

# Physics 1

## Motion Unit

### Motion in a single direction worksheet

Complete the following problems.

1. Why is it that an object can accelerate while traveling at a constant speed, but not at a constant velocity?
2. Which has more acceleration when moving in a straight line – a car increasing its speed from 50 to 60 km/hr, or a bicycle that goes from zero to 10 km/hr in the same time? Defend your answer.
3. If a freely falling rock were equipped with a speedometer, by how much would its speed readings increase with each second of fall?
4. If humans originated in Africa and migrated to other parts of the world, some time would be required for this to occur. At the modest rate of two kilometers per year, how many centuries would it take for humans originating in Africa to migrate to China, some 10,000 km away?

5. A cheetah charges an antelope 30 meters away. If it takes two seconds for it to reach the stationary antelope, what is its average velocity?
  
  
  
  
  
  
  
  
  
  
6. A car starts from rest and accelerates at a rate of  $6.00 \text{ m/s}^2$  for 4.50 sec. What distance does the car cover in this time? What is its velocity after 4.50 seconds?
  
  
  
  
  
  
  
  
  
  
7. A cyclist traveling at  $3.50 \text{ m/sec}$  accelerates at a rate  $0.5 \text{ m/s}^2$  for two seconds. How fast is the cyclist going after accelerating?
  
  
  
  
  
  
  
  
  
  
8. Alexis drops a soccer ball from the roof of a very tall building. If the ball is in the air for 3.20 seconds, how high is the building? What is the ball's velocity just before hitting the ground?
  
  
  
  
  
  
  
  
  
  
9. Calculate the hang time of an athlete who jumps a vertical distance of 0.75 m.

10. A 500-lira coin is dropped off the leaning tower of Pisa and falls freely. Calculate its speed after 1.00 sec and 2.00 sec.

#### Challenge

11. A motorist crosses a school-crossing corner traveling at a velocity of 14 m/s. A police officer stopped at the corner starts off in pursuit accelerating at 3.0 m/s/s. How long does it take the officer to catch the motorist?
12. The human body can survive a negative acceleration trauma incident of the magnitude of the acceleration is less than 250 m/s/s. If you are in an automobile accident at an initial speed of 96 km/hr and are stopped by an airbag that inflates from the dashboard, over what distance must the airbag stop you for you to survive the crash?
13. You are on the roof of the physics building, 46.0 m above the ground. Your physics professor who is 1.80 meters tall is walking toward the building at a constant speed of 1.20 m/s. If you wish to drop the egg on your professor's head, where should she be when you release the egg?