Answer on Question 58751, Physics, Mechanics | Relativity

Question:

A commuter backs her car out of her garage with an acceleration of $1.40\ ms^{-2}$.

(a) How long does it take her to reach a speed of $2.0\ ms^{-1}$?

(b) If she then brakes to a stop in $0.80\ s$, what is her deceleration?

Solution:

(a) We can find the time that the commuter's car needs to reach a speed of $2.0\ ms^{-1}$ from the kinematic equation:

$$v_f = v_i + at,$$

here, $v_f = 2.0\ ms^{-1}$ is the final speed of the commuter's car, $v_i = 0.0\ ms^{-1}$ is the initial speed of the commuter's car, a is the acceleration of the commuter's car, t is the time that the commuter's car needs to reach a speed of $2.0\ ms^{-1}$.

Then, from this formula we can find t:

$$t = \frac{v_f - v_i}{a} = \frac{2.0\ ms^{-1} - 0.0\ ms^{-1}}{1.40\ ms^{-2}} = 1.43\ s.$$

(b) We can find the deceleration of the commuter's car from the same kinematic equation: $v_f = v_i + at$, here, $v_f = 0.0\ ms^{-1}$ is the final speed of the commuter's car (when the car brakes to a stop), $v_i = 2.0\ ms^{-1}$ is the initial speed of the commuter's car, a is the deceleration of the commuter's car and t is the time that the commuter's car needs to stop in $0.80\ s$.

Then, from this formula we can find the deceleration of her car:

$$a = \frac{v_f - v_i}{t} = \frac{0.0\ ms^{-1} - 2.0\ ms^{-1}}{0.80\ s} = -2.5\ ms^{-2}.$$

Answer:

(a) $t = 1.43\ s$, (b) $a = -2.5\ ms^{-2}$.