

9. Some doors in Europe have door knobs in the center of the door rather than at the edge. Which door requires more force to produce the same torque to close the door?
10. If you find a pendulum clock running slightly fast, how can you adjust it to keep better time? Explain.
11. Suppose an astronaut carries a pendulum to the moon. Would the period of the pendulum be shorter, longer, or the same on the moon as on Earth?

PROBLEMS

7.1 Projectile Motion

- ▶ 1. Assuming that the two baseballs in Figure 7-19 have the same velocity, 25 m/s, draw two separate graphs of y as a function of t and x as a function of t for each ball.

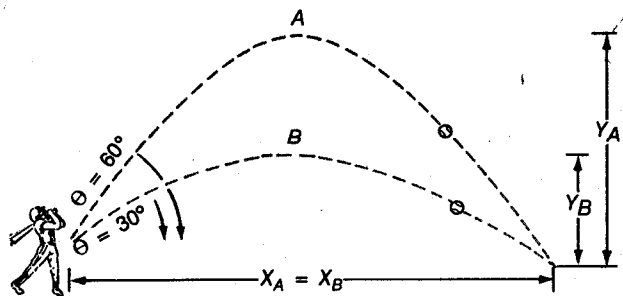


FIGURE 7-19. Use with Problem 1.

2. A stone is thrown horizontally at 8.0 m/s from a cliff 78.4 m high. How far from the base of the cliff does the stone strike the ground?
3. A toy car runs off the edge of a table that is 1.225 m high. If the car lands 0.400 m from the base of the table,
 - a. how long does it take for the car to fall?
 - b. what is the horizontal velocity of the car?
4. Janet jumps off a high-diving platform with a horizontal velocity of 2.8 m/s and lands in the water 2.6 s later. How high is the platform, and how far from the base of the platform does she land?
- ▶ 5. An airplane traveling 1001 m above the ocean at 125 km/h is to drop a box of supplies to shipwrecked victims below.
 - a. How many seconds before being directly overhead should the box be dropped?
 - b. What is the horizontal distance between the plane and the victims when the box is dropped?
- ▶ 6. Divers at Acapulco dive from a cliff that is 61 m high. If the rocks below the cliff extend outward for 23 m, what is the minimum horizontal velocity a diver must have to clear the rocks safely?
- ▶ 7. A dart player throws a dart horizontally at a speed of +12.4 m/s. The dart hits the board 0.32 m below the height from which it was thrown. How far away is the player from the board?
- ▶ 8. An arrow is shot at a 30.0° angle with the horizontal. It has a velocity of 49 m/s.
 - a. How high will the arrow go?
 - b. What horizontal distance will it travel?
- ▶ 9. A pitched ball is hit by a batter at a 45° angle. It just clears the outfield fence, 98 m away. Find the velocity of the ball when it left the bat. Assume the fence is the same height as the pitch.
- ▶ 10. Trailing by two points, and with only 2.0 s remaining in a basketball game, a player makes a jump-shot at an angle of 60° with the horizontal, giving the ball a velocity of 10 m/s. The ball is released at the height of the basket, 3.05 m above the floor. Yes! It's a score.
 - a. How much time is left in the game when the basket is made?
 - b. Shots made outside a semicircle of 6.02-m radius from a spot directly beneath the basket are awarded 3 points, while those inside score 2 points. Did the player tie the game or put the team ahead?
- ▶ 11. A basketball player tries to make a half-court jump-shot, releasing the ball at the height of the basket. Assuming the ball is launched at 51.0°, 14.0 m from the basket, what velocity must the player give the ball?
- ▶ 12. A baseball is hit at 30.0 m/s at an angle of 53.0° with the horizontal. Immediately an outfielder runs 4.00 m/s toward the infield and catches the ball at the same height it was hit. What was the original distance between the batter and the outfielder?

7.2 Periodic Motion

13. It takes a 615-kg racing car 14.3 s to travel at a uniform speed around a circular racetrack of 50.0 m radius.
 - a. What is the acceleration of the car?
 - b. What average force must the track exert on the tires to produce this acceleration?