## Answer on Question 60149, Physics - Mechanics | Relativity

## Question:

How long will it take a car to accelerate from $50 \mathrm{~km} / \mathrm{hr}$ to $90 \mathrm{~km} / \mathrm{hr}$ if it produces an acceleration of $3 \mathrm{~m} / \mathrm{s}^{2}$ ?

## Solution:

Let's first convert the initial and final velocities of the car from $\mathrm{km} / \mathrm{hr}$ to $\mathrm{m} / \mathrm{s}$ :

$$
\begin{gathered}
v_{i}=\left(50 \frac{\mathrm{~km}}{\mathrm{hr}}\right) \cdot\left(\frac{1000 \mathrm{~m}}{1 \mathrm{~km}}\right) \cdot\left(\frac{1 \mathrm{hr}}{3600 \mathrm{~s}}\right)=13.9 \mathrm{~ms}^{-1} \\
v_{f}=\left(90 \frac{\mathrm{~km}}{\mathrm{hr}}\right) \cdot\left(\frac{1000 \mathrm{~m}}{1 \mathrm{~km}}\right) \cdot\left(\frac{1 \mathrm{hr}}{3600 \mathrm{~s}}\right)=25 \mathrm{~ms}^{-1} .
\end{gathered}
$$

By the definition, acceleration of a car is the rate of change of its velocity:

$$
a=\frac{\Delta v}{\Delta t}=\frac{v_{f}-v_{i}}{t},
$$

here, $v_{f}=25 \mathrm{~ms}^{-1}$ is the final velocity of the car, $v_{i}=13.9 \mathrm{~ms}^{-1}$ is the initial velocity of the car, $a=3 \mathrm{~m} / \mathrm{s}^{2}$ is the acceleration of the car, $t$ is the time that the car needs to accelerate from $13.9 \mathrm{~ms}^{-1}$ to $25 \mathrm{~ms}^{-1}$.

From this formula we can find the time $t$ :

$$
t=\frac{v_{f}-v_{i}}{a}=\frac{25 \mathrm{~ms}^{-1}-13.9 \mathrm{~ms}^{-1}}{3 \mathrm{~ms}^{-2}}=3.7 \mathrm{~s} .
$$

## Answer:

$t=3.7 \mathrm{~s}$.

