Answer on Question 71086, Physics, Mechanics, Relativity

Question:

A $6.9\ kg$ bowling ball is initially at rest. If a $13\ N$ force acts on it for $0.14\ s$, what is the final velocity of the bowling ball?

Solution:

We can find the final velocity of the bowling ball from the definition of the impulse. As we know, the impulse is equal to the change in momentum:

$$J = \Delta p = m\Delta v = F\Delta t,$$

here, J is the impulse, Δp is the change in momentum, m is the mass of the bowling ball, $\Delta v = v - v_0$ is the change in velocity, $v_0 = 0$ is the initial velocity of the bowling ball, v is the final velocity of the bowling ball, F is the force acting on the bowling ball, Δt is given amount of time in which the force acting on the bowling ball.

Then, from this formula we can find the final velocity of the bowling ball:

$$m(v - v_0) = F\Delta t,$$

$$mv = F\Delta t,$$

$$v = \frac{F\Delta t}{m} = \frac{13\ N \cdot 0.14\ s}{6.9\ kg} = 0.26\ \frac{m}{s}.$$

Answer:

$v = 0.26\ \frac{m}{s}$.