

The Elevator Ride

Problem: Why do you feel heavier or lighter when riding in an elevator?

Materials: 1 kg mass
20 N spring balance
Masking tape

Procedure:

1. Imagine that you take an upward elevator ride. Write a few sentences describing when you feel normal, heavier than normal, and lighter than normal. Repeat for a downward elevator ride.
2. Hold the 1-kg mass in your hand and give it an upward elevator ride. Describe when the mass feels normal, heavier than normal, and lighter than normal.
3. Hold the mass in your hand and give it a downward elevator ride. Describe when the mass feels normal, heavier than normal, and lighter than normal.
4. Securely tape the mass to the hook on the spring scale. Caution: A falling mass can cause serious damage to feet or toes.
5. Start with the mass just above the floor and take it on an upward and then a downward elevator ride.
6. When you have completed the lab, unwrap the tape and throw it away. Put away the mass and the spring scale.

Data and Observations:

1. Watch the spring scale and record the readings for different parts of the ride.

Analyze and Conclude:

1. Identify those places in the ride when the spring scale records a normal value for the mass. Describe the motion of the mass. Are the forces balanced or unbalanced?
2. Identify those places in the ride when the spring scale records a heavier value. Which direction is the F_{net} ? Which direction is the acceleration?
3. Identify those places in the ride when the spring scale records a lighter value. Which direction is the F_{net} ? Which direction is the acceleration?

Apply:

1. Based on the trends in your data, predict how riding in an elevator while standing on a scale will affect your weight measurement. Try it (see attached sheet for instructions), and describe the forces on you.
2. Do you feel heavier or lighter when riding on an escalator? Explain your answer in terms of the motion and the forces.
3. Identify the places on a roller coaster where you feel heavier or lighter. Explain your answer in terms of the motion and the forces.

Elevator Lab extension

Name: _____

1. What is your weight in pounds?
2. What is your weight in Newtons? (1 pound = 4.448 221 628 Newton)
3. What is your mass in kg? (1kg = 2.205 lbs)
4. Ride the elevator and carefully watch your weight reading on the scale.

Weight	Beginning going up	Slowing at top	Beginning going down	Slowing at bottom
pounds				
Newtons				

5. What would the acceleration of the elevator have to be for you to feel weightless?
6. What force would the scale have to exert on you for you to feel weightless?
7. Did your readings agree with the lab discussion we had on the elevator lab?