Module 5: Impulse and Momentum
Topic 3 Content: Conservation of Momentum Problem Solutions

Practice problems related to the Conservation of Momentum.

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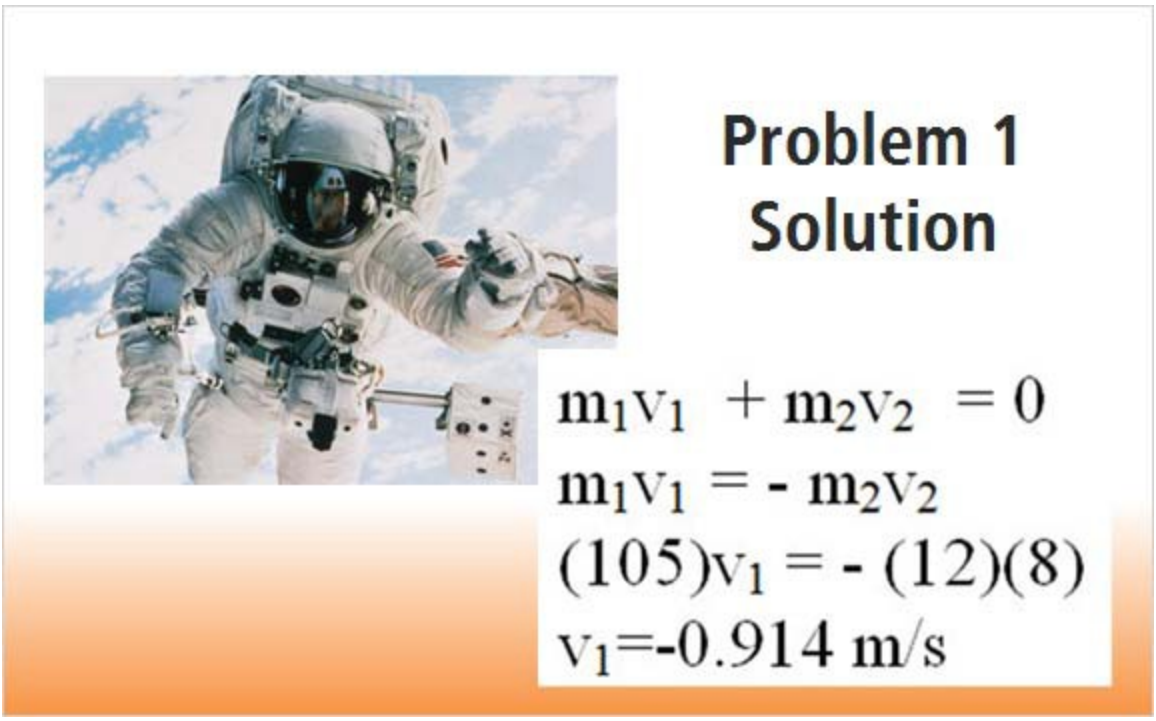
Problem 1:

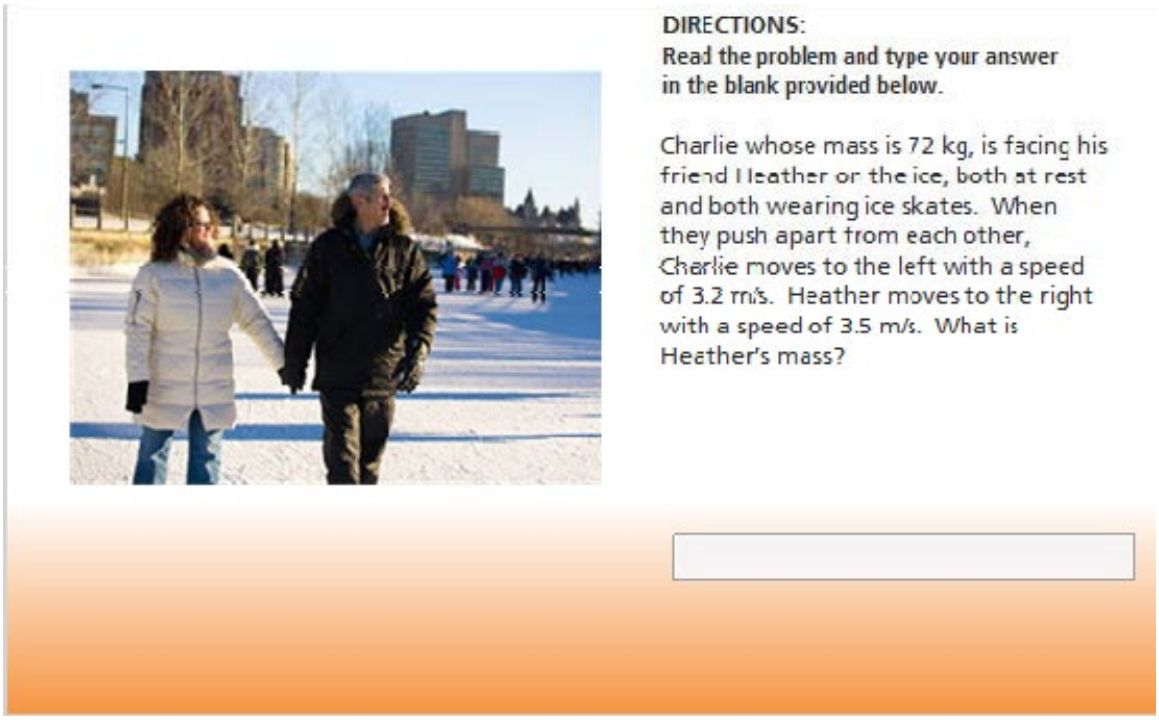
A one hundred five kilogram astronaut with his twelve kilogram tool kit floats near the open bay doors of the space shuttle. Unfortunately, he realizes he forgot to attach his tether and can't get back to the shuttle. Remembering his studies of physics, the astronaut decides to toss his tools at a speed of 8 m/s away from the shuttle. With what speed does the astronaut now move towards the shuttle after throwing the tools?



Problem 1 Solution:

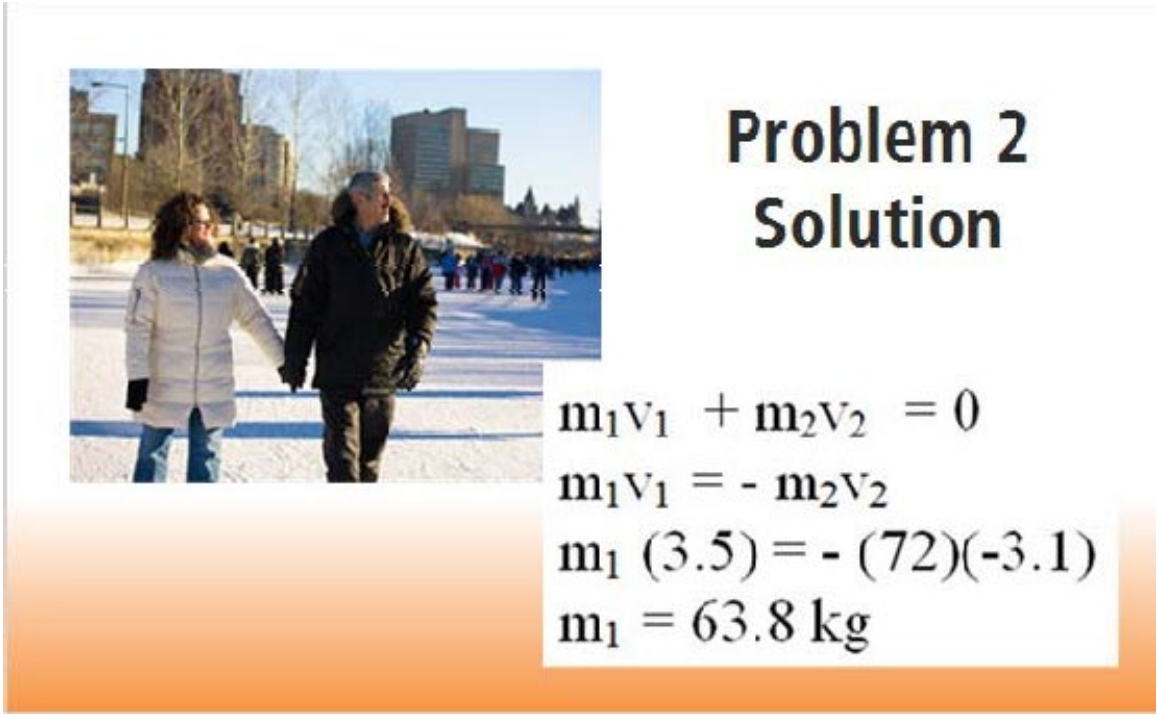
Since the astronaut and the tool kit start at rest you know that after the throw the total momentum is zero. The momentum of the tool kit is equal in magnitude and opposite in direction to the momentum of the astronaut. So you can write m one v one equals negative m two v two.

Substituting the mass of the astronaut for m one and the mass and velocity of the toolkit for m two and v two, you find that the velocity of the astronaut is negative zero point nine one four meters per second. The negative tells us that his speed is point nine one four meters per second in a direction opposite to that of the tool kit.



Problem 2:

Charlie, whose mass is seventy two kilograms, is facing his friend Heather on the ice, both at rest and both wearing ice skates. When they push apart from each other, Charlie moves to the left with a speed of three point two meters per second. Heather moves to the right with a speed of three point five meters per second. What is Heather's mass?



Problem 2 Solution:

Since they start at rest, their initial momentum is zero, so after the push, they must have equal and opposite momentum. You can therefore write m one v one equals negative m two v two. You can substitute Heather's velocity for v one and Charlie's mass and velocity for m two and v two. You write negative three point one for Charlie's velocity, as you typically assign left to be negative,. Solving, you see that Heather's mass must be sixty three point eight kilograms.