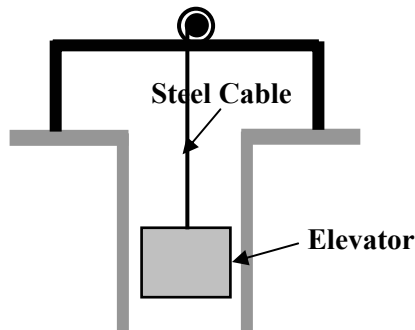


## Newton's Second Law Mental Models: Mechanics, horizontal &amp; vertical contexts



A woman applies a *constant* horizontal force on a large box causing it to move forward at a *constant* speed. For the statements below, indicate your choice by circling the corresponding letter, **a** to **d**.

1. The force applied by the woman is...
  - (a) greater than the force of friction.
  - (b) equal to the force of friction.
  - (c) less than the force of friction.
  - (d) None of the above.
2. If the woman *doubles* the force that she applies, then the...
  - (a) speed of the box increases until it reaches twice the original speed.
  - (b) speed of the box will quickly double.
  - (c) box will speed up continuously.
  - (d) None of the above.
3. If another identical box is placed on top of this box, and the woman applies the original force, then the two boxes would...
  - (a) move at half their original speed.
  - (b) slow to a *stop*.
  - (c) move slower until their speed is half their original speed.
  - (d) None of the above.



An elevator suspended by a cable in a shaft can move freely *without any friction*. For the statements below, indicate your choice by circling the corresponding letter, **a** to **d**.

1. If the elevator is moving up at a constant speed, then the upward force by the cable is...
  - (a) equal to the downward force of gravity.
  - (b) greater than the downward force of gravity.
  - (c) less than the downward force of gravity.
  - (d) None of the above.
2. If you double the force by the cable, the...
  - (a) speed of the elevator will double.
  - (b) elevator will speed up continuously.
  - (c) elevator will speed up until it get to double the original speed.
  - (d) None of the above.
3. If the elevator is speeding up, then the force by the cable is...
  - (a) constant but greater than the force of gravity.
  - (b) steadily increasing with time.
  - (c) constant but smaller than the force of gravity.
  - (d) None of the above.