

Reviewing Content

1. c 2. a 3. a
4. d 5. a 6. c
7. b 8. a 9. d
10. b

Understanding Concepts

11. The net force is zero and the crate does not move.
12. 8 N
13. Yes, all of the forces can cancel one another.
14. It accelerates.
15. Static friction
16. A machine part rubs against a rolling surface rather than a flat surface, thus reducing the size of the surfaces in contact and the amount of friction.
17. As the velocity of the falling object increases, the air resistance acting on it also increases. Eventually the opposing force of air resistance equals the object's weight, and the object reaches its terminal velocity.
18. Weight is a measure of the force of gravity acting on an object. Mass is the amount of matter an object contains as measured by its inertia.
19. When a force is exerted on an object, the object responds with an equal and opposite force. The forces generated in this way are called action-reaction pairs.
20. The mass of each vehicle
21. Electric force
22. Strong: protons and neutrons; weak: all particles
23. Gravitational force

Critical Thinking

24. The arrow follows a projectile path. It begins to fall as soon as it leaves the bow. Thus, if the arrow is aimed directly at the target, it will hit the target below the bull's-eye.
25. Newton's third law of motion describes the action and reaction forces that occur when the ball is struck by the racquet and when the ball strikes the wall. Newton's second law of motion describes the acceleration of the tennis ball when a force from the racquet or the wall is applied to it.
26. An object's weight is six times greater on Earth; however, its mass is the same in both locations.
27. 0.6 m/s^2 ; 5 kg
28. The inertia, mass, and weight of the 10-kg rock are 10 times greater than that of the 1-kg rock.
29. The air resistance is greatly increased when the top is down resulting in fewer miles per gallon.
30. Increasing the force applied to the object or decreasing the mass of the object will increase the acceleration of the object.

Math Skills

31. 0.25 m/s^2
32. $200 \text{ kg} \cdot \text{m/s}$
33. 290 N

Concepts in Action

34. The fluid friction from the hovercraft's contact with the air is less than an ordinary boat's fluid friction from contact with the water.
35. The racer could be tested in a wind tunnel or out on a road. If the clothing is effective, the force on the racer in the wind tunnel will decrease. The racer's maximum speed on the road will increase.
36. Attach a spring scale to the box. Gradually increase the force applied by pulling on the spring scale. The smallest measured force on the spring scale that moves the box equals the force of static friction.
37. Student paragraphs will vary but should include the force applied at the drive wheels (supplied by the engine), the action-reaction force pair where the tires are in contact with the road, the air resistance (fluid friction), the rolling friction of the tires on the road, and the rolling friction of the ball bearings in the engine and wheels.