Shannon Chen

Mr. Kerr

AP physics 1

9/30/15

Jumping and launching tweety

Question:

Do we need more force to jump or to launch tweety?

Hypothesis:

I think we need more force to jump.

Materials:

-Meter stick

-Rubber band

-Scale

-Tweety

-Timer

Procedure:

<Jumping lab>

1. Jump vertically besides a meter stick
2. Measure the time you need to jump from the ground and you land on the ground, also measure the height that you jump

<Tweety lab>

1. Use a paper to fold a tweety
2. Measure the mass of the tweety
3. Measure the height you launch the tweety and measure the distance that you pull back the tweety
4. Launch the tweety
5. Measure the distance between the spot that tweety leave the rubber band and the spot that the tweety drop on the ground

Result:

<Jumping>

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average
Time (s)	0.091	0.061	0.084	0.072	0.060	0.074
Height (m)	0.430	0.410	0.355	0.340	0.330	0.373

<Tweety>

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average
Distance (m)	0.790	0.850	0.970	0.860	0.930	0.880

*Distance that the tweety stays on the rubber band: 3.5cm *Height:23.5 cm

Sample Calculations:

<Jumping>

Using time:

$$\Delta y = v_0 t + \frac{1}{2} g (\frac{t}{2})^2$$

$$\Delta y = 0 + \frac{1}{2} \cdot 9.80 \cdot (\frac{0.074}{2})^2$$

$$\Delta y = 0.0067$$

$$v^2 = {v_0}^2 + 2a(x - x_0)$$

$$0^2 = {v_0}^2 + 2 \cdot (-9.80)(0.0067)$$

$$v_0 = 0.36$$

$$v = v_0 + at$$

$$0 = 0.36 + a \cdot 0.074$$

$$a = -4.8(m/s^2)$$

$$F = ma$$

$$F = 50.0 \cdot 4.8$$

$$F = -240N$$

<Jumping>

Using distance:

$$v^2 = {v_0}^2 + 2a(x - x_0)$$

$$0 = {v_0}^2 + 2(-9.80)(0.373)$$

$$v_0 = 2.70$$

$$v = v_0 + at$$

$$0 = 2.70 + a(0.056)$$

$$a = -48.2(m/s^2)$$

$$F = ma$$

$$F = 50\ .0 \cdot -48.2$$

$$F = -2410\text{N}$$

<tweety>

$$y = y_0 + v_0 t + \frac{1}{2} a t^2$$

$$0 = 0.235 + 0 - \frac{1}{2} \cdot 9.80 t^2$$

$$t = 0.218$$

$$\frac{\Delta x}{\Delta t} = \frac{0.880}{0.218} = 4.03\ {}^{m}/_{s}$$

$$4.03^2 = 0^2 + 2a(0.035)$$

$$a = 232\ {}^{m}/_{s^2}$$

$$F = ma$$

$$F = 0.0011 * 232$$

$$F = 0.26N$$

Discussion:

According to our data, we found that we have different result of using distance to calculate and using time to calculate. We might have some errors in the experiment. We only use our eyes to measure the height and because we move quickly, we can't really no the accurate height. Also, we cannot measure the time accurate because we can't start timing at the same time that we jump and we land. For the tweety experiment, we did not launch the tweety straight that the actual distance might be longer than we measured.

Conclusion:

We need more force to jump that to launch tweety. If we do the lab again, we should change the way that we measure the time and the height of the jumping experiment. We can use a camera to record the time and the height that we jump, its more accurate that using eyes. For the tweety lab, we should launch it on the sand to see the spot that we need to measure clearly.