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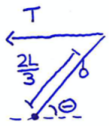
1. (1 point)
Student Name: Arfaz Hossain
Student ID: V00984826

A massless bar of length $L = 1.78$m is held in equilibrium as shown in the diagram below.



The bar makes an angle of θ with the horizontal.

The upper end of the bar is attached to a rope which exerts a force of magnitude $T > 0$N in the negative x-direction.

A ball of mass $m = 6.09$kg is suspended from the bar a distance $\frac{2L}{3}$ along the bar.

The bottom of the bar is held in place on a rough horizontal surface by friction. The coefficient of static friction between the bar and the surface is $\mu = 0.408$.

(The input below will accept answers with no more than 1

For what angles can the bar be in equilibrium?

_____ degrees $\leq \theta \leq$ _____ degrees

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Correct Answers:

- 58.533
- 90.000

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2. (1 point)
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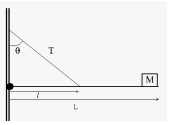
A massless bar of length $L = 2.52$m is held horizontally in equilibrium as shown in the diagram.



The left end of the bar is held in place by a hinge. On the right end of the bar there is a box of mass $M = 34.1$kg.

At a distance $\ell = 1.24$m from the left end of the bar there is a rope under tension T which makes an angle $\theta = 58.5°$ with the vertical as shown.

(The input below will accept answers with no more than 1

What is the x-component of the force on the bar by the hinge?

_____ N

What is the z-component of the force on the bar by the hinge?

_____ N

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Correct Answers:

- 1108.256
- -344.960

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3. (1 point)
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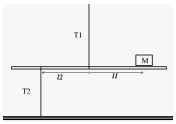
A uniform bar of mass $m = 22.8$kg is held horizontally by two ropes as shown in the diagram.



A rope is attached to its center of mass, and pulls upward exerting a force of magnitude T_1.

A second rope is attached a distance $\ell_2 = 1.29$m to the left of the bar's center of mass. It pulls downward with a force of magnitude T_2.

A mass $M = 16.56$kg is supported by the bar a distance $\ell_1 = 1.47$m to the right of the bar's center of mass.

(The input below will accept answers with no more than 1

What is T_1?

_____ N

What is T_2?

_____ N

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Correct Answers:

- 570.661
- 184.933

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4. (1 point)
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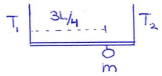
A uniform bar of mass $M = 28.1$kg has a mass $m = 14$kg attached three quarters of the way from its left end.

The bar is supported in equilibrium by two vertical ropes at the left and right ends under tension T_1 and T_2 respectively.

The bar has a length $L = 3.38$m. This is shown in the diagram.



(The input below will accept answers with no more than 1

What is T_1?

_____ N

What is T_2?

_____ N

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Correct Answers:

- 171.990
- 240.590

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5. (1 point)
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A force of $\vec{F} = 22.5\text{N}\hat{i} - 16.5\text{N}\hat{j} + 9.9\text{N}\hat{k}$ is exerted on a rigid object.
The force is exerted at location $\vec{r} = 2.62\text{m}\hat{i} - 3.01\text{m}\hat{j} + 4.8\text{m}\hat{k}$.

(The input below will accept answers with no more than 1
What is the torque exerted by the force measure around the origin?
$\vec{\tau} =$ _____ Nm$\hat{i}+$ _____ Nm$\hat{j}+$ _____ Nm$\hat{k}$

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Correct Answers:

- 49.401
- 82.062
- 24.495