Physics 201 Examples 4

Jan 23, 2013

1. A person whose weight is 520 N is being pulled up vertically by a rope from the bottom of a cave that is 35.1 m deep. The maximum tension that the rope can withstand without breaking is 569 N. What is the shortest time, starting from rest, in which the person can be brought out of the cave?

8.72 s

2. In Figure 1, the rope and the pulleys are massless, and there is no friction. Find (a) the tension in the rope and (b) the acceleration of the 10.0-kilogram block. (Hint: The larger mass moves twice as far as the smaller mass.)

(a) 13.7 newtons
(b) 1.37 m/s^2

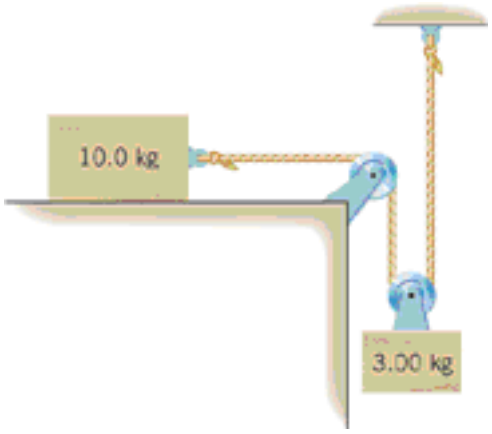

Figure 1: Problem 4.83

3. An 81-kilogram baseball player slides into second base. The coefficient of kinetic friction between the player and the ground is 0.49. (a) What is the magnitude of the frictional force? (b) If the player comes to rest after 1.6 seconds, what was his initial velocity?

(a) 390 newtons
(b) 7.7 m/s

4. Traveling at a speed of 16.1 m/s, the driver of an automobile suddenly locks the wheels by slamming on the brakes. The coefficient of kinetic friction between the tires and the road is 0.720. What is the speed of the automobile after 1.30 seconds have elapsed? Ignore the effects of air resistance.

6.93 m/s

5. A box is sliding up an incline that makes an angle of 15.0° with respect to the horizontal. The coefficient of kinetic friction between the box and the surface of the incline is 0.180. The initial speed of the box at the bottom of the incline is 1.50 m/s. How far does the box travel along the incline before coming to rest?

0.265 meters

6. Figure 2 shows three objects. They are connected by strings that pass over massless and frictionless pulleys. The objects move, and the coefficient of kinetic friction between the middle object and the surface of the table is 0.100. (a) What is the acceleration of the three objects? (b) Find the tension in each of the two strings.

(a) 0.597 m/s^2
(b) 104 newtons on the left and 230 newtons on the right

Figure 2: Problem 4.93

7. A 11400 kilogram lunar landing craft is about to touch down on the surface

29,400 newtons

of the moon, where the acceleration due to gravity is 1.60 m/s^2. At an altitude of 165 meters the craft's downward velocity is 18.0 m/s. To slow down the craft, a retrorocket is firing to provide an upward thrust. Assuming the descent is vertical, find the magnitude of the thrust needed to reduce the velocity to zero at the instant when the craft touches the lunar surface.

8. A woman stands on a scale in a moving elevator. Her mass is 60.0 kilograms, and the combined mass of the elevator and scale is an additional 815 kilograms. Starting from rest, the elevator accelerates upward. During the acceleration the hoisting cable applies a force of 9410 newtons. What does the scale read during the acceleration?

645 newtons