

# #1 Motion: Speed, Velocity, and Acceleration

Equations:  $v_{\text{avg}} = \Delta d / \Delta t$        $a_{\text{avg}} = \Delta v / \Delta t$        $\Delta v = v_f - v_o$

- 1) What is the average velocity in m/s of a track star who runs 100.m in 9.53s? What would that average velocity be in miles/hr? (1 mile = 1.6km)
- 2) What is the width of a stadium if you shout on one side and hear the echo return in 0.86 seconds? (The speed of sound is 340.m/s)
- 3) A car is traveling in a straight line at an average speed of 52km/hr. How many seconds would it take this car to travel 2.5m?
- 4) An ant crawls 3.8cm in 0.21s. What is its average velocity in m/s?
- 5) A student travels down a long hallway but is impeded by other students who get in their way by talking in the middle of the hallway. She travels 32.5m at an average velocity of 0.850m/s, then travels 25.3m at an average speed of 0.640m/s, and then travels 52.5m at an average speed of 1.20m/s. If she has 2 minutes to get to class from her starting point, will she be on time?
- 6) What is the change in velocity of an object that is accelerating at a rate of  $2.35\text{m/s}^2$  for 5 seconds?
- 7) What is the acceleration of an object that is traveling at 10.8m/s and comes to a stop in 2.3s?
- 8) A ball is rolling on the floor at a speed of 0.81m/s and hits a wall and bounces back and is traveling at 23.1cm/s. If the impact lasted 0.023s, what was its acceleration?
- 9) An object is traveling at 23.5m/s and undergoes an acceleration of 1.80m/s. How long did it accelerate if its final velocity is 42.3m/s?
- 10) A car is traveling at 45.2m/s and the driver is forced to slam on their breaks to avoid hitting another car that pulled out from a driveway. If the car decelerates at a rate of  $-20.1\text{m/s}^2$  and only has 2.3 seconds before impact, will it stop in time?

## Answers

- 1) 10.5m/s, 23.6 miles/hr
- 2) 146. m
- 3) 0.17s
- 4) 0.18m/s
- 5) No, it takes her 2.03min
- 6) 11.75m/s
- 7) -4.7m/s
- 8)  $-45\text{m/s}^2$
- 9) 10.4s
- 10) Yes, It would stop in 2.25s, or it could have been traveling at 46.2m/s before breaking.