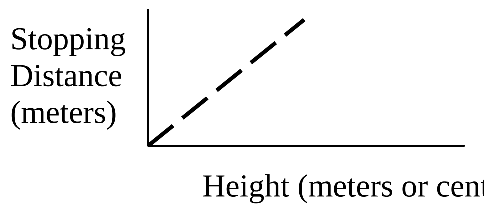
“Conserving Energy” Answers

PROCEDURE:

4. The greatest height should have moved the cup the most, done the most work on the cup.

QUESTIONS:

1) Your graph should have shown a linear relationship.



This means the data is related in the following way: The greater the height from which the ball is released, the greater the stopping distance is.

2) Start with conservation of energy: gravitational potential energy at the top becomes kinetic energy at the bottom.

GPE = KE

$mgh = ½ mv^2$ (mass cancels)

$gh = ½ v^2$

We need to solve for v, so multiply each side by 2; this will get rid of the ½ on the right side of the equation.

$2gh = v^2$

$v^2 = 2gh = 2(9.81\ m/s^2)(0.42\ m) = 8.24\ m^2/s^2$ (if height from floor to ramp was 42 cm)

Now we need to take the square root of the number and the units.

v = 2.87 m/s

3) Same process as question 2.

4) This is how to convert m/s to mph.

$$\frac{2.87\ m}{s} \times \frac{3600\ s}{1\ hr} \times \frac{1\ mile}{1609\ m} = \frac{6.42\ mile}{hr} = \mathbf{6.42\ mph}$$

5) The ball did **not** have the speeds you calculated because energy was not truly conserved. Friction between the ball and the ramp, any bounce, and the energy that became rotational energy of the ball took energy from your system.

6) No, you do not need the mass. It cancels in the equation because conservation of energy assumes no outside forces (air resistance, friction, etc.) acting on your system; when energy is conserved, all masses are accelerated downward at the same rate.

7) Less Height → Less GPE → Less KE → Less velocity

More Height → More GPE → More KE → More velocity