
        count=count+1
    end
    {Calc B}
end
```

Flow Chart 1	Flow Chart 2	Flow Chart 3	Flow Chart 4	None
○	○	○	○	○

3.

```
count=1
while {Cond 2}
    if count<N
        {Calc B}
    else
        {Calc A}
    end
    count=count+1
end

{Calc C}
```

Flow Chart 1	Flow Chart 2	Flow Chart 3	Flow Chart 4	None
○	○	○	○	○

4.

```
for count = 1:N
    {Calc A}
    if {Cond 2}
        {Calc B}
    else
        {Calc C}
    end
end
```

Flow Chart 1	Flow Chart 2	Flow Chart 3	Flow Chart 4	None
○	○	○	○	○

5.

```
count=1
while (count<N)
    {Calc A}
    count=count+1
end

if {Cond 2}
    {Calc B}
else
    {Calc C}
end
```

Flow Chart 1	Flow Chart 2	Flow Chart 3	Flow Chart 4	None
○	○	○	○	○

6.

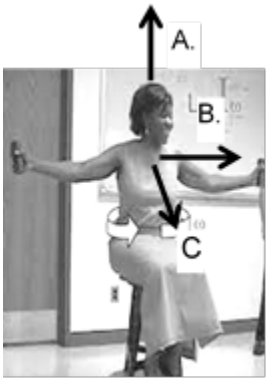
```
count=1
while {Cond 2}
    if count<N
        {Calc B}
        count=count+1
    else
        {Calc A}
    end
end

{Calc C}
```

Flow Chart 1	Flow Chart 2	Flow Chart 3	Flow Chart 4	None
○	○	○	○	○

7. (2 pts) A 12 lb bowling ball (solid) and a 0.2 lb billiard ball (solid) start from rest and roll down an incline. Which one reaches the bottom first?

Bowling Ball	Billiard Ball	Both reach the bottom at the same time	Not enough information
○	○	○	○

8. (2 pts) A student rotates on a spinning stool with her arms extended horizontally. What is the direction of the angular momentum vector? (Picture to the right includes arrows A, B, and C to help visualize the different directions.)

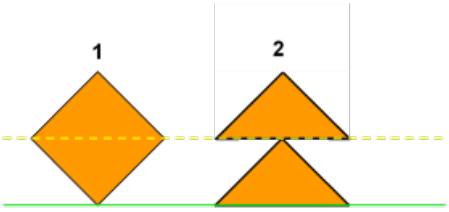


A. Vertical	B. Horizontal, parallel to arms	C. Horizontal, out of the paper
○	○	○

9. (2 pts) The value of $(\hat{\imath} \times \hat{\jmath}) \cdot \hat{k}$ is:

$\hat{\imath}$	$\hat{\jmath}$	$\hat{k}$	$\hat{\imath}\hat{\jmath}\hat{k}$	1	0
○	○	○	○	○	○

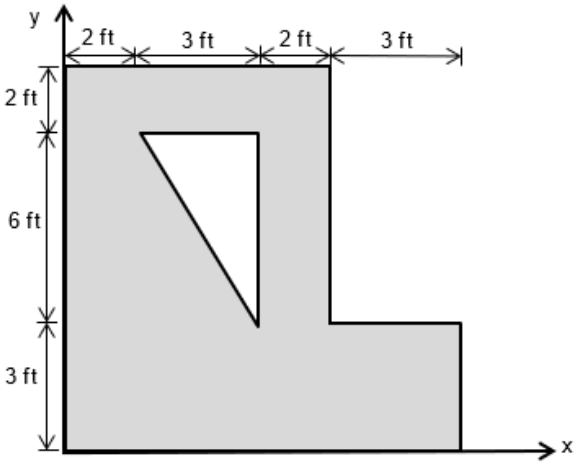
10. (2 pts) The square plate shown in (1) clearly has its center of mass at the center. Suppose the plate is cut in half and the pieces arranged as shown in (2). Where is the center of mass of (2) as compared to (1)?



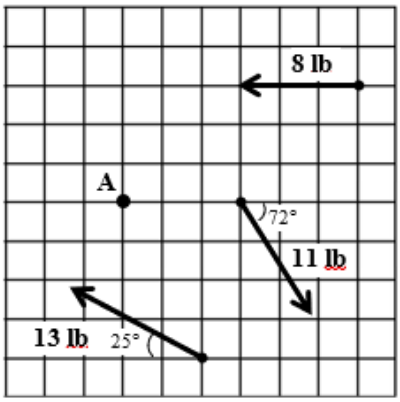
Higher	Lower	At the same place	There is no definable CM in this case
○	○	○	○

11. (6 pts) A figure skater with a mass moment of inertia of 1.3 kg-m^2 is spinning at 2.6 rad/sec. The figure skater lowers her arms, so her mass moment of inertia is 0.7 kg-m^2. What is her rotational kinetic energy after she lowers her arms?

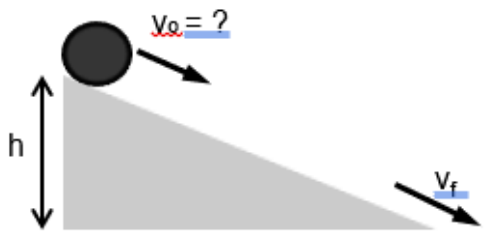
12. (10 pts) The object shown has uniform density and thickness. Determine the x-coordinate of the center of mass.



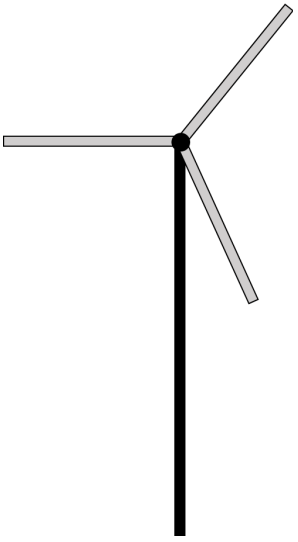
13. (12 pts) Determine the net torque about point **A**.
Assume each block = 1 ft. Use CCW as positive.



14. (12 pts) A TA rolls a 0.3 kg solid cylinder, diameter = 9.4 cm, down an incline (height = 1.4 m). Determine the initial velocity if its velocity at the bottom of the hill is 6.0 m/s.



15. (12 pts) The three rotor blades of a wind turbine can be considered to be long thin rods. Each of the rotor blades is 50 m long. Determine the mass of a single blade if a torque of 3.18 MN-m is required to ensure the blades spin with an acceleration of 0.027 rad/s^2.



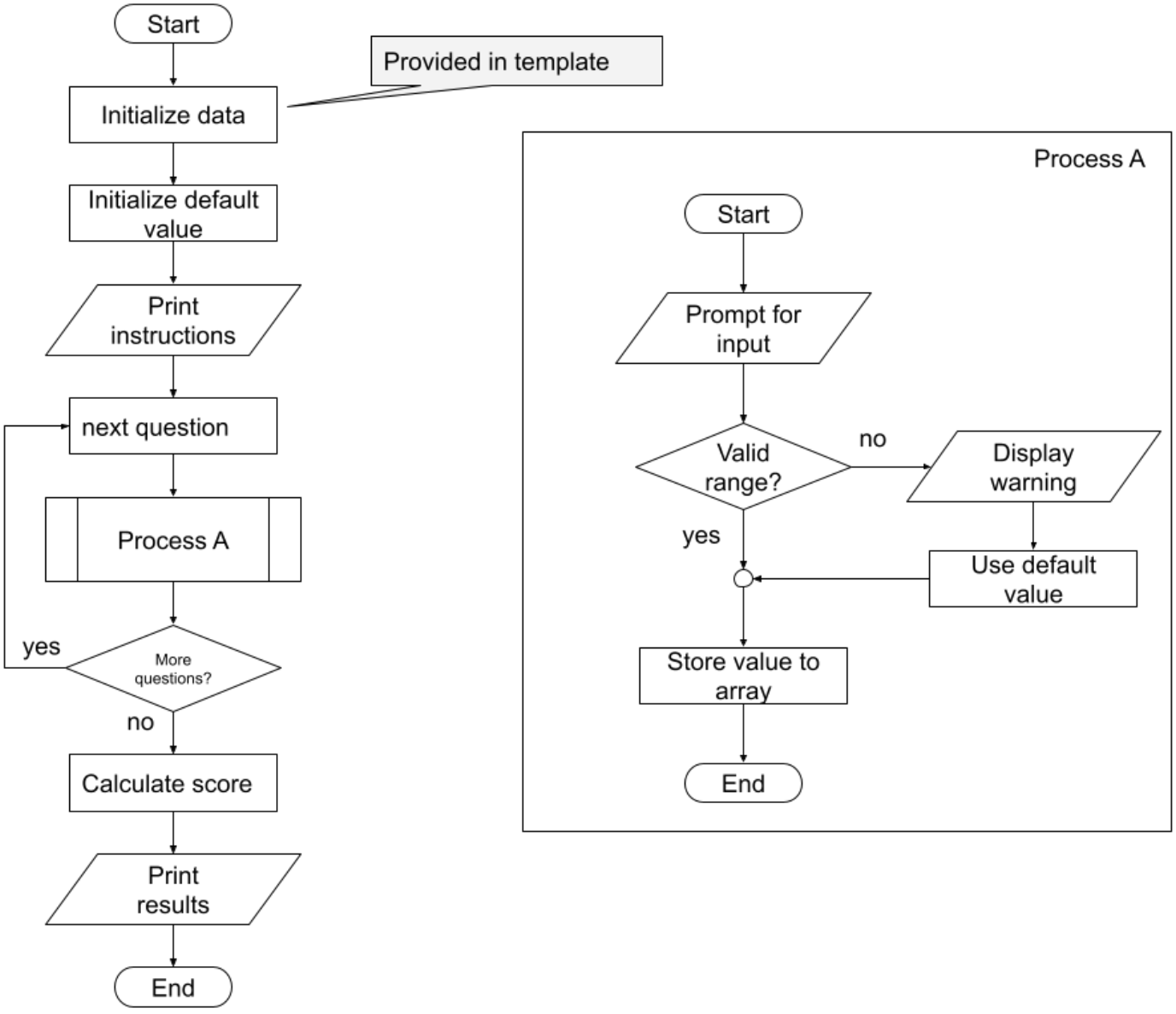
EF142 Spring 2022 Exam 3: Coding **Version 1**

A list of grit questions is provided as a data array. Write a program that will prompt the user to respond to each question on a scale of 1-5. Calculate a final score between 1 and 100 and print the result to the output. Assume that the user will always input a numeric value, but check that the range is between 1 and 5. If it is not, display a warning and use a default value instead.

Organize

- Assign a default value of 3 to an appropriately named variable, use this default value when the user inputs a number that is out of the desired range of 1 through 5.
- The only math required is a calculation of the final score. Assuming individual responses to each prompt are stored in an array `res`, the following line of code will calculate the final score.
    - `floor(100*mean(res)/5)`

Plan



Implementation Notes

- The `warning` function shares the same syntax as `fprintf`, but will print a formatted message as a warning instead of regular output.

Test Cases and Sample Output

Design your own prompts and output to match the example output below. Your program should work for at least these cases, but also all other cases of any combination of valid and invalid user input.

Case 1: User enters all valid values

```
For each prompt, enter a number between 1 and 5
I have overcome setbacks to conquer an important challenge: 4
Setbacks don't discourage me: 3
I am a hard worker: 5
I finish whatever I begin: 3
I have achieved a goal that took years of work: 5
Your grit score is 80/100
```

Case 2: User enters some invalid values

The line number and script name reported in your warnings will be different from the reference displayed here.

```
For each prompt, enter a number between 1 and 5
I have overcome setbacks to conquer an important challenge: 5
Setbacks don't discourage me: 0
Warning: You entered an invalid value. Using a default response of 3
> In grit_exam_ref (line 21)
I am a hard worker: 5
I finish whatever I begin: 3
I have achieved a goal that took years of work: 6
Warning: You entered an invalid value. Using a default response of 3
> In grit_exam_ref (line 21)
Your grit score is 76/100
```