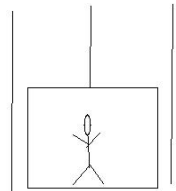


Unit 5 Problem Set 1: $\Sigma F = ma$

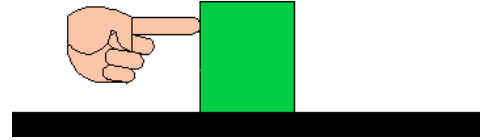
Work out each of the following on a separate sheet of paper. Follow the four steps.

1. Draw Force Diagram
2. Write $F_{\text{net}} = ma$
3. Identify forces which affect acceleration
4. Plug in and solve.

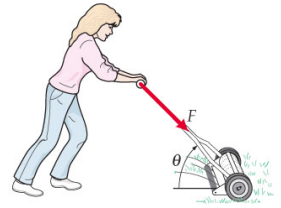
1. A 4741 kg helicopter accelerates upward at 3 m/s^2 . What lift force is exerted by the air on the propellers?
2. A grocery bag can withstand 250 N of force without ripping. Suppose a bag is filled with 22.7 kg of groceries and lifted with an acceleration of 4.7 m/s^2 . Find the amount of force on the bag by the groceries (F_n). (Remember if its more than 250 N, then the bag would rip.)
3. A student standing on a scale in an elevator at rest sees that it reads 696 N. As the elevator rises, the scale reads 794 N. Find the acceleration of the elevator. (Hint: The scale tells you how much normal force there is.)
4. A sign in an elevator states that the maximum occupancy is 20 persons. Suppose safety engineers assume the mass of an average person is 72 kg. The elevator itself has a mass of 543 kg. The supporting cable can tolerate a maximum forces of 31104 N. What is the greatest acceleration the elevator's motor can produce without snapping the cable?



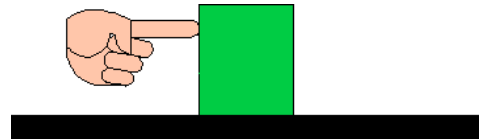
5. How much force would you need to apply to a 15 kg box on a level surface in order to accelerate it at 4.1 m/s^2 ? Assume there is no friction.



6. A student pushes a 14.4 kg lawnmower. The handle makes a 26 degree angle with the ground as shown. If the friction is 68 N, find how much force the student must apply to the lawnmower in order to accelerate in at 2.9 m/s^2 .



7. A 25 kg box is pushed across the level ground with a horizontal force of 185 N. As a result it accelerates at 2 m/s^2 . How much friction must be present?



8. A book is tossed across the floor. It slows with an acceleration of 2.3 m/s^2 . If the friction force is 29.4 N, find the mass of the book.