Additional Exercises

A-1: What is the minimal force a mother must exert to lift her 5.0-kg baby out of its crib?

A-2: On the moon, the gravity is 1/6 that of Earth. While on the moon, Buzz Aldrin carried on his back a support system that would weigh over 1760 N on Earth. a) What did the backpack weigh on the moon? b) What was its mass on the moon?

A-3: A common malady in runners who run on too hard a surface is shin splints. If a runner's 7.0-kg leg hits the pavement so that it comes to rest with an acceleration of $-200.0\ m/s^2$ on each hit, how much force must the runner's leg withstand on each step?

A-4: In the district soccer championship finals, Elizabeth kicks a 0.600-kg soccer ball with a force of 80.0 N. How much does she accelerate the soccer ball from rest in the process?

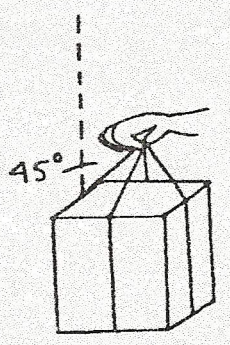
A-5: Barker is unloading 20-kg bottles of water from this delivery truck when one of the bottles tips over and slides down the truck ramp that is inclined at an angle of 30° to the ground. What amount of force moves the bottle down the ramp?

A-6: Sarah, whose mass is 40.0 kg, is on her way to school after a winter storm when she accidentally slips on a patch of ice whose coefficient of sliding friction is 0.060. What force of friction will eventually bring Sarah to a stop?

A-7: In her physics lab, Molly puts a 1.0-kg mass on a 2.0-kg block of wood. She pulls the combination across another wooden board with a constant speed to determine the coefficient of sliding friction between the two surfaces. If Molly must pull with a force of 6.0 N, what coefficient of sliding friction does she calculate for wood on wood?

A-8: A 1250-kg slippery hippo slides down a mud-covered hill inclined at an angle of 18.0° to the horizontal. a) If the coefficient of sliding friction between the hippo and the mud is 0.0900, what force of friction impedes the hippo's motion down the hill? b) If the hill were steeper, how would this affect the coefficient of sliding friction?

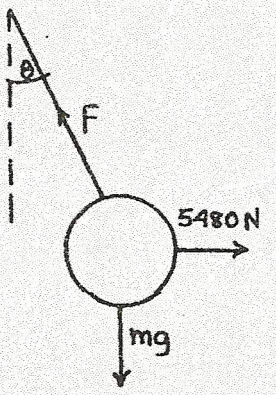
A-9: Erma receives a 5.00-kg package in the mail tied with a string that goes around each side of the box, as shown. If Erma lifts the box by the string in the center so that each piece of string makes an angle of 45.0° with the vertical, what is the tension in each piece of string?



A-10: To make extra money during the summer, Mr. Garber, a 66.0-kg physics teacher, paints the outside of houses while sitting on a 4.0-kg plank suspended by two vertical cables. What is the tension in each of the two cables?

A-11: While camping in Denali National Park in Alaska, a wise camper hangs his pack of food from a rope tied between two trees, to keep the food away from the bears. If the 5.0-kg bag of food hangs from the center of a rope that is 3.0 m long, and the rope sags 6.0 cm in the middle, what is the tension in the rope?

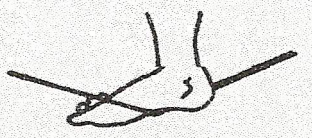
A-12: In the figure, a 1240-kg wrecking ball is pulled back with a horizontal force of 5480 N before being swung against the side of a building. a) What angle does the wrecking ball make with the vertical when it is pulled back? b) What is the tension in the ball's supporting cable when it is at this angle?



A-13: What force must you exert on a ball point pen in order to apply a pressure of 0.067 N/mm^2 on a piece of paper, if the ball of the pen has a surface area of 1.2 mm^2 touching the paper?

A-14: Asad cuts his knee in a fall while chasing a soccer ball. If a 6-N force is exerted on Asad's knee during the fall, applying a pressure of 1000 N/m^2 on an area of his skin, what is the area of the cut that results from the impact?

A-15: The amazing Gambini walks across a 30.0-m-long tightrope high above a 3-ring circus. a) If the 75.0-kg Gambini pushes the tightrope down 15.0 cm in the center, find the tension in the tightrope. b) If a 10-cm^2 area of Gambini's foot presses on the rope, how much pressure does Gambini apply on this area?



A-16: In the TV show, *The Addams Family*, Uncle Fester found it quite comfortable to sleep on a bed of nails. Though this doesn't sound like the most pleasant way to take a nap, it is not too painful if many nails are placed fairly close together. a) If Uncle Fester has a mass of 53 kg and his body covers 700 nails, each with a surface area of 1.00 mm^2, what is the pressure exerted on his body? b) What would be the pressure if Uncle Fester napped on a bed made of only 1 nail?

Challenge Exercises for Further Study

Example 15: Linc, the 65.0-kg lifeguard, slides down a water slide that is inclined at an angle of 35.0° to the horizontal, into the community swimming pool. If the coefficient of friction of the slide is 0.050, what is Linc's rate of acceleration as he slides down?