

Answer on Question #60688 – Physics – Mechanics – Relativity

A soccer player, kicking a soccer ball, gives the ball a velocity of +26.8m/s. The mass of the ball is 0.425kg, and the duration of the impact is 1.05×10^{-3} s.

- a) If the ball is to have a greater velocity after being struck, should the contact time with the foot be shorter or longer? Explain your reasoning.

Solution. If a system does not interact with its environment in any way, then certain mechanical properties of the system cannot change. They are sometimes called "constants of the motion". These quantities are said to be "conserved" and the conservation laws which result can be considered to be the most fundamental principles of mechanics. If the system is an isolated system, then the momentum of the system is a constant of the motion and subject to the principle of conservation of momentum. Our system is an isolated system. Using equation for change of momentum soccer ball $m\Delta v$. If the initial velocity equal zero then $m\Delta v = mv$. On the other hand $m\Delta v = F\Delta t$, where F – force and Δt – the duration of the impact. Hence $mv = F\Delta t$
 $\rightarrow v = \frac{F\Delta t}{m}$.

- a) If the ball is to have a greater velocity after being struck, using formula $v = \frac{F\Delta t}{m}$ considering that the force remains unchanged we have the contact time with the foot be longer.

Answer: The contact time with the foot be longer.