$v = u + at$

Motion Problems (Practice)

1. What is the final speed of an bullet that is shot from a rifle, if it accelerates at 556 m/s^2 for 0.4 seconds?

$v = 0 + (556 \times 0.4)$
$= 222.4 \text{ m/s}$

2. What is the average negative acceleration of an cricket ball slowing from 11m/s to 3m/s in 0.9 seconds?

$a = \frac{v-u}{t} = \frac{3-11}{0.9} = -8.88 \text{ m/s}^2$

3. What is the initial speed of an American badger if it has accelerated for 1.1 seconds at 3.0 m/s^2, reading a steady speed of 4.2 m/s?

$u = v - at$
$= 4.2 - (1.1 \times 3.0) = 0.9 \text{ m/s}$

4. How long would it take a pizza delivery van to accelerate 6km/h to 73km/h if it was accelerating at 6.7 m/s^2? (first change speeds to m/s)

$t = \frac{(73-6) \text{ m/s}}{6.7} = \frac{18.6}{6.7} = 2.77 \text{ sec.}$

5. If a swimmer has changed her velocity by 0.45m/s over a period 2.4 seconds from an initial velocity of 0.33m/s, what is her acceleration?

$a = \frac{0.78 - 0.33}{2.4} = 0.187 \text{ m/s}^2$

6. What is the swimmer's final velocity through the water?

$v = 0.78 \text{ m/s}$

7. If she continues swimming at this velocity, how long will it take her to complete the last 20m of the track?

$t = \frac{20}{0.78} = 25.64 \text{ sec.}$

8. A roller coaster car rapidly picks up speed as it rolls down a slope. As it starts down the slope, its speed is 4 m/s. But 3 seconds later, at the bottom of the slope, its speed is 22 m/s. What is its acceleration?

$$a = \frac{22-4}{3} = 6\ m/s/s$$

9. A cyclist accelerates from 0 m/s to 8 m/s in 3 seconds. What is his acceleration? Is this acceleration higher than that of a car which accelerates from 0 to 30 m/s in 8 seconds?

$$a = \frac{8}{3} = 2.66\ m/s^2$$

NO

car

$$a = \frac{30}{8} = 3.75\ m/s^2$$

10. A car advertisement states that a certain car can accelerate from rest to 70 km/h with an acceleration of 8 m/s^2. Find how long it would take for the care to do this.

$$t = \frac{70-0}{8} = 8.75\ \text{sec.}$$

11. A lizard accelerates to a final speed of 10 m/s in 4 seconds. If his acceleration was 0.8 m/s^2, what was his initial speed before he accelerated?

$V = u + at$

$u = V - at$

$u = 10 - (0.8 \times 4)$

$= 6.8\ m/sec.$

12. A runner covers the last straight stretch of a race in 4 s. During that time, he speeds up from 5 m/s to 9 m/s. What is the runner's acceleration in this part of the race?

$$a = \frac{9-5}{4} = 1\ m/s^2$$

13. You are travelling in a car that is moving at a velocity of 20 m/s. Suddenly, a car 10 meters in front of you slams on it's brakes. At that moment, you also slam on your brakes and slow to 5 m/s. Calculate the acceleration if it took 2 seconds to slow your car down.

$$a = \frac{20-5}{2} = 7.5\ m/s^2$$

14. A ball is dropped from the top of a building. After 2 seconds, it's velocity is measured to be 19.6 m/s. Calculate the acceleration for the dropped ball.

$$a = \frac{19.6-0}{2} = 9.8\ m/s^2$$