**Unit 1 Problem Sets**

**Conversion WS 1:**

1. 45.0 km/h to m/s
2. 6.0 m/s to km/min
3. 45.0 cm/s to km/h
4. 6.00 m/s to ft/h
5. 8.0 mi/h to m/s

**Conversion WS 2:**

1. 400 km to μm
2. 150 dm to nm
3. 4 km2 to Mm2
4. 9.8 m/s2 to ft/min2
5. 200 cm to m

**PS1:**

1. What must your average speed be in order to travel 330 m in 4.25 h?
2. At an average speed of 25.0 km/h, how far will a bicyclist travel in 110 min?
3. A bird can fly 25 km/h. How long does it take to fly 18 km?
4. If you are driving 110 km/h and you look to the side for 2.5 s, how far do you travel during this period?
5. 55 mph is how many (a) km/h, (b) m/s, (c) ft/s?

**PS2**

1. The sears tower in Chicago is 443 m tall. Ms. Yaghoubian wants to set the world’s stair climbing record and runs all the way to the roof of the tower. If Ms. Yaghoubian’s average upward speed is 0.6 m/s, how long will it take her to climb from street level to the roof of the Sears Tower?
2. In the 2008 Olympics, Jamaican sprinter Usain Bolt shocked the world as he ran the 100-meter dash in 9.69 seconds. Determine Usain's average speed for the race.
3. In the Funny Car competition at the Joliet Speedway in Joliet, Illinois in October of 2004, John Force complete the ¼-mile dragster race in a record time of 4.437 seconds. Determine the average speed of the dragster in mi/hr and m/s. GIVEN: (1.000 mi =1609 m)
4. South African frogs are capable of jumping as far as 10.0 m in one hop. Suppose one of these frogs makes exactly 15 of these jumps in a time interval of 60 s. What is the frog’s average velocity?
5. A cheetah is known to be the fastest mammal on Earth, at least for short distances. Cheetahs have been observed running a distance of 5.50 x 102 m with an average speed of 1.00 x 102 km/h. (Hint: Be careful with the units! Look carefully!) How long will it take a cheetah to cover this distance at this speed?
6. In last week's Homecoming victory, Al Konfurance, the star halfback of South's football team, broke a tackle at the line of scrimmage and darted upfield untouched. He averaged 9.8 m/s for an 80-yard (73 m) score. Determine the time for Al to run from the line of scrimmage to the end zone.

**PS3**

1. A person jogs eight complete laps around a quarter-mile track in a total time of 13.5 min. Calculate (a) average speed and (b) average velocity, in m/s.
2. A horse canters away from its trainer in a straight line, moving 150 m away in 14 s. It then turns abruptly and gallops halfway back in 4.5 s. Calculate (a) its average speed and (b) its average velocity for the entire trip, using “away from the trainer” as the positive direction.
3. Calculate the average speed and average velocity of a complete round trip in which the first 200 km is covered at 90 km/h, followed by a one hour lunch break, and the final 200 km is covered at 50 km/h.
4. An airplane travels 2400 km at a speed of 800 km/h and then encounters a tailwind that boosts its speed to 1000 km/h for the next 1800 km. What was the total time for the trip? What was the average speed of the plane for this trip?
5. Two locomotives approach each other on parallel tracks. Each has a speed of 120 km/h with respect to the ground. If they are initially 8.5 km apart, how long will it be before they pass each other?
6. In the qualifying round of the 50-yd freestyle in the sectional swimming championship, Dugan got an early lead by finishing the first 25.00 yd in 10.01 seconds. Dugan finished the return leg (25.00 yd distance) in 10.22 seconds. (a) Determine Dugan's average speed for the entire race. (b) Determine Dugan's average speed for the first 25.00 yd leg of the race. (c) Determine Dugan's average velocity for the entire race.

**PS4**

1. A car initially traveling 6.0 m/s is uniformly accelerating at a rate of 3.0 m/s2 for 15 seconds. What is its final velocity?
2. A sprinter accelerates from rest to 10.0 m/s in 1.3 s. What is her acceleration?
3. A ball rolling at 4.0 m/s accelerates uniformly down a hill at 5.5 m/s2 for 6 seconds. What is the final velocity?
4. A sports car accelerates from rest to 100 km/h in 6.2 s. What is its acceleration in m/s2?
5. A small plane must reach a speed of 30 m/s for takeoff. How much time does the plane spend on the runway if it accelerates at 3.0 m/s2?
6. A racing car traveling initially at 8.0 m/s accelerates uniformly at 10 m/s2 for 5 seconds. How far does it travel during this time interval?
7. In 1993, bicyclist Rebecca Twigg of the United States traveled 3.00 km in 217.347 s. Suppose Twigg travels the entire distance at her average speed and that she then accelerates at -1.72 m/s2 to come to a complete stop after crossing the finish line. How long does it take Twigg to come to a stop?