Kinematics Worksheet (Part 1)

Directions: Answer the following motion problems using the kinematic equations. Show all work and circle your final answer.

1. Mary and Cory drive away from a red light at a constant 3 m/s². What is the velocity of their car 15 sec after leaving the red light?

\[ v_f = ? \]
\[ v_i = \frac{0 \text{ m}}{s} \]
\[ a = \frac{3 \text{ m}}{s^2} \]
\[ t = 15 \text{ s} \]
\[ d = xxx \]

\[ v_f = v_i + at \]
\[ v_f = 0 \text{ m/s} + \left( \frac{3 \text{ m}}{s^2} \right) (15 \text{ s}) \]

\[ v_f = 45 \text{ m/s} \]

2. A race car can travel at a maximum velocity of 100 m/s. If a car travels at a constant acceleration from rest for 25 seconds, what is the acceleration of the car if it achieves maximum velocity at 25 seconds?

\[ v_f = 100 \frac{\text{m}}{s} \]
\[ v_i = \frac{0 \text{ m}}{s} \]
\[ a = ? \]
\[ t = 25 \text{ s} \]
\[ d = xxx \]

\[ a = \frac{v_f - v_i}{t} \]
\[ a = \frac{100 \frac{\text{m}}{s} - 0 \frac{\text{m}}{s}}{25 \text{ s}} \]

\[ a = 4 \frac{\text{m}}{s^2} \]

3. A racing car reaches a speed of 40 m/s. At this instant, it begins a uniform negative acceleration, using a parachute and a braking system, and comes to rest 5.0 seconds later. How far did it take the car to come to a complete stop?

\[ v_f = \frac{0 \text{ m}}{s} \]
\[ v_i = 40 \frac{\text{m}}{s} \]
\[ a = xxx \]
\[ t = 5.0 \text{ s} \]
\[ d = ? \]

\[ d = (\frac{v_i + v_f}{2})t \]
\[ d = (\frac{40 \frac{\text{m}}{s} + 0 \frac{\text{m}}{s}}{2})5.0 \text{ s} \]

\[ d = 100 \text{ m} \]

4. If a plane lands on a runway with a velocity of 195 km/h and can decelerate at negative 1.5 m/s², how much time did it take for the plane to come to a stop?

\[ v_f = \frac{0 \text{ m}}{s} \]
\[ v_i = 195 \frac{\text{km}}{h} \]
\[ a = -1.5 \frac{\text{m}}{s^2} \]
\[ t = ? \]
\[ d = xxx \]

\[ v_f = v_i + at \]
\[ t = \frac{v_f - v_i}{a} \]
\[ t = \frac{0 \frac{\text{m}}{s} - 54.17 \frac{\text{m}}{s}}{-1.5 \frac{\text{m}}{s^2}} \]

\[ t = 36.11 \text{ s} \]
5. A bicyclist accelerates from 5.0 m/s to a velocity of 16 m/s in 8.0 seconds. Assuming constant acceleration, what is the displacement of the bicyclist during this time interval?

\[ v_f = 16.0 \text{ m/s} \]
\[ v_i = 5.0 \text{ m/s} \]
\[ a = xxx \]
\[ t = 8.0 \text{ s} \]
\[ d = ? \]

\[ d = \left( \frac{v_i + v_f}{2} \right) t \]
\[ d = \left( \frac{5.0 \text{ m/s} + 16.0 \text{ m/s}}{2} \right) 8.0 \text{ s} \]
\[ d = 84 \text{ m} \]

6. While a baseball is being hit, its velocity changes from -35 m/s to 52 m/s in a time interval of 0.10 seconds. Assuming constant acceleration, what is the ball’s displacement during this time interval?

\[ v_f = 52 \text{ m/s} \]
\[ v_i = -35 \text{ m/s} \]
\[ a = xxx \]
\[ t = 0.10 \text{ s} \]
\[ d = ? \]

\[ d = \left( \frac{v_i + v_f}{2} \right) t \]
\[ d = \left( \frac{-35 \text{ m/s} + 52 \text{ m/s}}{2} \right) 0.10 \text{ s} \]
\[ d = 0.85 \text{ m} \]