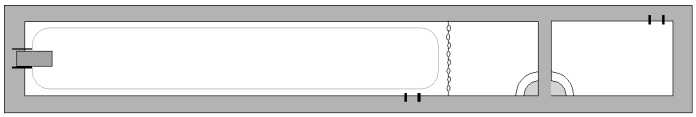
PhyzSpringboard: Take a Flying Leap



CHANGING MOMENTUM

1. When a stationary baseball is hit by a bat, an impact force significantly changes the ball's momentum.

2. When an ocean-going oil-tanker coasts to a stop before arriving at port, a force significantly changes the ship's momentum.

3. Since we use *p* to represent **momentum**, how could we denote the **change** in momentum of an object?

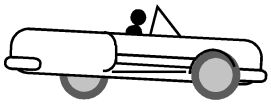
4. We also have a **term** for change in momentum. It is

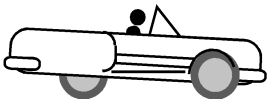
_____.

5. Equations:

MOMENTUMOUS OCCASIONS

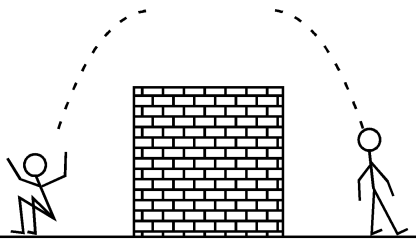
1. Which activity would require more impulse?
___ accelerating a soccer ball from rest to 10 m/s
___ accelerating a medicine ball from rest to 10 m/s
___ same for both
Explain.





2. Which activity would require more impulse?
___ slowing a car from 60 mph to 40 mph
___ slowing the same car from 40 mph to 10 mph
___ same for both
Explain.

3. Which activity would require more impulse?
___ landing from a jump while flexing the legs (bending at the knees)
___ landing from a jump while keeping the legs straight (locking knees)
___ same for both
Explain.



NEWTON REVISITED

1. Write Newton's second law of motion as he **originally** wrote it.

2. Rewrite that expression, solving for impulse.

3. Which method of landing from a jump involves the greater impulse (the greater change in momentum)?
___ flexing the legs ___ locking the legs ___ same for both

4. In light of this, why is it better to flex the legs when landing from a jump?

5. Discuss the two impulses described in the "Changing Momentum" section above.

FLYING LEAPS

1. Felix and Digby are into extreme adventures. They want to jump off a high bridge in New Zealand. And live to do it again sometime. They agree they should tie one end of a cord of some sort around their waist and attach the other end to the bridge. Felix says they should use a stretchy, rubber (bungee) cord. Digby says they should use a strong metal cable. Who's right and why?

2. What is the "physics reason" for padding dashboards?

3. When do pole vaulters and film stunt artists employ this kind of physics?