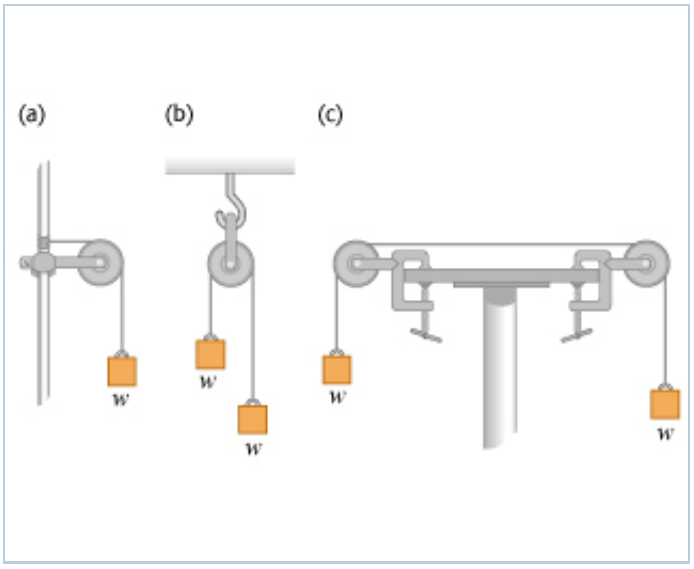
HW due 2/21

Due: 11:59pm on Sunday, February 21, 2016

You will receive no credit for items you complete after the assignment is due. Grading Policy

Exercise 5.2

In the figure each of the suspended blocks has weight w. The pulleys are frictionless and the ropes have negligible weight.

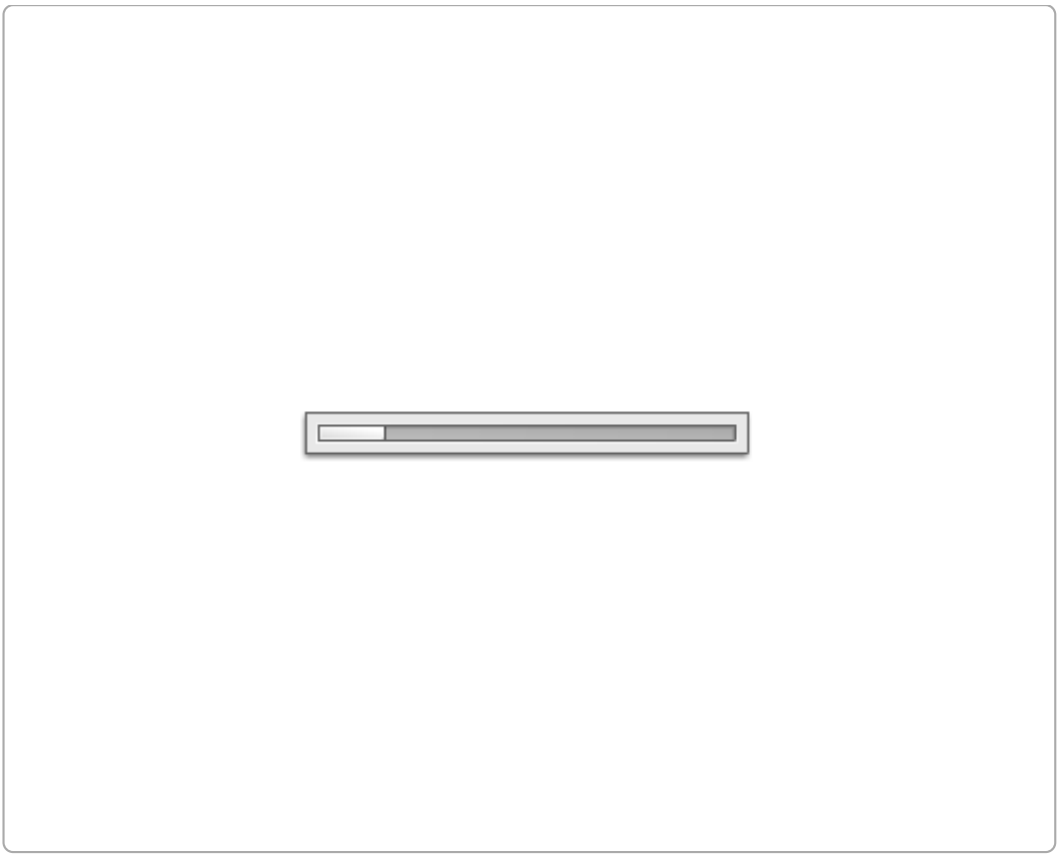


Part A

In the case (a), draw the free-body diagram.

Draw the force vectors with their tails at the dot. The location and orientation of your vectors will be graded. The exact length of your vectors will not be graded but the relative length of one to the other will be graded. The black vector is the sum of the vectors in your diagram.

ANSWER:



Correct

Part B

Calculate, in the case (a), the tension T in the rope in terms of the weight w.

ANSWER:

$T =$ w

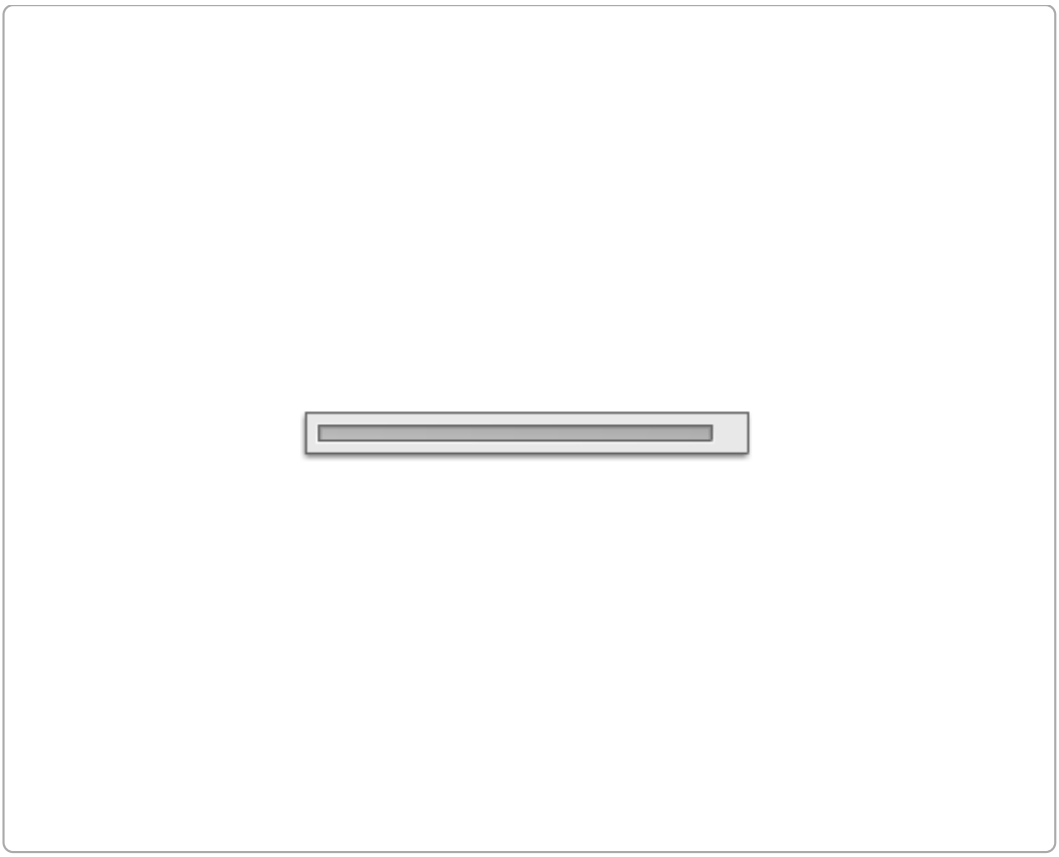
Correct

Part C

In the case (b), draw the free-body diagram of one of the blocks.

Draw the force vectors with their tails at the dot. The location and orientation of your vectors will be graded. The exact length of your vectors will not be graded but the relative length of one to the other will be graded. The black vector is the sum of the vectors in your diagram.

ANSWER:



Correct

Part D

Calculate, in the case (b), the tension T in the rope in terms of the weight w.

ANSWER:

$T =$ w

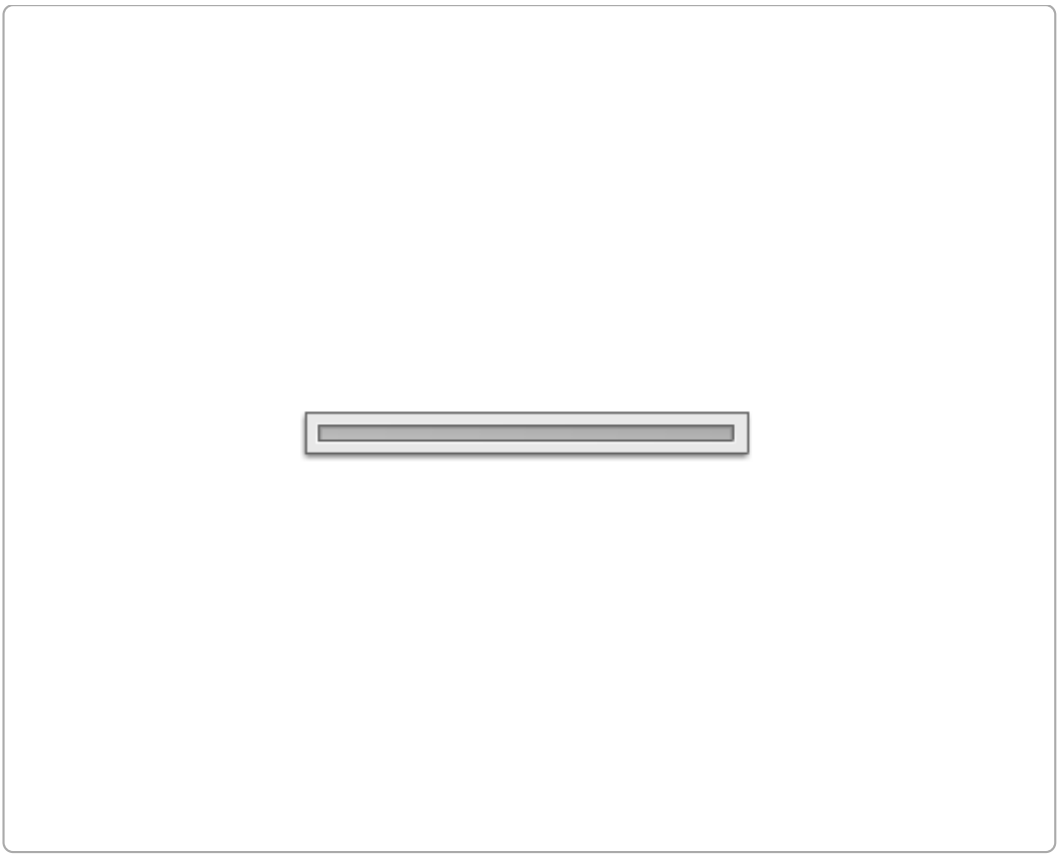
Correct

Part E

In the case (c), draw the free-body diagram of one of the blocks.

Draw the force vectors with their tails at the dot. The location and orientation of your vectors will be graded. The exact length of your vectors will not be graded but the relative length of one to the other will be graded. The black vector is the sum of the vectors in your diagram.

ANSWER:



Correct

Part F

Calculate, in the case (c), the tension T in the rope in terms of the weight w.

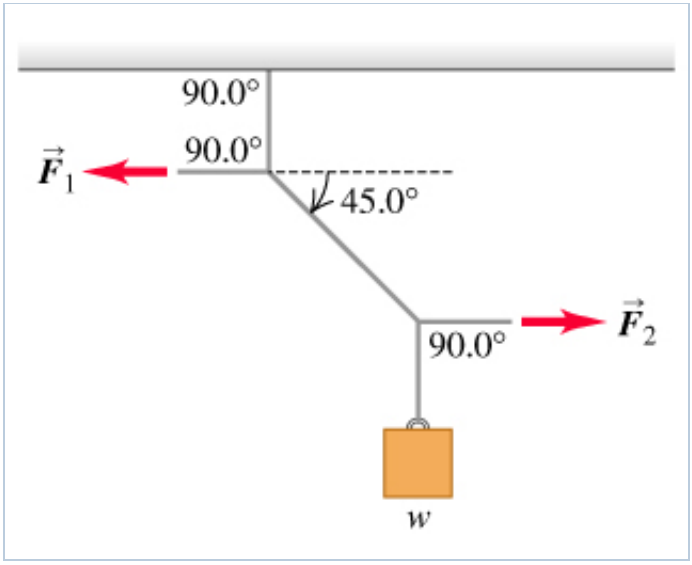
ANSWER:

$T =$ w

Correct

Exercise 5.10

In the figure the weight w is 69.2 N .



Part A

What is the tension in the diagonal string?

ANSWER:

T = 97.9 N

Correct

Part B

Find the magnitudes of the horizontal forces $\vec{F}_1$ and $\vec{F}_2$ that must be applied to hold the system in the position shown.

ANSWER:

F_1, F_2 = 69.2,69.2 N

Correct

Exercise 5.20 - Copy

A 525-N physics student stands on a bathroom scale in an 900-kg (including the student) elevator that is supported by a cable. As the elevator starts moving, the scale reads 467 N .

Part A

Find the magnitude of the acceleration of the elevator.

ANSWER:

a = 1.08 $\mathrm{m/s^2}$

Correct

Part B

Find the direction of the acceleration of the elevator.

ANSWER:

- upwards
- downwards

Correct

Part C

What is the acceleration if the scale reads 612 N ?

ANSWER:

a = 1.62 $\mathrm{m/s^2}$

Correct

Part D

What is the tension in the cable in part A?

ANSWER:

T = 7850 N

Correct

Part E

What is the tension in the cable in part D?

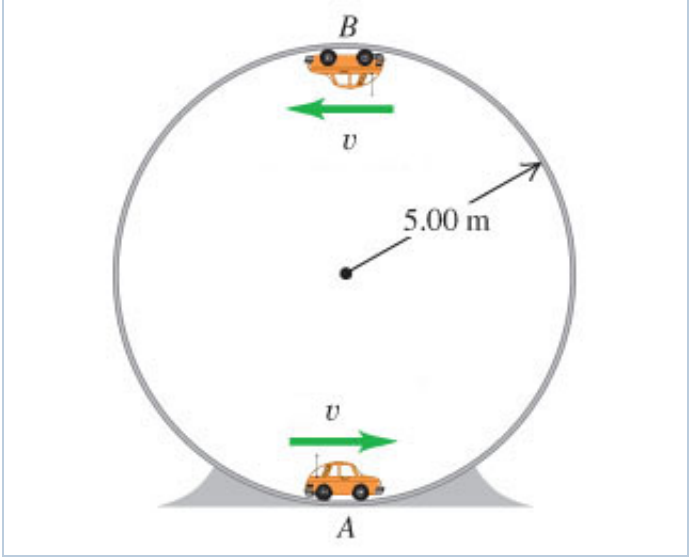
ANSWER:

T = 0 N

Correct

Exercise 5.46

A small car with mass 0.790 kg travels at constant speed on the inside of a track that is a vertical circle with radius 5.00 m the following figure.



Part A

If the normal force exerted by the track on the car when it is at the top of the track (point B) is 6.00 N , what is the normal force on the car when it is at the bottom of the track (point A)?

Express your answer with the appropriate units.

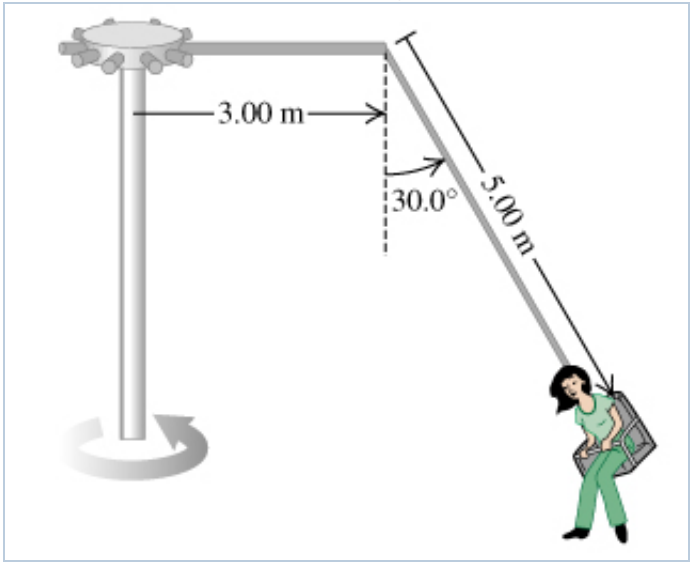
ANSWER:

F = 21.5 N

Correct

Exercise 5.50

The "Giant Swing" at a county fair consists of a vertical central shaft with a number of horizontal arms attached at its upper end. Each arm supports a seat suspended from a cable 5.00 m long, the upper end of the cable being fastened to the arm at a point 3.00 m from the central shaft.



Part A

Find the time of one revolution of the swing if the cable supporting a seat makes an angle of 30.0° with the vertical.

ANSWER:

T = 6.19 s

Correct

Part B

Does the angle depend on the weight of the passenger for a given rate of revolution?

ANSWER:

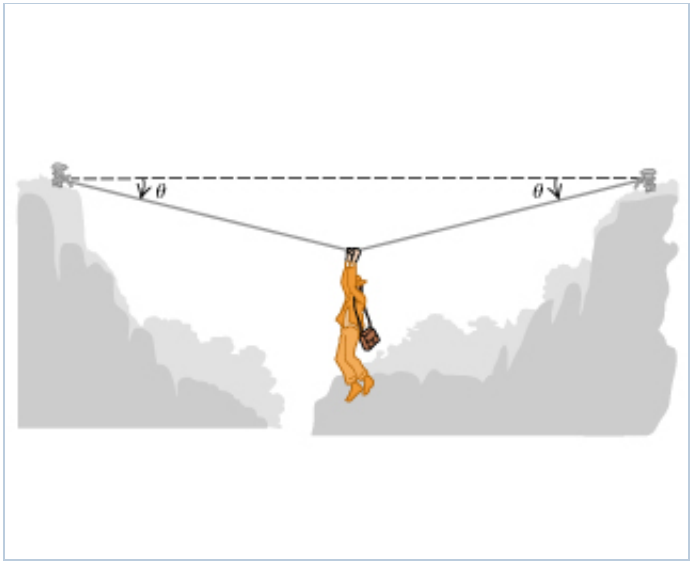
- Yes.
- (•) No.

Correct

Problem 5.60

An adventurous archaeologist crosses between two rock cliffs by slowly going hand-over-hand along a rope stretched

between the cliffs. He stops to rest at the middle of the rope . The rope will break if the tension in it exceeds $2.70\times10^4\ \mathrm{N}$, and our hero's mass is $86.2\ \mathrm{kg}$.



Part A

If the angle between the rope and the horizontal is θ = 10.3 $^\circ$, find the tension in the rope.

ANSWER:

2360 N

Correct

Part B

What is the smallest value the angle θ can have if the rope is not to break?

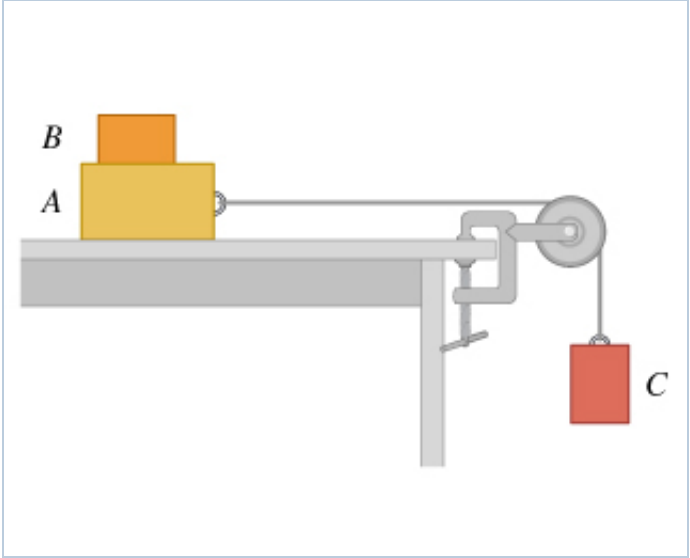
ANSWER:

0.896 $^\circ$

Correct

Problem 5.92

Block *B*, with mass $5.00\ \mathrm{kg}$, rests on block *A*, with mass $8.00\ \mathrm{kg}$, which in turn is on a horizontal tabletop (the figure). There is no friction between block *A* and the tabletop, but the coefficient of static friction between block *A* and block *B* is 0.750. A light string attached to block *A* passes over a frictionless, massless pulley, and block *C* is suspended from the other end of the string.



Part A

What is the largest mass that block *C* can have so that blocks *A* and *B* still slide together when the system is released from rest?

ANSWER:

m = 39.0 kg

Correct

Problem 5.100

Consider a wet banked roadway, where there is a coefficient of static friction of 0.30 and a coefficient of kinetic friction of 0.25 between the tires and the roadway. The radius of the curve is $\mathrm{R} = 50\ \mathrm{m}$.

Part A

If the banking angle is $\beta = 25^\circ$, what is the *maximum* speed the automobile can have before sliding *up* the banking?

Express your answer using two significant figures.

ANSWER:

$v_{\max}$ = 21 $\mathrm{m/s}$

Correct

Part B

What is the *minimum* speed the automobile can have before sliding *down* the banking?

Express your answer using two significant figures.

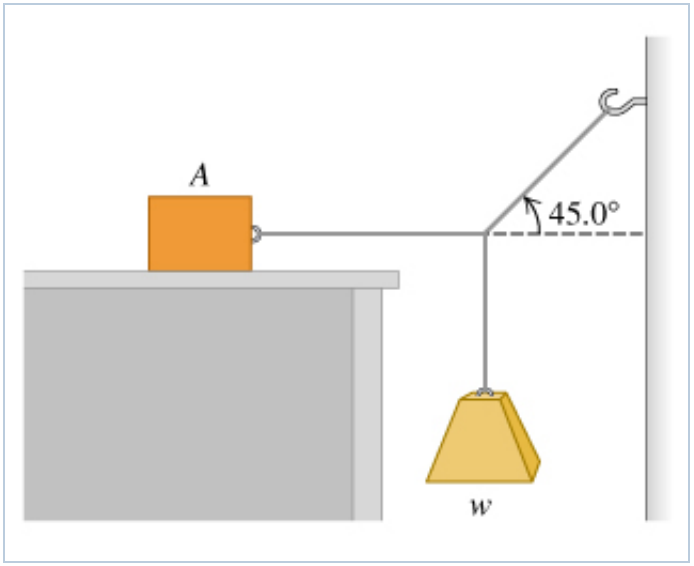
ANSWER:

v_{min} = 8.5 m/s

Correct

Problem 5.76

Block *A* in the figure weighs 67.2 N . The coefficient of static friction between the block and the surface on which it rests is 0.26. The weight w is 10.6 N and the system is in equilibrium.



Part A

Find the friction force exerted on block *A*.

ANSWER:

f = 10.6 N

All attempts used; correct answer displayed

Part B

Find the maximum weight for which the system will remain in equilibrium.

ANSWER:

$w_{\max}$ = 17.5 N

Correct

Score Summary:

Your score on this assignment is 100%.
You received 32.5 out of a possible total of 35 points, plus 2.5 points of extra credit.