At time t=0, a small asteroid is at position $\vec{r}_0$, travelling with velocity $\vec{v}_0$. According to Conservation of Momentum, the position of the asteroid at time t will be

A) $\vec{r}_0$

B) $\vec{v}_0 t$

C) $\vec{r}_0 + m\vec{v}_0$

D) $\vec{r}_0 + \vec{v}_0 t$

E) $\vec{r}_0 + m\vec{v}_0 t$

Extra: be prepared to give a clear argument for your answer that uses the law of conservation of momentum.

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The interstellar space-fishing regulations state that only space-salmon with mass of more than 2kg may be caught. Come up with a method to determine the mass of a fish in outer space. Bringing the fish back to Earth and weighing it is not allowed.

Point of information: space-salmon are small spherical objects indistinguishable from rocks.

After shooting a pea at an initially stationary object, the object is found to have velocity v. How many peas do we need to shoot at an object with twice the mass to achieve the same final velocity?

A) 1 B) 2 C) 4 D) cannot be determined.

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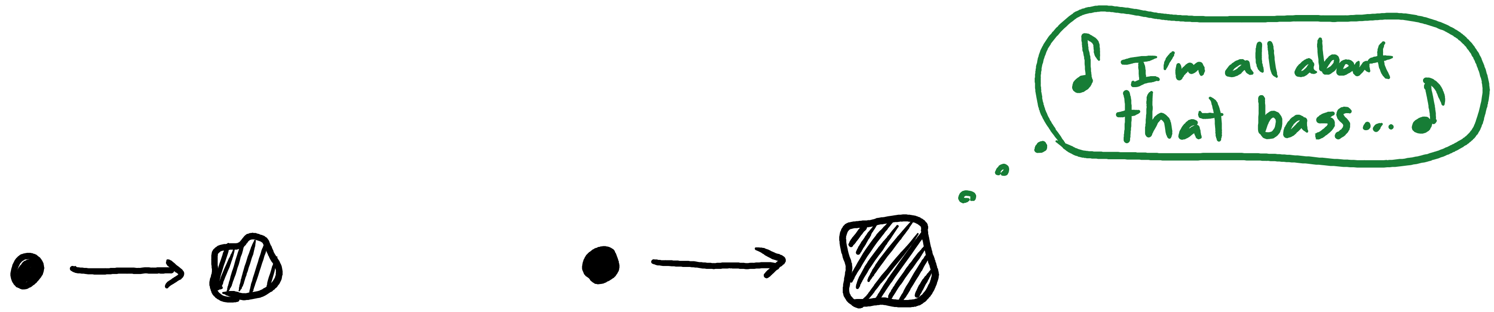

Somewhere in outer space, two identical space-rocks each collide (at identical velocity) with two different asteroids, one twice as heavy as the other. If the rocks bounce off at the same speed in each case, which asteroid has a larger change in momentum?

A) The lighter asteroid
B) The heavier asteroid
C) The change is the same

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Total momentum is conserved. Therefore, in each case, the change in momentum of the asteroid must be the negative of the change of momentum of the rock. The change in the momentum of the rock is the same in each case, so the change in the asteroid momentum is the same in each case.