Momentum Team Problems

Fun With Fiziks

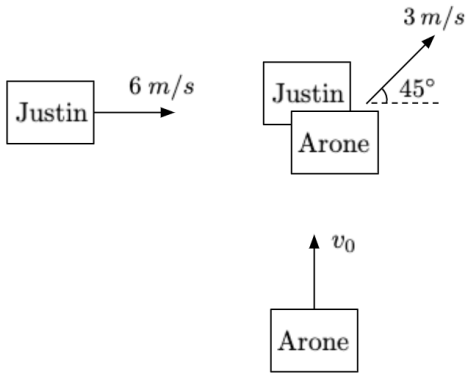
July 12, 2022

Practice Problems

1. Erica and Jonathan are driving two trucks. Erica is traveling at $10\,m/s$ and Jonathan is traveling at $2\,m/s$ towards her. Assume that Erica and Jonathan's trucks have the same mass. Unfortunately, they crash and stick together after the collision. How fast are they moving?

2. At Taekwondo practice, Chris brings leg pads to protect her legs from getting hit. If a big $0.5\,kg$ wooden stick traveling at $12\,m/s$ gets stopped by her leg pads in $2\,s$, what is the force on her leg?

3. Justin weighs $60\,kg$ and is biking at $6\,m/s$ in the middle of the road. A car suddenly appears behind him. To save Justin from getting ran over, Arone sprints and tackles Justin out of the way from the side, as shown in the diagram. After they collide, Justin and Arone stick together and move at $3\,m/s$ at a $45°$ angle. What is Arone's required mass and velocity?



4. You might remember a similar problem from when we did energy. A $1000\,kg$ rocket ship is moving at $10\,m/s$, which is way too slow! To travel faster, the astronauts turn on the rocket engine, which provides $100\,N$ of thrust. After the rocket moves for $10\,s$, how fast is it traveling?

5. In a physics lab, Luke has two carts A and B, where A is $3\,kg$ and B is $1\,kg$. Initially, A travels at $1\,m/s$ to the right and B travels at 2 to the left. After the collision, A travels at $0.5\,m/s$ to the left and B travels at v_f to the right. What is v_f?

6. Luke and his friends went to see fireworks. A firework can be simplified to a particle that is launched straight up. When it reaches the top of its trajectory, the firework explodes into 3 smaller red, white, and blue particles of equal mass. The red particle moves at $10\,m/s$ straight up. The white particle moves at $10\,m/s$ to the right. What is the velocity and direction of the blue particle?