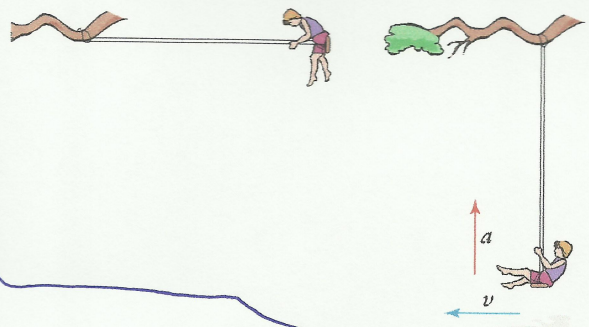


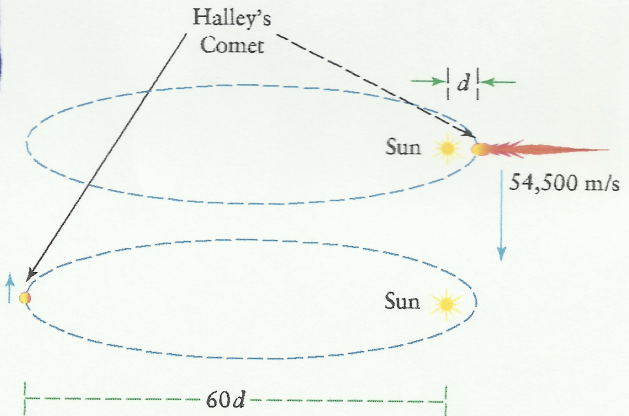
- Rank the following three collisions in terms of the extent of damage that the car would experience. Explain your reasons for ranking the collisions as you did.
  - A car going 10 m/s striking an identical car that was stationary on level ground.
  - A car going 10 m/s running into an immovable concrete wall.
  - A head-on collision between identical cars, both going 10 m/s.
- A bullet with a mass of 0.01 kg is fired horizontally into a block of wood hanging on a string. The bullet sticks in the wood and causes it to swing upward to a height of 0.1 m. If the mass of the wood block is 2 kg, what was the initial speed of the bullet?
- In a head-on, inelastic collision, a 4,000-kg truck going 10 m/s east strikes a 1,000-kg car going 20 m/s west.
  - What is the speed and direction of the wreckage?
  - How much kinetic energy was lost in the collision?

4. A person on a swing moves so that the chain is horizontal at the turning points (● Figure 3.48). Show that the centripetal acceleration of the person at the low point of the arc is exactly 2g, regardless of the length of the chain. This means that the force on the chains at the low point is equal to *three times* the person's weight. (Hint: The vertical distance between the turning point and the low point equals the length of the chain.)



● Figure 3.48 Challenge 4.

- Assume that as a car brakes to a stop it undergoes a constant acceleration (deceleration). Explain why the stopping distance becomes *four times* as large if the initial speed is *doubled*.
- The "shot" used in the shot-put event is a metal ball with a mass of 7.3 kg. When thrown in Olympic competition, it is accelerated to a speed of about 14 m/s. As an approximation, let's say that the athlete exerts a constant force on the shot while throwing it and that it moves a distance of 3 m while accelerating.
  - What is the shot's kinetic energy?
  - Compute the force that acts on the shot.
  - It takes about 0.5 s to accelerate the shot. Compute the power required. Convert your answer to horsepower.
- At the point in its orbit when it is closest to the Sun, Halley's Comet moves with a speed of 54,500 m/s (● Figure 3.49). When it is at its most distant point, the separation between it and the Sun is about 60 times larger than when it is at its closest point. What is the speed of the comet at the distant point?



● Figure 3.49 Challenge 7.

I Need work explained in detail how the answer was found

Only the Circled Ones I Need Answered (2, 4, 6)