quizz 10, ME 240 Dynamics, Fall 2017
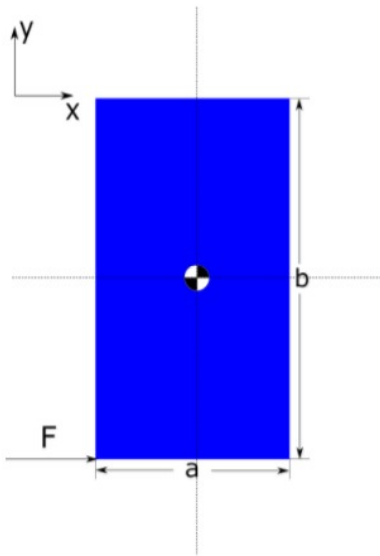
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0.1 Problem 1

Question 1   1 / 1 pts

A rectangular body with mass 3 kg, width a=0.3 m and height b=0.7 m as seen above is acted upon by a force F=30 N in the bottom corner in the x-direction as seen above. The body lies on a horizontal plane. The center of gravity is at the geometric center of the object.

What is the acceleration of the body's center of mass in the x-direction (in m/s^2)?
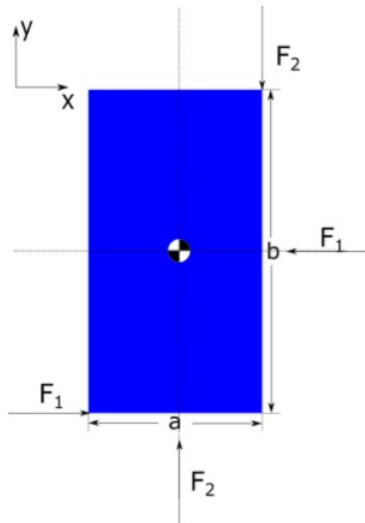
Report your answer to two decimal places

10.0000

0.2 Problem 2

Question 2   1 / 1 pts

Same situation as the previous question.

What is the angular acceleration of the object (in radians/s^2)?

Report your answer to two decimal places.

72.4110

0.3 Problem 3

The same rectangular body now has four thrusters attached to it. These thrusters will exert the forces shown above, and will move and rotate with the body if it begins to move or rotate. The forces are F_1=6 N, and F_2=4 N.

If the thrusters are turned on when the object is at rest, what is the displacement in the x-direction (in m) in 2 seconds?
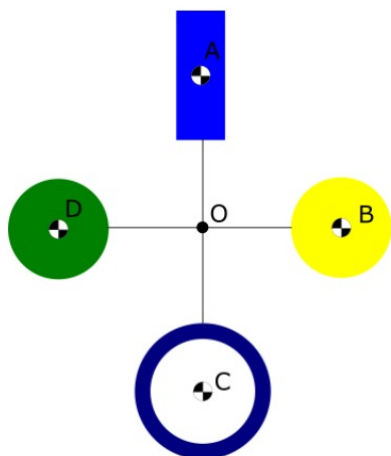
Report your answer to two decimal place.

0.0000

0.4 Problem 4

Question 4   1 pts

Same situation as the previous question.

How many radians does the object rotate 2 seconds after the thrusters are turned on from rest?

Report your answer to one decimal place.

20.69 rad/sec

0.5 Problem 5

An windmill art project consists of four objects welded together. The art project will be mounted such that it spins about point O. Object A is a thin rectangular plate with mass 2.3 kg, width 0.02 m and height 0.08 m whose center of mass is 0.30 m from O. Object B is a thin disk with mass 2.6 kg, radius 0.06 m, and whose center of mass is 0.22 m from O. Object C is a thin ring with mass 2.9 kg, radius 0.05 m, and whose center of mass is 0.49 m from O. Object D is a sphere with mass 2.7 kg, radius 0.09 m whose center of mass is 0.26 m from O. Objects A-D are connected by mass-less thin rods.

What is the moment of inertia about point O (in kg*m^2)?

Report your answer to three decimal places.

1.24

Calculation is below

```
ma=2.3;
b=0.02;
h=0.08;
oA=0.3;
IAo=1/12 ma (b^2+h^2) + ma * oA^2
Out[140]= 0.2083033333333333
mb=2.6;
rb=0.06;
oB=0.22;
IBo=mb * rb^2/2 + mb * oB^2
Out[144]= 0.13052
mc=2.9
rc=0.05
oC=0.49;
ICo=mc *rc^2 + mc * oC^2
Out[148]= 0.7035399999999999
md=2.7;
rd=0.09;
oD=0.26;
IDo=2/5 md rd^2 + md * oD^2
Out[152]= 0.1912680000000001
total=IAo+IBo+ICo+IDo
Out[153]= 1.233631333333333
```