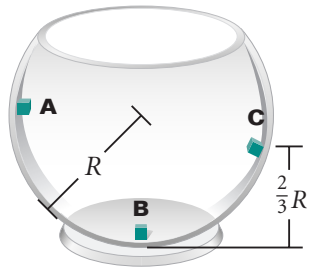
MIXED REVIEW

37. A 215 g particle is released from rest at point **A** inside a smooth hemispherical bowl of radius 30.0 cm, as shown at right. Calculate the following:



- **a.** the gravitational potential energy at **A** relative to **B**
- **b.** the particle's kinetic energy at **B**
- **c.** the particle's speed at **B**
- **d.** the potential energy and kinetic energy at **C**

38. A person doing a chin-up weighs 700.0 N, disregarding the weight of the arms. During the first 25.0 cm of the lift, each arm exerts an upward force of 355 N on the torso. If the upward movement starts from rest, what is the person's speed at this point?

39. A 50.0 kg pole vaulter running at 10.0 m/s vaults over the bar. If the vaulter's horizontal component of velocity over the bar is 1.0 m/s and air resistance is disregarded, how high was the jump?

40. An 80.0 N box of clothes is pulled 20.0 m up a 30.0° ramp by a force of 115 N that points along the ramp. If the coefficient of kinetic friction between the box and ramp is 0.22, calculate the change in the box's kinetic energy.

41. Tarzan and Jane, whose total mass is 130.0 kg, start their swing on a 5.0 m long vine when the vine is at an angle of 30.0° with the horizontal. At the bottom of the arc, Jane, whose mass is 50.0 kg, releases the vine. What is the maximum height at which Tarzan can land on a branch after his swing continues? (Hint: Treat Tarzan's and Jane's energies as separate quantities.)

42. A 0.250 kg block on a vertical spring with a spring constant of 5.00×10^3 N/m is pushed downward, compressing the spring 0.100 m. When released, the block leaves the spring and travels upward vertically. How high does it rise above the point of release?

43. Three identical balls, all with the same initial speed, are thrown by a juggling clown on a tightrope. The first ball is thrown horizontally, the second is thrown at some angle above the horizontal, and the third is thrown at some angle below the horizontal. Disregarding air resistance, describe the motions of the three balls, and compare the speeds of the balls as they reach the ground.

44. A 0.60 kg rubber ball has a speed of 2.0 m/s at point A and kinetic energy of 7.5 J at point B. Determine the following:

- **a.** the ball's kinetic energy at A
- **b.** the ball's speed at B
- **c.** the total work done on the ball from A to B

45. Starting from rest, a 5.0 kg block slides 2.5 m down a rough 30.0° incline in 2.0 s. Determine the following:

- **a.** the work done by the force of gravity
- **b.** the mechanical energy lost due to friction
- **c.** the work done by the normal force between the block and the incline

46. A skier of mass 70.0 kg is pulled up a slope by a motor-driven cable. How much work is required to pull the skier 60.0 m up a 35° slope (assumed to be frictionless) at a constant speed of 2.0 m/s?

47. An acrobat on skis starts from rest 50.0 m above the ground on a frictionless track and flies off the track at a 45.0° angle above the horizontal and at a height of 10.0 m. Disregard air resistance.

- **a.** What is the skier's speed when leaving the track?
- **b.** What is the maximum height attained?

48. Starting from rest, a 10.0 kg suitcase slides 3.00 m down a frictionless ramp inclined at 30.0° from the floor. The suitcase then slides an additional 5.00 m along the floor before coming to a stop. Determine the following:

- **a.** the suitcase's speed at the bottom of the ramp
- **b.** the coefficient of kinetic friction between the suitcase and the floor
- **c.** the change in mechanical energy due to friction

49. A light horizontal spring has a spring constant of 105 N/m. A 2.00 kg block is pressed against one end of the spring, compressing the spring 0.100 m. After the block is released, the block moves 0.250 m to the right before coming to rest. What is the coefficient of kinetic friction between the horizontal surface and the block?