HW due 3/6

Due: 11:59pm on Sunday, March 6, 2016

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

Exercise 8.4

Two vehicles are approaching an intersection. One is a 2300 kg pickup traveling at 14.0 $\mathrm{m/s}$ from east to west (the $-\mathrm{x}$-direction), and the other is a 1600 kg sedan going from south to north (the $+\mathrm{y}-$ direction at 25.0 $\mathrm{m/s}$).

Part A

Find the x -component of the net momentum of this system.

ANSWER:

p_{x} = -3.22×10^{4} $\mathrm{kg\cdot m/s}$

Correct

Part B

Find the y-component of the net momentum of this system.

ANSWER:

p_{y} = 4.00×10^{4} $\mathrm{kg\cdot m/s}$

Correct

Part C

What is the magnitude of the net momentum?

ANSWER:

p = 5.14×10^{4} $\mathrm{kg\cdot m/s}$

Correct

Part D

What is the direction of the net momentum?

ANSWER:

θ = 38.8 ° west of north.

Correct

Exercise 8.6

The mass of a regulation tennis ball is 57 g (although it can vary slightly), and tests have shown that the ball is in contact with the tennis racket for 30 ms. (This number can also vary, depending on the racket and swing.) We shall assume a 30.0-ms contact time. The fastest-known served tennis ball was served by “Big Bill” Tilden in 1931, and its speed was measured to be 73 $\mathrm{m/s}$.

Part A

What impulse did Big Bill exert on the tennis ball in his record serve? Assume that the positive direction is along the final direction of motion of the ball.

Express your answer with the appropriate units.

ANSWER:

J = 4.2 $\mathrm{kg \cdot \left(\frac{m}{s}\right)}$

Correct

Part B

What force did Big Bill exert on the tennis ball in his record serve?

Express your answer with the appropriate units.

ANSWER:

F_x = 140 N

Correct

Part C

If Big Bill's opponent returned his serve with a speed of 55 $\mathrm{m/s}$, what impulse did he exert on the ball, assuming only horizontal motion? Assume that the positive direction is the direction the ball is traveling before it is hit by the opponent's racket.

Express your answer with the appropriate units.

ANSWER:

J = -7.3 $\mathrm{kg}\cdot\left(\frac{\mathrm{m}}{\mathrm{s}}\right)$

Correct

Part D

What force did he exert on the ball, assuming only horizontal motion?

Express your answer with the appropriate units.

ANSWER:

F_x = -240 N

Correct

Exercise 8.8

Force of a Baseball Swing. A baseball has mass 0.149 kg .

Part A

If the velocity of a pitched ball has a magnitude of 44.0 $\mathrm{m/s}$ and the batted ball's velocity is 59.5 $\mathrm{m/s}$ in the opposite direction, find the magnitude of the change in momentum of the ball and of the impulse applied to it by the bat.

Express your answer to three significant figures and include the appropriate units.

ANSWER:

P = 15.4 $\frac{\mathrm{kg}\cdot\mathrm{m}}{\mathrm{s}}$

Correct

Part B

If the ball remains in contact with the bat for 1.7 ms , find the magnitude of the average force applied by the bat.

Express your answer to two significant figures and include the appropriate units.

ANSWER:

F = 9.1 kN

Correct

Exercise 8.10

A bat strikes a 0.145-kg baseball. Just before impact, the ball is traveling horizontally to the right at 35.0 $\mathrm{m/s}$; when it leaves the bat, the ball is traveling to the left at an angle of 29.0 $^\circ$ above horizontal with a speed of 52.0 $\mathrm{m/s}$. The ball and bat are in contact for 1.61 ms .

Part A

Find the horizontal and vertical components of the average force on the ball. Let $+x$ be to the right and $+y$ be upward

Express your answers using three significant figures separated by a comma.

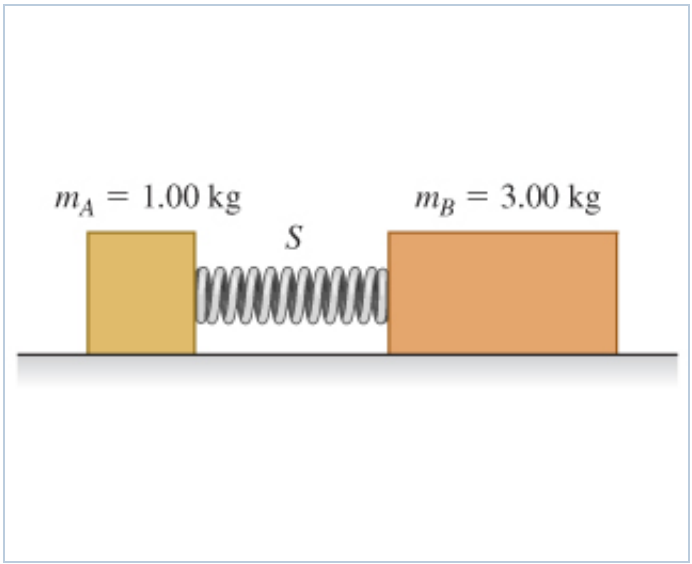
ANSWER:

F_x , F_y = -7250,2270 N

Correct

Exercise 8.24

Block A in the figure has mass 1.00 kg, and block B has mass 3.00 kg. The blocks are forced together, compressing a spring S between them; then the system is released from rest on a level, frictionless surface. The spring, which has negligible mass, is not fastened to either block and drops to the surface after it has expanded. Block B acquires a speed of 1.40 $\mathrm{m/s}$.



Part A

What is the final speed of block A?

ANSWER:

v = 4.20 $\mathrm{m/s}$

Correct

Part B

How much potential energy was stored in the compressed spring?

ANSWER:

U = 11.8 J

Correct

Exercise 8.42

A 8.00-g bullet is fired horizontally into a 1.20-kg wooden block resting on a horizontal surface. The coefficient of kinetic friction between block and surface is 0.20. The bullet remains embedded in the block, which is observed to slide 0.390 m along the surface before stopping.

Part A

What was the initial speed of the bullet?

Express your answer with the appropriate units.

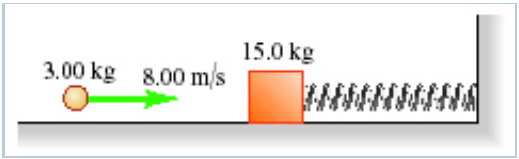
ANSWER:

v = 190 $\frac{\mathrm{m}}{\mathrm{s}}$

Correct

Exercise 8.44

A 15.0 kg block is attached to a very light horizontal spring of force constant 525 $\mathrm{N/m}$ and is resting on a smooth horizontal table. (See the figure below .) Suddenly it is struck by a 3.00 kg stone traveling horizontally at 8.00 $\mathrm{m/s}$ to the right, whereupon the stone rebounds at 2.00 $\mathrm{m/s}$ horizontally to the left.



Part A

Find the maximum distance that the block will compress the spring after the collision.(*Hint*: Break this problem into two parts - the collision and the behavior after the collision - and apply the appropriate conservation law to each part.)

Enter your answer using three significant figures.

ANSWER:

x = 0.338 m

Correct

Problem 8.64

A steel ball with mass 42.0 g is dropped from a height of 1.91 m onto a horizontal steel slab. The ball rebounds to a height of 1.55 m .

Part A

Calculate the impulse delivered to the ball during impact.

ANSWER:

0.488 N · s

Correct

Part B

If the ball is in contact with the slab for a time of 2.20 ms , find the average force on the ball during impact.

ANSWER:

222 N

Correct

Score Summary:

Your score on this assignment is 100%.
You received 40 out of a possible total of 40 points.