1. You throw a ball vertically upward from the roof of a tall building. The ball leaves your hand at a point even with the roof railing with an upward speed of 15.0 m/s; the ball is then in free fall. On its way back down, it just misses the railing. Find (a) the ball's position and velocity 1.00 s and 4.00 s after leaving your hand; (b) the ball's velocity when it is 5.00 m above the railing; (c) the maximum height reached; (d) the ball's acceleration when it is at its maximum height.

✓2. An antelope moving with constant acceleration covers the distance between two points 70.0 m apart in 6.00 s. Its speed as it passes the second point is 15.0 m/s. What are (a) its speed at the first point and (b) its acceleration?

3. (a) If a flea can jump straight up to a height of 0.440 m, what is its initial speed as it leaves the ground? (b) How long is it in the air?

4. A projectile is fired upward at an angle Θ above the horizontal with an initial speed V₀. At its maximum height, what are its velocity vector, its speed, and its acceleration vector?

5. Sketch the six graphs of the x- and y-components of position, velocity, and acceleration versus time for projectile motion with x0 = y0 = 0 and 0 < α < 90°

✓6. An important piece of landing equipment must be thrown to a ship, which is moving at 45.0 cm/s, before the ship can dock. This equipment is thrown at 15.0 m/s at 60.0° above the horizontal from the top of a tower at the edge of the water, 8.75 m above the ship's deck. For this equipment to land at the front of the ship, at what distance D from the dock should the ship be when the equipment is thrown? Ignore air resistance.
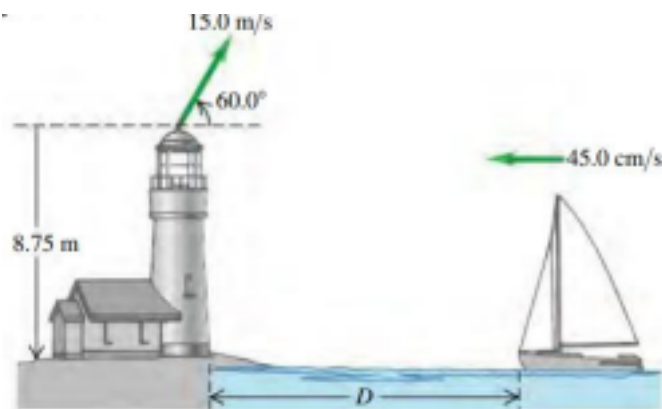


7. When you fly in an airplane at night in smooth air, you have no sensation of motion, even though the plane may be moving at 800 km/h (500 mi/h). Why?

Ans: Both you and the plane are traveling at constant velocity, and without a change in speed or direction you won't sense motion. In that situation, there is no

movement of air, so there is less friction between the surface of the airplane and the air. So, there is less vibration (which gives us the sensation of motion). Hence, we don't feel that we / the airplane is moving.

8. Why is the earth only approximately an inertial reference frame?

ANS:An inertial frame of reference is either at rest or moving with zero acceleration or uniform velocity. Further, in an inertial frame of reference, Newton's laws are valid. Earth can be supposed as an inertial frame of reference because the acceleration due to Earth's rotation or orbiting around the Sun is negligible compared to the acceleration due to gravity.

9. Can a body be in equilibrium when only one force acts on it? Explain.

ANS: Equilibrium means that the net effect of all forces acting on an object is zero.

An object under the effect of a single, nonzero force will have a nonzero acceleration and will not be in equilibrium. Of course, if the value of the single force is zero, then there are simply no forces acting on the object.

✓10. A spaceship far from all other objects uses its thrusters to attain a speed of $1 \times 10^4$ m/s. The crew  then shuts off the power. According to Newton's first law, what will happen to the motion of the  spaceship from then on?

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ANS: Velocity remains the same at $10^4$ m/s

**Explanation:**

According to Newton's 1st law of motion, an object subjected to no force or net force equal 0 would maintain its velocity. In our case the crew shuts off the power, spaceship is in space and far from all other objects (so no gravity whatsoever) would have no force acting on it. Therefore its velocity would stay the same at $10^4$ m/s