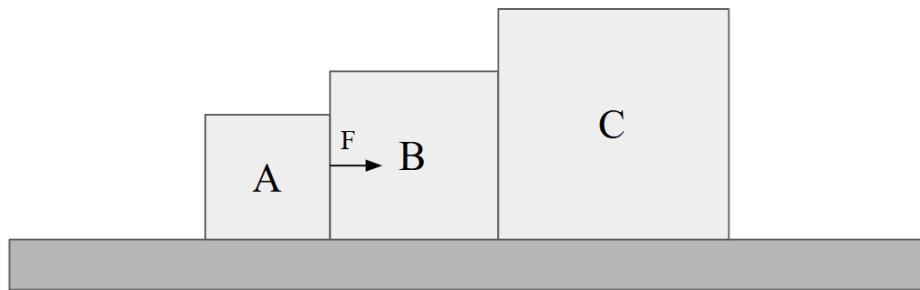


## Newton's Laws

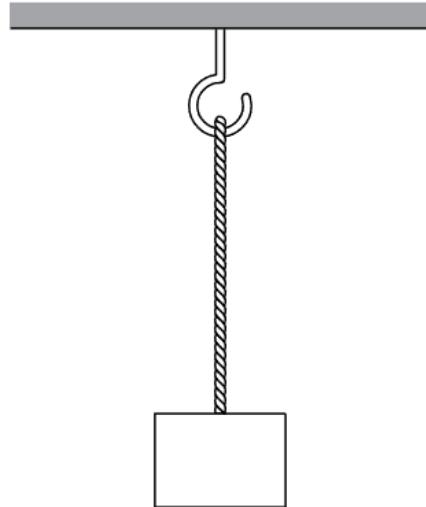
- Three blocks  $A$ ,  $B$ , and  $C$  are in contact with each other, and they are at rest on a horizontal surface with negligible friction. The mass of the blocks are given by  $m_A$ ,  $m_B$  and  $m_C$  respectively. A force pushes block  $A$  to the right, and block  $A$  exerts a force of magnitude  $F$  newtons on  $B$ . Find the acceleration of each block in terms of  $F$  and the three masses



- Bob pushes a block of mass  $m$  with a constant force of magnitude  $F$  newtons. Once the block travels  $x$  meters, Bob calculates the velocity at that point to be  $v$ . Suppose Bob were to repeat the experiment, keeping  $F$  and  $x$  the same, but decreasing  $m$  by a factor of 2. Write what the new final velocity of the block would be in terms of  $v$ .

3. A block hangs vertically by a rope, with uniform density, attached to a hook as shown. Assuming the weight of the rope is **not** negligible. Draw free-body diagrams for each of the following points:

- (a) The point of the rope attached to the hook
- (b) The middle of the rope
- (c) The end of the rope attached to the weight
- (d) The center of the weight



4. A passenger in the backseat of a car is thrust to the side of the car when the car takes a sharp turn. Ignoring the friction of the passenger's seat, draw a free-body diagram of the passenger. What newtonian law and physical property is guiding his motion?

5. Suppose you were to bring a drone into an elevator and cause it to hover at a constant height from the ground. What would happen if this drone kept hovering as the elevator rose up to a higher level?