8. Sample answer: During a head-on collision, an unbalanced force stops the motion of the car. But no unbalanced force immediately acts on the people inside the car. The people continue to move forward. Airbags are important because they provide unbalanced forces to stop the motion of the people in the car. The airbags prevent the people from hitting the dashboard and windshield of the car.
9. Your hand hit the table with a certain amount of force. According to Newton's third law of motion, the table exerts an equal and opposite force on your hand. The force exerted by the table causes your hand to hurt.

SECTION: MOMENTUM

1. Sample answer: To calculate the momentum of an object, multiply the mass of the object by its velocity.
2. C
3. The law of conservation of momentum states that any time objects collide, the total amount of momentum stays the same. The law of conservation of momentum is true when no other forces act on the objects.
4. Newton's third law can explain the law of conservation of momentum. Because the action and reaction forces are equal and opposite, momentum is neither gained nor lost.
5. p = 2.5 kg x 4.8 m/s south = 12 kg•m/s south
6. No, although the train and the car have the same velocity, the train has more mass than the car, so the train has greater momentum.
7. The softball has momentum as it travels toward your glove. When the ball hits your glove, some of its momentum is transferred to your glove and your hand. As a result, your glove and hand move in the direction that the ball was moving before the catch.

Chapter Review

1. inertia
2. terminal velocity
3. Projectile motion
4. Momentum
5. Free fall
6. B
7. D
8. D
9. B
10. B
11. Accept all reasonable answers. Sample answers: A feather falling inside a vacuum chamber is in free fall. An object dropped on the moon is in free fall.
12. Gravity and air resistance combine to give a net force on a falling object. When gravity and air resistance are the same size but in opposite directions, the object stops accelerating downward and has reached its terminal velocity.
13. Friction is a force that opposes the motion of objects. Friction slows the motion of moving objects so you don't see objects moving forever in a straight line.
14. a. $\Delta\upsilon = g \times t = 9.8\ m/s^2 \times 1.5\ s = 14.7\ m/s$
    b. p=5 m x v 5 12 kg x 14.7 m/s = 176.4 kg•m/s
15. The answer to this exercise can be found at the end of the Teacher Edition.
16. Newton's second law: $a = F/m$. During takeoff, the shuttle burns fuel and therefore loses mass. However, the forward force on the shuttle remains the same. So, the shuttle's acceleration increases because its mass constantly decreases during takeoff.
17. When the hammer hits the nail, the hammer stops. Its momentum is transferred to the nail, driving it into the wood. Momentum is also transferred from the hammer to your hand and from the nail to the wood and to the work bench or table top.

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