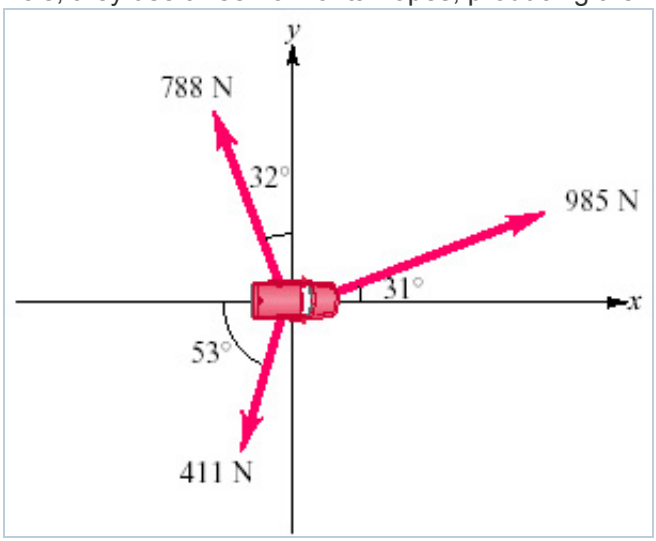
HW due 2/7

Due: 11:59pm on Sunday, February 7, 2016

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

Exercise 4.2

Workmen are trying to free an SUV stuck in the mud. To extricate the vehicle, they use three horizontal ropes, producing the force vectors shown in the figure.



Part A

Find the x components of each of the three pulls.

Enter your answer as three numbers, separated with commas.

ANSWER:

$F_{985\ \mathrm{N},\,x}$; $F_{788\ \mathrm{N},\,x}$; $F_{411\ \mathrm{N},\,x}$ = 844,-418,-247 N

Correct

Part B

Find the y components of each of the three pulls.

Enter your answer as three numbers, separated with commas.

ANSWER:

$F_{985\ \mathrm{N},\,y}$; $F_{788\ \mathrm{N},\,y}$; $F_{411\ \mathrm{N},\,y}$ = 507,668,-328 N

Correct

Part C

Use the components to find the magnitude of the resultant of the three pulls.

ANSWER:

F_{Σ} = 866 N

Correct

Part D

Use the components to find the direction of the resultant of the three pulls.

Enter your answer as the angle counted from +x axis in the counterclockwise direction.

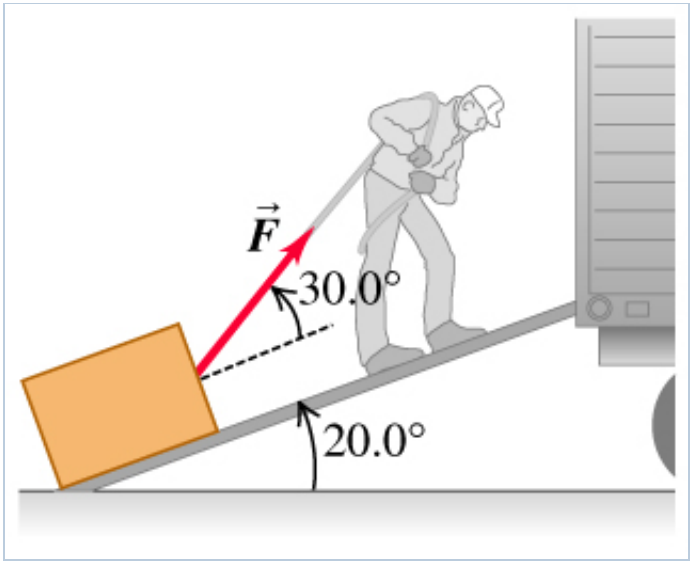
ANSWER:

θ = 78.1 °

Correct

Exercise 4.4

A man is dragging a trunk up the loading ramp of a mover's truck. The ramp has a slope angle of 20.0°, and the man pulls upward with a force $\vec{F}$ whose direction makes an angle of 30.0° with the ramp in .



Part A

How large a force $\vec{F}$ is necessary for the component F_x parallel to the ramp to be 90.0 N?

Express your answer with the appropriate units.

ANSWER:

F = 104 N

Correct

Part B

How large will the component F_y perpendicular to the ramp then be?

Express your answer with the appropriate units.

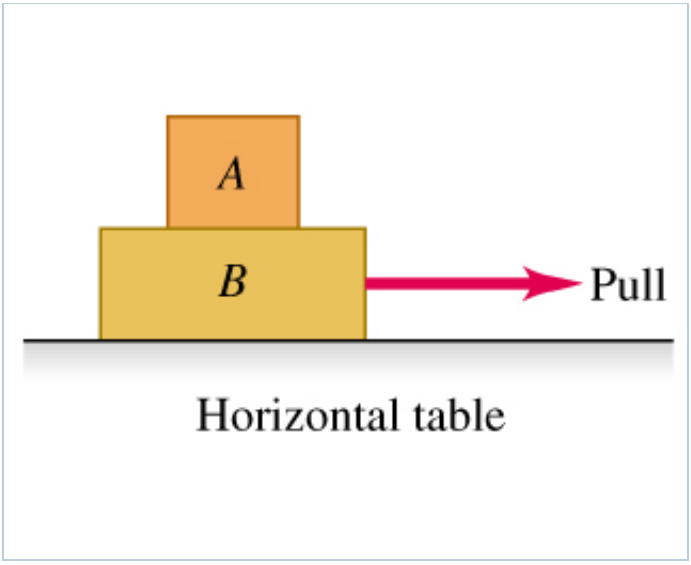
ANSWER:

F_y = 52.0 N

Correct

Exercise 4.26

A person pulls horizontally on block B in the figure , causing both blocks to move together as a unit.

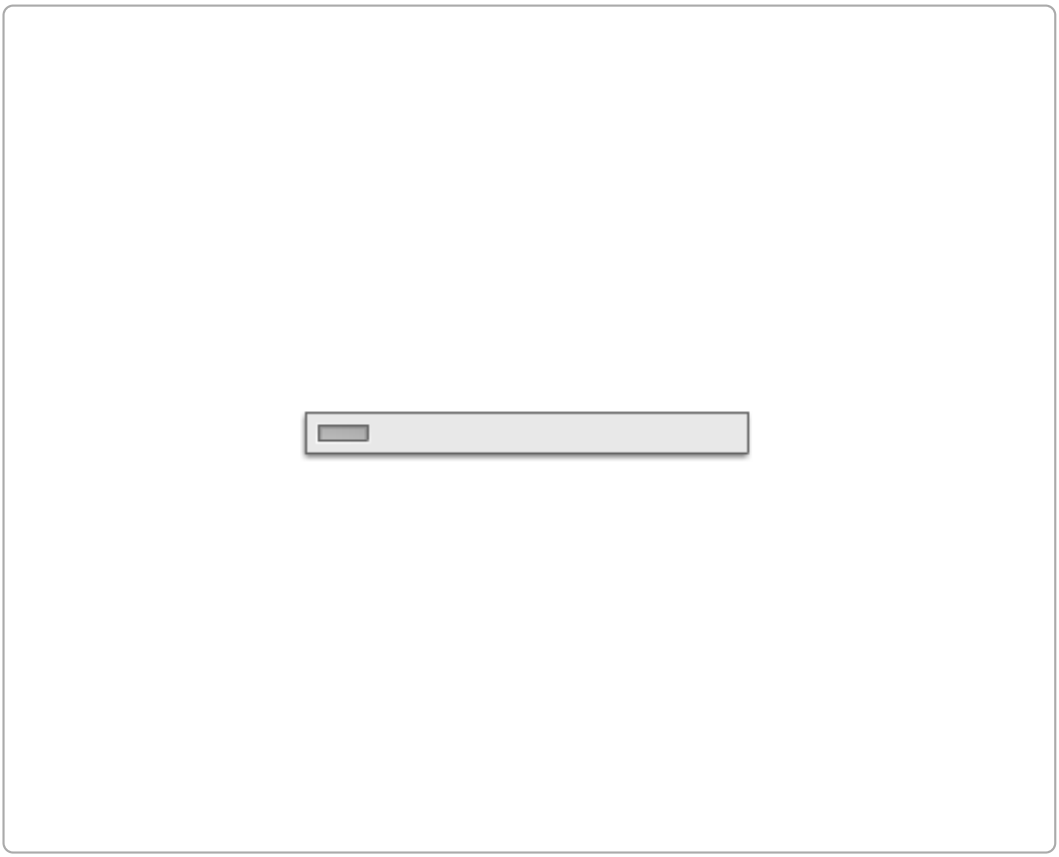


Part A

While this system is moving, make a carefully labeled free-body diagram of block A if the table is frictionless.

Draw all relevant force vectors with their tails at the dot. The 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.

ANSWER:



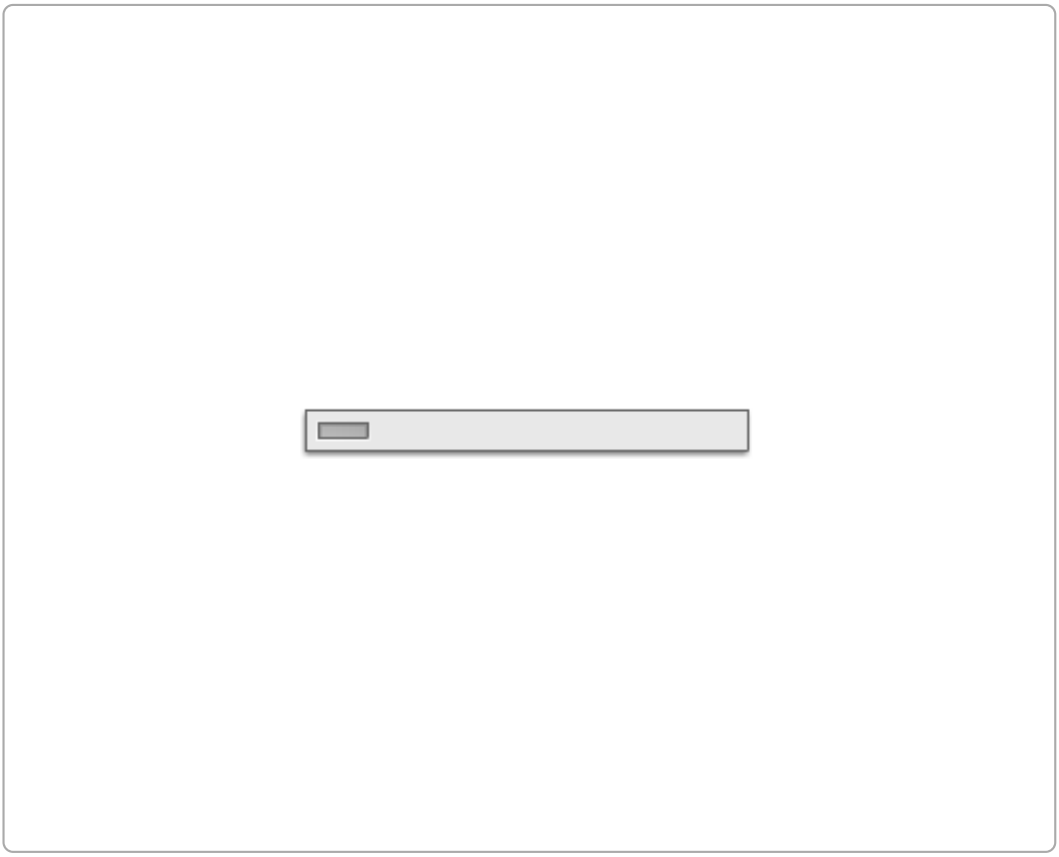
Correct

Part B

While this system is moving, make a carefully labeled free-body diagram of block A if there is friction between block B and the table and the pull is equal to the friction force on block B due to the table.

Draw all relevant force vectors with their tails at the dot. The 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.

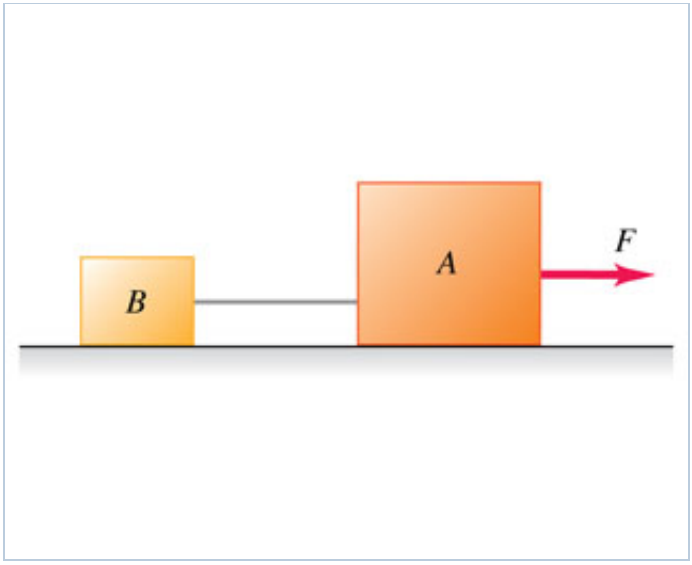
ANSWER:



Correct

Problem 4.40

Two blocks connected by a light horizontal rope sit at rest on a horizontal, frictionless surface. Block A has mass 14.5 kg , and block B has mass m. A constant horizontal force F = 60.0 N is applied to block A . In the first 5.00 s after the force is applied, block A moves 18.0 m to the right.



Part A

While the blocks are moving, what is the tension T in the rope that connects the two blocks?

Express your answer with the appropriate units.

ANSWER:

T = 39.1 N

Correct

Part B

What is the mass of block B?

Express your answer with the appropriate units.

ANSWER:

m = 27.2 kg

Correct

Problem 4.44

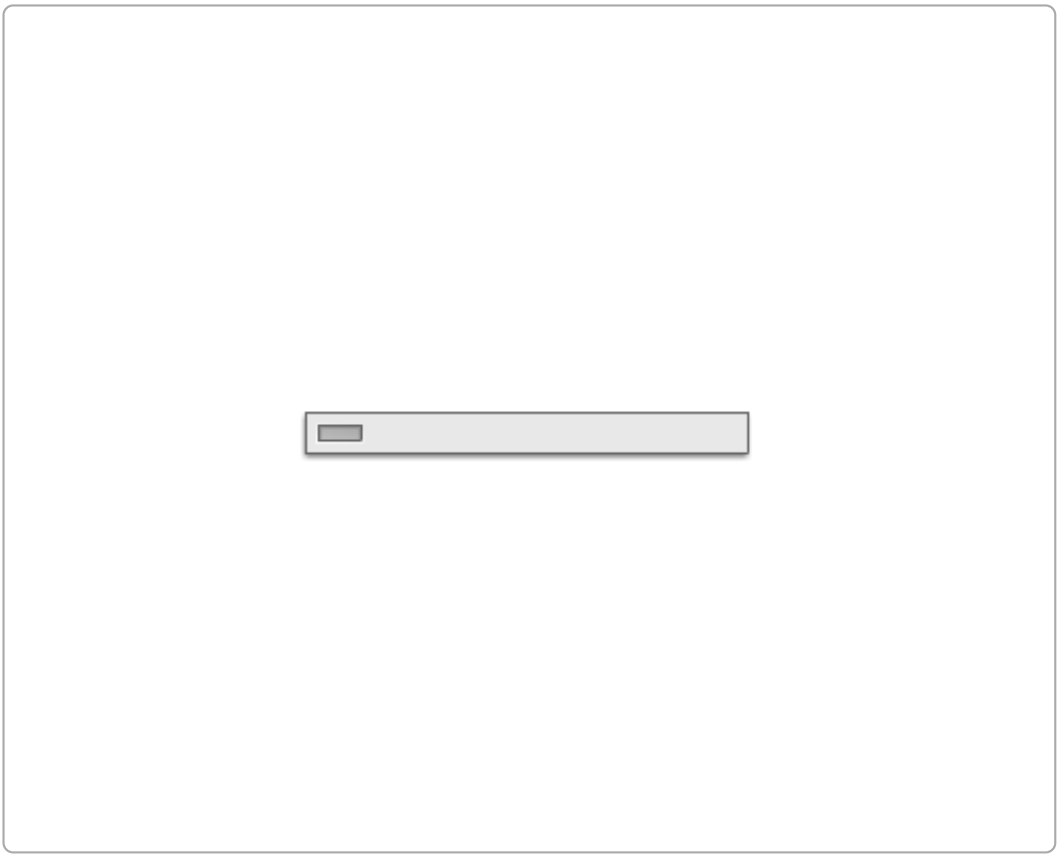
A loaded elevator with very worn cables has a total mass of 2500 kg , and the cables can withstand a maximum tension of 2.80×10^4 N .

Part A

Draw the free-body force diagram for the elevator.(Assume that the elevator is accelerating upward.)

Draw the force vectors with their tails at the dot. The 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.

ANSWER:



Correct

Part B

Apply Newton's second law to the elevator and find the maximum upward acceleration for the elevator if the cables are not to break?

ANSWER:

a = 1.40 $\mathrm{m/s^2}$

Correct

Part C

What would be the answer to part B if the elevator were on the moon, where free fall acceleration is g = 1.62 $\mathrm{m/s^2}$.

ANSWER:

a = 9.58 $\mathrm{m/s^2}$

Correct

Exercise 5.32

A pickup truck is carrying a toolbox, but the rear gate of the truck is missing, so the box will slide out if it is set moving. The coefficients of kinetic and static friction between the box and the bed of the truck are 0.265 and 0.650, respectively.

Part A

Starting from rest, what is the shortest time this truck could accelerate uniformly to 25.0 $\mathrm{m/s}$ ($\approx$ 55.9 mph) without causing the box to slide. (Hint: First use Newton's second law to find the maximum acceleration that static friction can give the box, and then solve for the time required to reach 25.0 $\mathrm{m/s}$.)

ANSWER:

t_{min} = 3.92 s

Correct

Score Summary:

Your score on this assignment is 150%.
You received 20 out of a possible total of 20 points, plus 10 points of extra credit.