1-D Kinematics: Problem Set

1. 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.
2. In the Funny Car competition at the Joliet Speedway in Joliet, Illinois in October of 2004, John Force complete the Â¼-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)

1. 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.
2. Ken Runfast is the star of the cross-country team. During a recent morning run, Ken averaged a speed of 5.8 m/s for 12.9 minutes. Ken then averaged a speed of 6.10 m/s for 7.1 minutes. Determine the total distance which Ken ran during his 20 minute jog.
3. The Lamborghini Murcielago can accelerate from 0 to 27.8 m/s (100 km/hr or 62.2 mi/hr) in a time of 3.40 seconds. Determine the acceleration of this car in both m/s/s and mi/hr/s.
4. A Cessna 150 airplane has a takeoff speed of 28 m/s (63 mi/hr). Determine the minimum length of the runway which would be required for the plane to take off if it averages an acceleration of 1.9 m/s/s.
5. Suzie Lavtaski has reached the end of the ski slope and abruptly decelerates from 29.0 m/s to 1.8 m/s in 1.45 seconds. Determine Suzie' acceleration rate and the distance she moved during this braking period.
6. Rickey Henderson, baseball's record holder for stolen bases, approaches third base. He dives head first, hitting the ground at 6.75 m/s and reaching the base at 5.91 m/s, accelerating at -5.11 m/s/s. Determine the distance Rickey slides across the ground before touching the base.
7. Win Blonehare and Kent Swimtashore are sailboating in Lake Gustastorm. Starting from rest near the shore, they accelerate with a uniform acceleration of 0.29 m/s/s, How far are they from the shore after 18 seconds?
8. According to Guinness, the tallest man to have ever lived was Robert Pershing Wadlow of Alton, Illinois. He was last measured in 1940 to be 2.72 meters tall (8 feet, 11 inches). Determine the speed which a quarter would have reached before contact with the ground if dropped from rest from the top of his head.
9. A California Condor is approaching its nest with a large chunk of carrion in its beak. As it approaches, it makes an upward swoop, achieving a momentary upward velocity of 12.8 m/s when the carrion falls from its mouth, hitting a cliff outcropping 32.1 m below. Determine the speed of the carrion upon hitting the outcropping.
10. It's breakfast time and Mr. H entertains himself once more by watching the daily beetle race across the 35.7-cm length of the Wheaties box top. Angie the beetle typically averages 3.77 mm/s and Bessie the beetle averages 4.78 mm/s. If Bessie gives Angie a 5.4 cm head start, then which beetle wins and by what distance?
11. Alexander's hobby is dirt biking. On one occasion last weekend, he accelerated from rest to 17.8 m/s/s in 1.56 seconds. He then maintained this speed for 9.47 seconds. Seeing a coyote cross the trail ahead of him, he abruptly stops in 2.79 seconds. Determine Alexander's average speed for this motion.
12. Hayden and Matthew are riding around the neighborhood on their scooters. Hayden is at rest when Matthew passes him moving at a constant speed of 0.37 m/s. After 1.8 seconds, Hayden decides to chase after Matthew, accelerating at 0.91 m/s/s. How much time must Hayden accelerate before he is side-by-side with Matthew?