Kinetic Movement Worksheet

example answers

In your group, choose one person to be the test subject, another to watch the scale, and another to record measurements and values.

Walking

1. Measure the mass of the test subject (in kg).

m = 60 kg

2. Have the test subject walk across the scale.

    a. What is the maximum weight recorded?

W = 120 N

    b. Calculate the maximum force exerted on the scale, using Newton's second law.

F = m * a = m * g
F = 120 kg * 9.8 m/s
F = 1176 N

3. Assuming that the impact of the foot with the ground takes 0.02 seconds, calculate the impulse of the step.

I = F * t
I = 1176 N * 0.02 s
I = 24 N * s

4. Calculate the impact velocity of the shoe with the ground.

I = m * Δv
Δv = I / m
Δv = 24 N * s / 60 kg
Δv = 0.4 m/s

Running

1. Have the test subject jog across the scale. What is the maximum mass~~weight~~ recorded (in kg)?

$$\textbf{W = 240 kg}$$

2. Calculate the maximum force using Newton's second law.
   How does this force compare to that of walking?

$$\textbf{F = m * a = m * g}$$
$$\textbf{F = 240 kg * 9.8 m/s}$$
$$\textbf{F = 2,352 N}$$

3. Assuming that the impact takes 0.02 seconds, calculate the impulse of the step.

$$\textbf{I = F * t}$$
$$\textbf{I = 2,352 N * 0.02 s}$$
$$\textbf{I = 47 N * s}$$

4. Calculate the impact velocity of the shoe with the ground.
   How does the impact velocity compare to that of walking?

$$\mathbf{\Delta v = I / m}$$
$$\mathbf{\Delta v = 47 N * s / 60 kg}$$
$$\mathbf{\Delta v = 0.78 m/s}$$