Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Guided Notes: Momentum

* All moving objects have what Newton called a “quantity of motion.”
* What is this quantity of motion?
  + Today we call it \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + Momentum is a characteristic of a moving object that is related to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the object.
* The momentum of a moving object can be determined by multiplying the object’s mass and velocity.
  + Momentum = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ x \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Since mass is measured in kilograms and velocity is measured in meters per second, the unit for momentum is kilogram-meters per second (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_).
  + Like velocity, acceleration, and force, momentum is described by its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as well as its quantity.
* The momentum of an object is in the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_as its velocity.
* The more momentum a moving object has, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_it is to stop.
  + The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of an object affects the amount of momentum the object has.
  + For example, you can catch a baseball moving at 20 m/s, but you cannot stop a car moving at the same speed.
    - The car has more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_because it has a greater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of an object also affects the amount of momentum an object has.
  + For example, an arrow shot from a bow has a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_momentum because, although it has a small mass, it travels at a high velocity.
* Which has more momentum: a 3.0 kg sledgehammer swung at 1.5m/s, or a 4.0 kg sledgehammer swung at 0.9 m/s?

Read and Understand

* What information are you given?
  + Mass of smaller sledgehammer = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Velocity of smaller sledgehammer = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Mass of larger sledgehammer = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Velocity of larger sledgehammer =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Plan and Solve

* What quantities are you trying to calculate?
  + The momentum of each sledgehammer
* What formula contains the given quantities and the unknown quantity?
  + Momentum = Mass x Velocity

Perform the calculations

* Smaller sledgehammer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Larger sledgehammer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Practice Momentum Problems

1. A golf ball travels at 16 m/s while a baseball moves at 7 m/s. The mass of the golf ball is 0.045 kg and the mass of the baseball is 0.14 kg. Which has a greater momentum?
2. What is the momentum of a bird with a mass of 0.018 kg flying at 15 m/s?

Conservation of Momentum

* In everyday language, conservation means \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_resources.
  + You might conserve water or fossil fuels, for example.
* The word conservation has a more specific meaning in physical science.
  + In physical science, conservation refers to the conditions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_some event
  + An amount that is conserved is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_amount after an event as it was before.
  + The total amount of momentum objects have is conserved when they \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Momentum may be transferred from one object to another, but none is lost.
  + This fact is called the law of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of momentum.
  + The law of conservation of momentum states that, in the absence of outside \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the total momentum of objects that interact does not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + The amount of momentum is the same before and after they interact.
* The total momentum of any group of objects remains the same, or is conserved, unless outside forces act on the objects.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is an example of an outside force.