

Problems Concerning Constant Rate, Average Speed and Uniform Linear Accelerated Motion

Solve the following problems on separate sheets of paper. Show all work including conversions, equations, and substitutions with units. Remember to employ proper-problem-solving techniques throughout.

1. A boy rapidly walks 175 meters in 1 minute and 20 seconds. Calculate his approximate speed, to the nearest tenth, in meters per second.
2. A bicyclist travels at 10 m/s for 5 minutes. Calculate the distance traveled in
a. meters and b. kilometers.
3. How much time is required for a car traveling at a constant speed of 45 m/s to travel 1,250 meters? Express your answer to the nearest second.
4. A car travels at 60 m/s for 1 hour and then travels 40 m/s for another hour.
a. Determine the average speed of the car.
b. Suppose the car then travels for an additional half-hour at 30 m/s. Calculate the new average speed of the car.
5. A car increases its speed from 10 m/s to 40 m/s in a straight line in an elapsed time of 10 seconds. Calculate
a. the acceleration of the car, and
b. the distance traveled.
6. A truck, starting from rest, accelerates uniformly at 3 m/s^2 for 15 seconds.
a. Calculate the truck's speed at the end of 15 seconds.
b. Calculate the distance traveled.
c. Calculate the average speed of the truck.
7. A bus accelerates in a straight line from rest to 40 m/s over a distance of 200 meters.
a. Calculate the acceleration of the bus.
b. Calculate the time of travel.
8. A small airplane must accelerate from rest at an acceleration of 19.6 m/s^2 [2 g's] for 10 seconds to attain flight speed.
a. Calculate the flight speed.
b. Calculate the minimum length of the runway required in order for the airplane to take off.

9. A marble is repeatedly rolled down a slightly inclined track 2 meters long. It is eventually determined that it takes 4.0 seconds for this motion to occur.
- Assuming the marble is uniformly accelerated, calculate its acceleration.
 - Calculate its speed as it passes the half-way point [1 meter].
 - Calculate its speed after 2 seconds of travel.
10. A body falls freely for 8 seconds.
- Assuming no air resistance, calculate how far it has fallen.
 - Calculate its speed.
11. A car moving at 50 m/s is brought to rest in 5 seconds.
- Calculate its acceleration.
 - Calculate its distance traveled.
12. A rifle barrel is 0.8 meters long. A fired bullet leaves the gun with a muzzle velocity of 300 m/s.
- Assuming the bullet was uniformly accelerated in the barrel, calculate its acceleration.
 - Calculate the time of travel of the bullet in the barrel.
13. A person throws a ball vertically upward. It rises against the force of gravity which acts downward.
- If the initial velocity is 20 m/s, calculate the height of rise.
 - Calculate the total travel time of the ball.
 - Calculate the speed of the ball if it returns to the same place from which it was thrown.
14. A stone is observed falling past a small window 1 meter tall in 0.2 seconds.
- How fast is the stone moving as it passes the bottom of the window?
 - How far is the bottom of the window from the roof where the stone began its fall from rest?
 - Calculate the stone's average speed as it passes the window.
15. A moving car slows down from 50 m/s to 10 m/s in 8 seconds.
- Calculate its rate of deceleration.
 - Calculate the distance traveled.
 - Calculate the additional time required for the car to come to rest.