This print-out should have 14 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 (part 1 of 2) 10.0 points

An animal-rescue plane flying due east at 51 m/s drops a bale of hay from an altitude of 70 m.

The acceleration due to gravity is 9.81 m/s^2.

If the bale of hay weighs 180 N, what is the momentum of the bale the moment it strikes the ground? Answer in units of kg m/s.

002 (part 2 of 2) 10.0 points

At what angle of inclination will the bale strike? Answer between $-180°$ and $+180°$. Answer in units of °.

003 10.0 points

What is the momentum of a two-particle system composed of a 1300 kg car moving east at 50 m/s and a second 1100 kg car moving west at 35 m/s? Let east be the positive direction.

Answer in units of kg · m/s.

004 (part 1 of 2) 10.0 points

A 0.10 kg ball of dough is thrown straight up into the air with an initial speed of 17 m/s.

The acceleration of gravity is 9.81 m/s^2.

a) What is its momentum at its maximum height? Answer in units of kg · m/s.

005 (part 2 of 2) 10.0 points

b) What is its momentum halfway to its maximum height on the way up? Answer in units of kg · m/s.

006 10.0 points

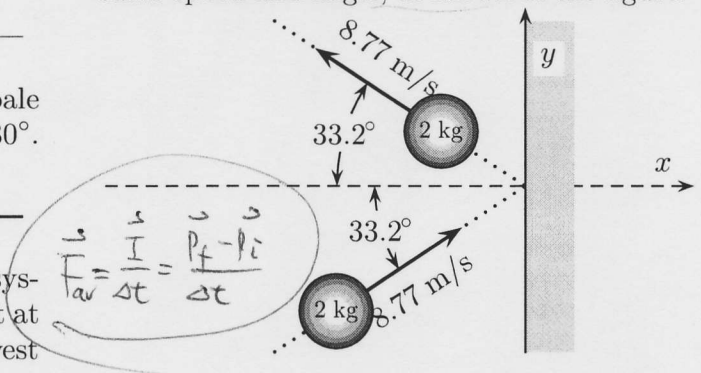
A ball of mass 0.4 kg is initially at rest on the ground. It is kicked and leaves the kicker's foot with a speed of 5.0 m/s in a direction 60° above the horizontal.

The magnitude of the impulse $\|\vec{I}\|$ imparted by the ball to the foot is most nearly

1. $\|\vec{I}\| = \dfrac{2}{\sqrt{3}}$ N s.
2. $\|\vec{I}\| = 2$ N s.
3. $\|\vec{I}\| = 4$ N s.
4. $\|\vec{I}\| = 1$ N s.
5. $\|\vec{I}\| = \sqrt{3}$ N s.

007 10.0 points

A 2 kg steel ball strikes a wall with a speed of 8.77 m/s at an angle of 33.2° with the normal to the wall. It bounces off with the same speed and angle, as shown in the figure.



If the ball is in contact with the wall for 0.15 s, what is the magnitude of the average force exerted on the ball by the wall? Answer in units of N.

008 10.0 points

A barefoot field-goal kicker imparts a speed of 53 m/s to a football initially at rest.

If the football has a mass of 0.29 kg and the time of contact with the ball is 0.032 s, what is the force exerted by the ball on the kicker's foot? Answer in units of N.

009 10.0 points

A child bounces a 45 g superball on the sidewalk. The velocity change of the superball is from 23 m/s downward to 12 m/s upward.

If the contact time with the sidewalk is 1/800 s, what is the magnitude of the force exerted on the superball by the sidewalk? Answer in units of N.

010 (part 1 of 2) 10.0 points

In a particular crash test, an automobile of

mass 1252 kg collides with a wall and bounces back off the wall. The x components of the initial and final speeds of the automobile are 20 m/s and 3 m/s, respectively.

If the collision lasts for 0.1 s, find the magnitude of the impulse due to the collision. Answer in units of kg · m/s.

$$\vec{I} = \vec{p}_f - \vec{p}_i$$

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011 (part 2 of 2) 10.0 points

Calculate the magnitude of the average force exerted on the automobile during the collision. Answer in units of N.

$$\vec{F} = \frac{\vec{I}}{\Delta t}$$

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012 10.0 points

A(n) 4.9 lb hammer head, traveling at 5.7 ft/s strikes a nail and is brought to a stop in 0.00071 s.

The acceleration of gravity is 32 ft/s^2.

What force did the nail receive? Answer in units of lb.

$$\vec{F} = \frac{\vec{p}_f - \vec{p}_i}{\Delta t}$$

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013 (part 1 of 2) 10.0 points

A force of 3.21 N acts on a(n) 5.8 kg object for 23.6 s. What is the object's change in momentum? Answer in units of N · s.

$$\vec{I} = \vec{F}\,\Delta t = \vec{p}_f - \vec{p}_i$$

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014 (part 2 of 2) 10.0 points

What is its change in velocity? Answer in units of m/s.

$$\vec{p}_f = m\vec{v}_f$$

$$\vec{p}_i = m\vec{v}_i$$

$$\therefore \vec{p}_f - \vec{p}_i = m(\vec{v}_f - \vec{v}_i)$$