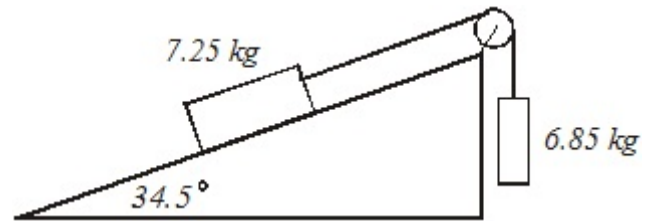# Fluids

Name: _____

1. Find the acceleration of the system shown in the drawing if the coefficient of kinetic friction between the 7.25 kg mass and the plane is 0.295.

7.25 kg

6.85 kg

34.5°

2. A 50.0 kg telephone repairperson climbs up your basic tall power pole. She is carrying 8.15 kg of tools, meters, and peanut butter sandwiches. If she generates 0.815 hp, how much time does it take her to climb the 3.40 m tall pole?

3. A golden coin has a mass of 15.0 grams. It is immersed in water. Find: (a) the volume it displaces, (b) the buoyant force exerted on it by the water, and (c) its apparent weight while it is dunked in the water.

4. An 87.0 kg astronaut in space throws a 15.0 kg oxygen tank away from herself. If the recoil speed of the astronaut is 2.85 m/s, what was the velocity given to the oxygen tank?

5. An asteroid revolves around the sun at a distance of 6.35×10^{12} m. The asteroid's mass is 2.5×10^8 kg and its radius is 55.34×10^3 m. The Sun's mass is 1.99×10^{30} kg   (a) What is its orbital velocity? (b) What is the period of its orbit (in days)?

6. A 1.25 kg ball is shot straight up into the air. It reaches a height of 38.0 meters. As it reaches the highest point in its travel, a second ball, a 2.20 kg one, traveling horizontally at a speed of 22.5 m/s (at the instant of the collision) smacks into it – this ball rebounds straight back at a speed of 5.25 m/s. Okay, here's the stuff you get to calculate: (a) The initial speed of the first ball. (b) The velocity of the first ball after the collision. (c) The total energy of the first ball after the collision. (d) The horizontal distance the first ball travels from its launch point to where it hits the ground.

7. A solid sphere has a radius of 15.0 cm and a mass of 1.05 kg. It sinks to the bottom of the ocean to a depth of 9 550 m. (a) Draw a FBD showing all the forces acting on the ball at this depth. (b) What is the pressure experienced by the ball at that depth? (c) What is the force exerted on the surface of the ball. (d) What is the buoyant force acting on the ball?

8. The distance between two slits is 0.0500 mm and the distance to the screen is 2.50 m. Monochromatic light is incident on the slits. The spacing between the first-order and second-order bright fringes is 2.90 cm. Find (a) the wavelength of the light and (b)   the frequency of the light.

9. There's this here cylinder-shaped oil storage tank (say, 10.0 m diameter by 8.00 m high) with a 1.00 m high earthen dike running around it at 2.00 m from its base. Billy Bob has a joint of pipe (diameter of 10.0cm) in the bed of his pick'emup truck that sticks way out. He accidentally backs into the tank. He then pulls forward, leaving a hole in the tank from the pipe sticking into it when he backed up. The hole is 1.50 m from the bottom of the tank. Okay, here goes: (a) Does the oil shoot out over the dike? If so, how much oil will be lost this way? (b) How much oil will end up inside the dike? (c) How much oil, if any, will spill out when, and if, the dike area fills? Assume the tank is completely filled with oil and is vented (no vacuum).