Momentum is described as a "**quantity of motion**" by Isaac Newton. It involves how much motion you are carrying in a certain direction and is closely related to **inertia**, but involves velocity as well. Examples: Supose a baseball and a bowling ball were both thrown at you with the same velocity.... which would you rather catch? The one with less momentum, of course. If two baseballs were both pitched to you, one by my 7 year old and one by a Major League pitcher, which would you rather catch bare-handed? Again, the one with then least momentum. In the first instance, the difference was in the mass of the two objects; in the second, it was the velocity with which the objects were moving, so our two momentum factors are **mass** and **velocity**. Velocity, of course, includes a **DIRECTION**, so momentum is a vector term, the direction of which is **very** important. Our formula is $\mathbf{p = mv}$ with the unit of "p" being $\mathbf{kg \cdot m/s}$ since **m** is in kg and **v** is in m/s. Another way of writing momentum's unit is **Ns**, which stands for Newton-seconds. Why does this unit work as well?

How much momentum you have is only changed by a **force** acting for a **time period** on you. We call this an **impulse**. Impulses cause a **change** in momentum, or $\mathbf{\Delta p}$. (Δ stands for "change in") Since momentum is made of mass and velocity, it is generally your velocity that undergoes the change during an impulse, not your mass, so $\mathbf{\Delta p = m\Delta v}$, and since the impulse is caused by a force acting for a time period, $\mathbf{\Delta p = Ft}$. Throwing them all together, we get: $\mathbf{Ft = m\Delta v = \Delta p}$
How much momentum does a car of mass 842 kg have when it's parked in your driveway? How much when it goes 15 m/s?

$\mathbf{p = mv}$, so p = 842 * 0 = zero when parked. p = 842 * 15 = 12630 = 13000 Ns

If another 842 kg car is going 15 m/s the **other** direction and they hit head-on, what will happen? How much total momentum is there when you add BOTH cars?

The momentum of car 2 is -13000 Ns, [(-) since it is going in the opposite direction.] We assume that since they have equal, but opposite momentums, when they hit, they should cancel each other out, and both will stop. Since cars are not designed to bounce, this will probably occur. If we add both cars' momentums together, we get 13000 + (-)13000 = 0, which predicts that this would occur. Before the collision, both cars have momentum, but the TOTAL momentum of the 2 cars was zero, since one was positive and one was negative.