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first two letters of last name

## Physics 7B - Winter 07 - Quiz 3

Name \_\_\_\_\_ Student ID \_\_\_\_\_

DL section number \_\_\_\_\_

I certify by my signature that I will abide by the code of academic conduct of the University of California

Signature \_\_\_\_\_

**No books or notes. Calculators OK. Show all of your work below - answers alone do not receive credit!**

1. A meter stick pivots around one end such that it swings in a vertical plane. The mass of the stick is 0.5 kg and it is one meter long (of course).

a) (0.5 pts) Indicate on the figure the force of gravity and determine its magnitude.

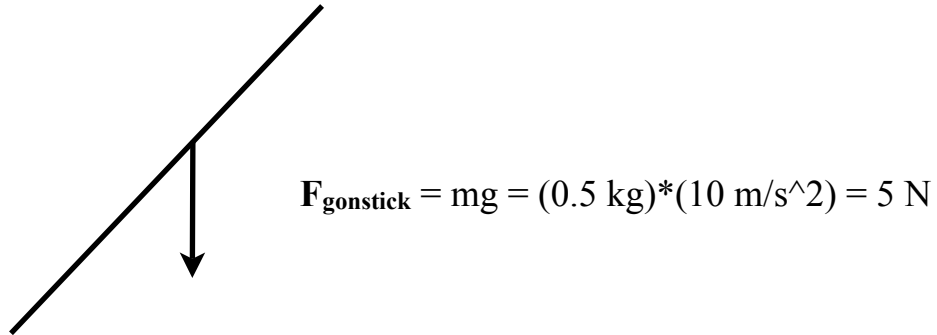


b) (2.0 pts) If the meter stick is 45 degrees from the vertical, what is the magnitude and direction of the torque on the stick around its pivot point due to the force of gravity?

2. (2.0 pts) Jill (the girl from the FNT at the end of DLM 6) is at the edge of a playground merry-go-round, which initially is rotating with angular velocity  $\omega$ . With some difficulty, Jill walks to the center of the merry-go-round. Assuming there is no friction and no external torque on the merry-go-round or Jill, describe in one sentence what happens to the angular velocity of the merry-go-round when she does this, and (in the same sentence!) explain why this is so. For example, you might write "The angular velocity remains constant because there is no external torque." (But don't, since that's not correct.)

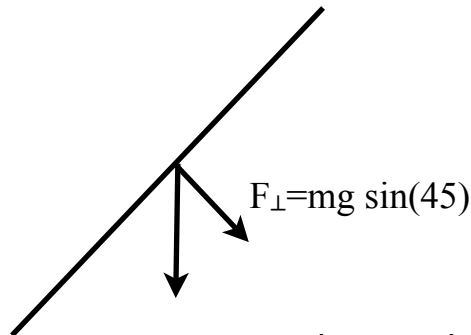
## Physics 7B-2 W07 Quiz 3 Rubric

1. (0.5 pts)



Letter	Grade	Total points	
<b>Q</b>	<b>4.5</b>	<b>0.5</b>	Perfect answer: gravity drawn in proper location and calculated correctly.
<b>R</b>	<b>4.1</b>	<b>0.46</b>	Minor math error, or missing units/serious unit error
<b>S</b>	<b>3.6</b>	<b>0.4</b>	$F_g$ not drawn accurately; $F_g = m$ or $F_g = g$ ; or negative number for magnitude
<b>T</b>	<b>2.8</b>	<b>0.31</b>	Two S-type errors
<b>U</b>	<b>1.8</b>	<b>0.2</b>	Used sin/cos of the angle to calculate $F_g$ , or used the length of the meterstick, or other major error
<b>W</b>	<b>1.0</b>	<b>0.11</b>	Several type-U errors, or showed little understanding.

2a. (2.0 pts)



$$F_{\text{perp}} = F_g \sin(45^\circ)$$

$$\tau = r \cdot F_{\text{perp}} = r \cdot F_g \sin(45^\circ) = (0.5 \text{ m})(5 \text{ N})(\sqrt{2}/2) = (5\sqrt{2})/4 = 1.77 \text{ N}\cdot\text{m}$$

Torque is trying to rotate the rod down (counter-clockwise), so right-hand rule says torque is out of the page.

(2a, cont.)

Letter	Grade	Total points	
<b>Q</b>	<b>4.5</b>	<b>2.0</b>	Perfect answer
<b>R</b>	<b>4.1</b>	<b>1.82</b>	Minor math error, or missing units/serious unit error
<b>S</b>	<b>3.6</b>	<b>1.6</b>	* $F_g$ not hypotenuse of a right triangle, or said $F_{\text{perp}} = F_g$ * Did not use moment arm = 0.5 m * Missing work * Wrong or missing direction of torque
<b>T</b>	<b>2.8</b>	<b>1.24</b>	Didn't use value of $F_g$ to calculate torque, or two S-type errors
<b>U</b>	<b>1.8</b>	<b>0.8</b>	3 or more type-S errors, but showed some understanding (e.g. correct direction of torque)
<b>W</b>	<b>1.0</b>	<b>0.44</b>	Work showed little understanding but some correct statements.
<b>Z</b>	<b>0.0</b>	<b>0</b>	Blank, or effectively blank.

**2b.** (2.0 pts)

“Since angular momentum is conserved (no external torques), when she decreases the total system’s rotational inertia by walking to the center, the system’s angular velocity must increase correspondingly.”

Letter	Grade	Total points	
<b>Q</b>	<b>4.5</b>	<b>2.0</b>	Perfect answer
<b>S</b>	<b>3.6</b>	<b>1.6</b>	As Q, except said $L = I\omega$ , but not that L was constant/conserved. Or similar error.
<b>T</b>	<b>2.8</b>	<b>1.24</b>	Did not refer to angular momentum but said $\omega$ increased because I decreased; or as S, but with a wrong statement.
<b>U</b>	<b>1.8</b>	<b>0.8</b>	As T but with incorrect statements. Or didn't refer to I, or said I changed but not that it decreased.
<b>W</b>	<b>1.0</b>	<b>0.44</b>	Work showed little understanding but some correct statements.
<b>Z</b>	<b>0.0</b>	<b>0</b>	Blank, or effectively blank.

Note: “Grade” is your numerical grade for that problem alone. To calculate your overall quiz grade on the 4.5-point scale, add up the appropriate values given in “total poin