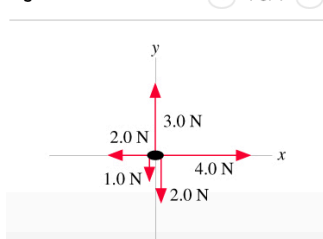


1.

The forces in (Figure 1) are acting on a 2.9 kg object.

Figure



Part A

Find the value of a_x , the x -component of the acceleration of the object.

Express your answer with the appropriate units.

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$a_x =$

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Part B

Find the value of a_y , the y -component of the acceleration of the object.

Express your answer with the appropriate units.

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$a_y =$

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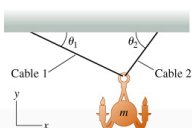
1 of 1

2.

(Figure 1) A chandelier with mass m is attached to the ceiling of a large concert hall by two cables. Because the ceiling is covered with intricate architectural decorations (not indicated in the figure, which uses a humbler depiction), the workers who hung the chandelier couldn't attach the cables to the ceiling directly above the chandelier. Instead, they attached the cables to the ceiling near the walls. Cable 1 has tension T_1 and makes an angle of θ_1 with the ceiling. Cable 2 has tension T_2 and makes an angle of θ_2 with the ceiling.

Figure

1 of 1



Part A

Find an expression for T_1 , the tension in cable 1, that does not depend on T_2 .

Express your answer in terms of some or all of the variables m , θ_1 , and θ_2 , as well as the magnitude of the acceleration due to gravity g . You must use parentheses around θ_1 and θ_2 , when they are used as arguments to any trigonometric functions in your answer.

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$T_1 =$

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3.

In a head-on collision, a car stops in 0.12 s from a speed of 20 m/s . The driver has a mass of 60 kg , and is, fortunately, tightly strapped into his seat.

Part A

What force is applied to the driver by his seat belt during that fraction of a second?

Express your answer in newtons.

$F =$ N

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4.

A chair of weight 120 N lies atop a horizontal floor; the floor is not frictionless. You push on the chair with a force of $F = 45.0\text{ N}$ directed at an angle of 37.0° below the horizontal and the chair slides along the floor.

Part A

Using Newton's laws, calculate n , the magnitude of the normal force that the floor exerts on the chair.

Express your answer in newtons.

$n =$ N

Submit

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5.

An early submersible craft for deep-sea exploration was raised and lowered by a cable from a ship. When the craft was stationary, the tension in the cable was 5000 N . When the craft was lowered or raised at a steady rate, the motion through the water added an 1800 N drag force.

Part A

What was the tension in the cable when the craft was being lowered to the seafloor?

Express your answer with the appropriate units.

$T =$

Submit

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Part B

What was the tension in the cable when the craft was being raised from the seafloor?

Express your answer with the appropriate units.

$T =$

Submit

[Request Answer](#)

6.

A 1400 kg car drives around a flat 230-m -diameter circular track at 25 m/s .

Part A

What is the magnitude of the net force on the car?

Express your answer in newtons.

N

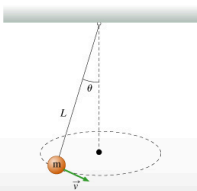
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7.

(Figure 1) A bob of mass $m = 0.250$ kg is suspended from a fixed point with a massless string of length $L = 20.0$ cm. You will investigate the motion in which the string traces a conical surface with half-angle $\theta = 19.0^\circ$.

Figure



8.

Gibbons, small Asian apes, move by brachiation, swinging below a handhold to move forward to the next handhold. A 9.5 kg gibbon has an arm length (hand to shoulder) of 0.60 m. We can model its motion as that of a point mass swinging at the end of a 0.60-m-long, massless rod. At the lowest point of its swing, the gibbon is moving at 3.5 m/s.

9.

A fast pitch softball player does a "windmill" pitch moving her hand through a vertical circular arc to pitch a ball at 70mph. The 0.18 kg ball is 51 cm from the pivot point at her shoulder.

▼ **Part A**

What tangential speed v must the bob have so that it moves in a horizontal circle with the string making an angle 19.0° with the vertical?

Express your answer numerically in meters per second.

$v =$ m/s

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▼ Part A

What upward force must a branch provide to support the swinging gibbon?

Express your answer with the appropriate units.

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$F =$

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▼ Part A

Just before the ball leaves her hand, what is its centripetal acceleration?

Express your answer in meters per second squared.

$$a_c = \text{[input box]} \text{ m/s}^2$$

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▼ **Part B**

At the lowest point of the circle, the ball has reached its maximum speed. What is the magnitude of the force her hand exerts on the ball at this point?

Express your answer in newtons.

$F =$ N

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▼ Part C

At the lowest point of the circle, the ball has reached its maximum speed. What is the direction of the force her hand exerts on the ball at this point?

✓ Please Choose
upward
downward
left
right

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Ne:

10.

(Figure 1) A bob of mass m is suspended from a fixed point with a massless string of length L (i.e., it is a pendulum). You are to investigate the motion in which the string moves in a cone with half-angle θ .

▼ Part A

What tangential speed, v , must the bob have so that it moves in a horizontal circle with the string always making an angle θ from the vertical?

Express your answer in terms of some or all of the variables m , L , and θ , as well as the acceleration due to gravity g .

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$v =$

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11.

A wind turbine has 12,000 kg blades that are 41 m long. The blades spin at 22 rpm.

▼ **Part A**

If we model a blade as a point mass at the midpoint of the blade, what is the inward force necessary to provide each blade's centripetal acceleration?

Express your answer with the appropriate units.

F =

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12.

• A professor's office door is 0.87 m wide, 2.0 m high, and 4.0 cm thick; has a mass of 25 kg; and pivots on frictionless hinges. A "door closer" is attached to the door and the top of the door frame.

▼ **Part A**

When the door is open and at rest, the door closer exerts a torque of $4.5 \text{ N} \cdot \text{m}$. What is the least force that you need to apply to the door to hold it open?

Express your answer in newtons.

$F =$ N

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13.

The tune-up specifications of a car call for the spark plugs to be tightened to a torque of $50 \text{ N} \cdot \text{m}$. You plan to tighten the plugs by pulling on the end of a 21-cm-long wrench. Because of the cramped space under the hood, you'll need to pull at an angle of 125° with respect to the wrench shaft.

▼ **Part A**

With what force must you pull?

Express your answer in newtons.

$F =$ N

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14.

Part A

What is the net torque about on the bar shown in (Figure 1) about the axis indicated by the dot? Suppose that $\phi = 70^\circ$ and $\theta = 30^\circ$. Express your answer with the appropriate units.

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$\tau =$

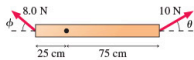
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Ne

Figure

1 of 1



15.

An athlete at the gym holds a 3.0 kg steel ball in his hand. His arm is 70 cm long and has a mass of 4.0 kg. For the steps and strategies involved in solving a similar problem, you may view a [Video Tutor Solution](#).

Part A

What is the magnitude of the torque about his shoulder if he holds his arm straight out to his side, parallel to the floor? Express your answer with the appropriate units.

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$\tau =$

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Part B

What is the magnitude of the torque about his shoulder if he holds his arm straight, but 60° below horizontal? Express your answer with the appropriate units.

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$\tau =$

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16.

Part A

What is the net torque on the bar shown in (Figure 1), about the axis indicated by the dot? Suppose that $F = 12 \text{ N}$. Express your answer with the appropriate units.

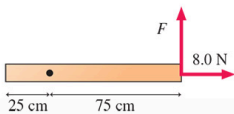
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$\tau =$

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Figure 1 of 1



17.

Part A

What is the net torque on the bar shown in (Figure 1), about the axis indicated by the dot? Suppose that $F = 7.0 \text{ N}$. Express your answer with the appropriate units.

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$\tau =$

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Figure 1 of 1

