

Movie Analysis: How Tall are Niagara Falls?

Purpose: To analyze the physics of a scene from the movie *Superman II*.

Procedure:

1. Watch the movie clip once to familiarize yourself with all the action.
2. Watch it a second time, but this time use a stop watch to record the time the little boy falls.

Data:

Time Little Boy Falls: _____ seconds

Calculations:

1. If the boy had fallen for the amount of time shown in the movie: How far would he have fallen?
 - a. What would be the acceleration of the boy during the catch?
 - b. How many times greater than the acceleration due to gravity is this acceleration?
 - c. How “happy” would the little boy (and his mother) be if that really happened?
2. How fast would the little boy be moving when Superman catches him?
3. When Superman finally catches the boy, it only takes a fraction of a second to stop the boy from falling. Let's call it 0.5 seconds to stop the little boy.
 - a. What would be the acceleration of the boy during the catch?
 - b. How many times greater than the acceleration due to gravity is this acceleration?
 - c. How “happy” would the little boy (and his mother) be if that really happened?
4. In reality, Niagara Falls is only 53.6 meters high.
 - a. How many seconds would it take to fall that distance?
 - b. How fast would an object be going at the bottom?
5. In reality, people's acceleration while they fall isn't a constant 10 m/s^2 . (Why?) After about 30 seconds, people will have reached what is called *terminal speed* – and then fall with a constant speed.
 - a. If the little boy had fallen 53.6 meters in the time you measured, what would be his average speed?
 - b. How does this compare to a person's terminal speed of about 50 m/s?