27. A teapot is initially at rest on a horizontal tabletop, then one end of the table is lifted slightly. Does the normal force increase or decrease? Does the force of static friction increase or decrease?

28. Which is usually greater, the maximum force of static friction or the force of kinetic friction?

29. A 5.4 kg bag of groceries is in equilibrium on an incline of angle $\theta = 15°$. Find the magnitude of the normal force on the bag.

Conceptual Questions

30. Imagine an astronaut in space at the midpoint between two stars of equal mass. If all other objects are infinitely far away, what is the weight of the astronaut? Explain your answer.

31. A ball is held in a person's hand.

a. Identify all the external forces acting on the ball and the reaction force to each.

b. If the ball is dropped, what force is exerted on it while it is falling? Identify the reaction force in this case. (Disregard air resistance.)

32. Explain why pushing downward on a book as you push it across a table increases the force of friction between the table and the book.

33. Analyze the motion of a rock dropped in water in terms of its speed and acceleration. Assume that a resistive force acting on the rock increases as the speed increases.

34. A sky diver falls through the air. As the speed of the sky diver increases, what happens to the sky diver's acceleration? What is the acceleration when the sky diver reaches terminal speed?

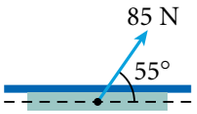
Practice Problems

For problems 35–37, see Sample Problem D.

35. A 95 kg clock initially at rest on a horizontal floor requires a 650 N horizontal force to set it in motion. After the clock is in motion, a horizontal force of 560 N keeps it moving with a constant velocity. Find μ_s and μ_k between the clock and the floor.

36. A box slides down a 30.0° ramp with an acceleration of 1.20 m/s^2. Determine the coefficient of kinetic friction between the box and the ramp.

37. A 4.00 kg block is pushed along the ceiling with a constant applied force of 85.0 N that acts at an angle of 55.0° with the horizontal, as in the figure. The block accelerates to the right at 6.00 m/s^2. Determine the coefficient of kinetic friction between the block and the ceiling.



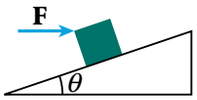
For problems 38–39, see Sample Problem E.

38. A clerk moves a box of cans down an aisle by pulling on a strap attached to the box. The clerk pulls with a force of 185.0 N at an angle of 25.0° with the horizontal. The box has a mass of 35.0 kg, and the coefficient of kinetic friction between box and floor is 0.450. Find the acceleration of the box.

39. A 925 N crate is being pulled across a level floor by a force **F** of 325 N at an angle of 25° above the horizontal. The coefficient of kinetic friction between the crate and floor is 0.25. Find the magnitude of the acceleration of the crate.

MIXED REVIEW

40. A block with a mass of 6.0 kg is held in equilibrium on an incline of angle $\theta = 30.0°$ by a horizontal force, **F,** as shown in the figure. Find the magnitudes of the normal force on the block and of **F.** (Ignore friction.)



41. A 2.0 kg mass starts from rest and slides down an inclined plane 8.0×10^{-1} m long in 0.50 s. What net force is acting on the mass along the incline?

42. A 2.26 kg book is dropped from a height of 1.5 m.

a. What is its acceleration?

b. What is its weight in newtons?

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c. 49 N

d. 38 N

27. The normal force decreases; The force of static friction increases to counteract the component of the weight along the table.

28. $F_{s,max}$

29. 51 N

30. 0 N; The forces exerted by each star cancel.

31. **a.** the weight of the ball and an equal reaction force of the ball on Earth; the force of the person's hand on the ball and an equal reaction force of the ball on the hand

b. F_g; the force of the ball on Earth

32. Pushing down on the book increases the normal force and therefore also increases the friction.

33. The rock will accelerate until the magnitude of the resistive force equals the net downward force on the rock. (This downward force is the rock's weight minus the buoyant force of the water.) Then the rock's speed will be constant.

34. As the sky diver's speed increases, the acceleration decreases because the resistive force increases with increasing speed; zero

35. 0.70, 0.60

36. 0.436

37. 0.816

38. 1.4 m/s^2 down the aisle

39. 1.0 m/s^2

40. 68 N; 34 N

41. 13 N down the incline

42. **a.** 9.81 m/s^2 downward

b. 22.2 N