

**Newton's Second Law Problem-Solving**

Study from **Lessons 3** of the **Newton's Laws** chapter at **The Physics Classroom**:

<http://www.physicsclassroom.com/Class/newtlaws/u213c.html>

<http://www.physicsclassroom.com/Class/newtlaws/u213d.html>

For the following problems, construct a free-body diagram and show your work clearly.

1. A rightward force of 302 N is applied to a 28.6-kg crate to accelerate it across the floor. The coefficient of friction between the crate and the floor is 0.750. Determine the acceleration of the crate.
2. During a football workout, two linemen are pushing the coach on the sled. The combined mass of the sled and the coach is 300 kg. The coefficient of friction between the sled and the grass is 0.800. The sled accelerates at a rate of 0.580 m/s/s. Determine the force applied to the sled by the lineman.
3. A 405-N rightward force is used to drag a large box across the floor with a constant velocity of 0.678 m/s. The coefficient of friction between the box and the floor is 0.795. Determine the mass of the box.
4. A  $6.58 \times 10^3$  N upward tension force is exerted on a 521-kg downward-moving freight elevator.  
(a) Determine the acceleration of the elevator. (b) Determine the distance traveled in 2.83 seconds.
5. A falling skydiver is accelerating in the downward direction at 3.29 m/s/s. The mass of the skydiver (including parachute gear) is 67.2 kg. Determine the air resistance force on the skydiver (and accompanying parachute).

6. A 67.2-kg falling skydiver opens his parachute and instantly slows down at a rate of  $7.2 \text{ m/s/s}$ . Determine the air resistance force on the skydiver (and accompanying parachute).
  
7. A basketball star exerts a force of 3225 N (average value) upon the gym floor in order to accelerate his 76.5-kg body upward. (a) Determine the acceleration of the player. (b) Determine the final speed of the player if the force endures for a time of 0.150 seconds.
  
8. A hockey player accelerates a puck ( $m = 0.167 \text{ kg}$ ) from rest to a velocity of  $50 \text{ m/s}$  in 0.0121 sec. Determine the acceleration of the puck and the force applied by the hockey stick to the puck. Neglect resistance forces.
  
9. Determine the force that must be applied to accelerate a 13.5-kg box across a horizontal surface ( $\mu=0.453$ ) at a rate of  $1.28 \text{ m/s/s}$ .
  
10. A 1.82-kg Physics book is set in motion across the floor with an initial speed of  $3.25 \text{ m/s}$ . The coefficient of friction between the book and the floor is 0.719.  
(a) Determine its acceleration. (b) Determine the time elapsed before it comes to a stop.