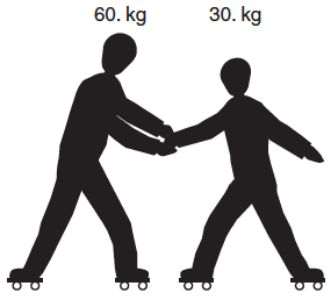
Name: _____ Period: _____

Momentum-Impulse

1. A 1,200-kilogram car traveling at 10 meters per second hits a tree and is brought to rest in 0.10 second. What is the magnitude of the average force acting on the car to bring it to rest?
   1. 1.2×10^2 N
   2. 1.2×10^3 N
   3. 1.2×10^4 N
   4. 1.2×10^5 N

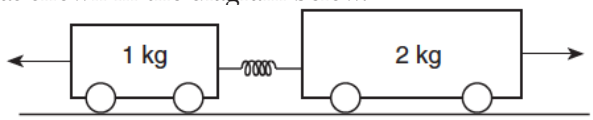
2. A 50-kilogram student threw a 0.40-kilogram ball with a speed of 20 meters per second. What was the magnitude of the impulse that the student exerted on the ball?
   1. 8.0 N·s
   2. 78 N·s
   3. 4.0×10^2 N·s
   4. 1.0×10^3 N·s

3. In the diagram below, a 60-kilogram rollerskater exerts a 10-newton force on a 30-kilogram rollerskater for 0.20 second.



   What is the magnitude of the impulse applied to the 30-kilogram rollerskater?
   1. 50 N·s
   2. 2.0 N·s
   3. 6.0 N·s
   4. 12 N·s

4. Two carts are pushed apart by an expanding spring, as shown in the diagram below.



   If the average force on the 1-kilogram cart is 1 newton, what is the average force on the 2-kilogram cart?
   1. 1 N
   2. 0.0 N
   3. 0.5 N
   4. 4 N

5. What is the speed of a 1.0×10^3-kilogram car that has a momentum of 2.0×10^4 kilogram·meters per second east?
   1. 5.0×10^{-2} m/s
   2. 2.0×10^1 m/s
   3. 1.0×10^4 m/s
   4. 2.0×10^7 m/s

6. A motorcycle being driven on a dirt path hits a rock. It's 60-kilogram cyclist is projected over the handlebars at 20 meters per second into a haystack. if the cyclist is brought to rest in 0.50 second, the magnitude of the average force exerted on the cyclist by the haystack is
   1. 6.0×10^1 N
   2. 5.9×10^2 N
   3. 1.2×10^3 N
   4. 2.4×10^3 N

7. A 70-kilogram hockey player skating east on an ice rink is hit by a 0.1-kilogram hockey puck moving toward the west. The puck exerts a 50-newton force toward the west on the player. Determine the magnitude of the force that the player exerts on the puck during this collision.

8. Which situation will produce the greatest change of momentum for a 1.0-kilogram cart?
   1. accelerating it from rest to 3.0 m/s
   2. accelerating it from 2.0 m/s to 4.0 m/s
   3. applying a net force of 5.0 N for 2.0 s
   4. applying a net force of 10.0 N for 0.5 s

9. A 0.149-kilogram baseball, initially moving at 15 meters per second, is brought to rest in 0.040 second by a baseball glove on a catcher's hand. The magnitude of the average force exerted on the ball by the glove is
   1. 2.2 N
   2. 2.9 N
   3. 17 N
   4. 56 N

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Momentum-Impulse

10. Calculate the magnitude of the impulse applied to a 0.75-kilogram cart to change its velocity from 0.50 meter per second east to 2.00 meters per second east. [Show all work, including the equation and substitution with units.]

11. Which is a scalar quantity?
    1. acceleration
    2. momentum
    3. speed
    4. displacement

12. A 0.45-kilogram football traveling at a speed of 22 meters per second is caught by an 84-kilogram stationary receiver. If the football comes to rest in the receiver's arms, the magnitude of the impulse imparted to the receiver by the ball is

    1. 1800 N·s
    2. 9.9 N·s
    3. 4.4 N·s
    4. 3.8 N·s

13. A force of 6.0 newtons changes the momentum of a moving object by 3.0 kilogram·meters per second. How long did the force act on the mass?
    1. 1.0 s
    2. 2.0 s
    3. 0.25 s
    4. 0.50 s

14. A 1000-kilogram car traveling due east at 15 meters per second is hit from behind and receives a forward impulse of 6000 newton-seconds. Determine the magnitude of the car's change in momentum due to this impulse.

15. Cart A has a mass of 2 kilograms and a speed of 3 meters per second. Cart B has a mass of 3 kilograms and a speed of 2 meters per second. Compared to the inertia and magnitude of momentum of cart A, cart B has
    1. the same inertia and a smaller magnitude of momentum
    2. the same inertia and the same magnitude of momentum
    3. greater inertia and a smaller magnitude of momentum
    4. greater inertia and the same magnitude of momentum

16. A 6.0-kilogram block, sliding to the east across a horizontal, frictionless surface with a momentum of 30 kilogram·meters per second, strikes an obstacle. The obstacle exerts an impulse of 10 newton·seconds to the west on the block. The speed of the block after the collision is
    1. 1.7 m/s
    2. 3.3 m/s
    3. 5.0 m/s
    4. 20 m/s

17. A 60-kilogram student jumps down from a laboratory counter. At the instant he lands on the floor his speed is 3 meters per second. If the student stops in 0.2 second, what is the average force of the floor on the student?
    1. 1×10^{-2} N
    2. 1×10^{2} N
    3. 9×10^{2} N
    4. 4 N

18. A 2.0-kilogram laboratory cart is sliding across a horizontal frictionless surface at a constant velocity of 4.0 meters per second east. What will be the cart's velocity after a 6.0-newton westward force acts on it for 2.0 seconds?
    1. 2.0 m/s east
    2. 2.0 m/s west
    3. 10 m/s east
    4. 10 m/s west

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Momentum-Impulse

19. A 40-kilogram mass is moving across a horizontal surface at 5.0 meters per second. What is the magnitude of the net force required to bring the mass to a stop in 8.0 seconds?
    1. 1.0 N
    2. 5.0 N
    3. 25 N
    4. 40 N

20. A 0.15-kilogram baseball moving at 20 meters per second is stopped by a catcher in 0.010 second. The average force stopping the ball is
    1. 3.0×10^{-2} N
    2. 3.0×10^{0} N
    3. 3.0×10^{1} N
    4. 3.0×10^{2} N

21. A 2.0-kilogram body is initially traveling at a velocity of 40 meters per second east. If a constant force of 10 newtons due east is applied to the body for 5.0 seconds, the final speed of the body is
    1. 15 m/s
    2. 25 m/s
    3. 65 m/s
    4. 130 m/s

22. A 75-kilogram hockey player is skating across the ice at a speed of 6.0 meters per second. What is the magnitude of the average force required to stop the player in 0.65 second?
    1. 120 N
    2. 290 N
    3. 690 N
    4. 920 N

23. A bicycle and its rider have a combined mass of 80 kg and a speed of 6 m/s. What is the magnitude of the average force needed to bring the bicycle and its rider to a stop in 4.0 seconds?
    1. 1.2×10^{2} N
    2. 3.2×10^{2} N
    3. 4.8×10^{2} N
    4. 1.9×10^{3} N

24. A 5-kilogram block slides along a horizontal, frictionless surface at 10 meters per second for 4 seconds. The magnitude of the block's momentum is
    1. 200 kg·m/s
    2. 50 kg·m/s
    3. 20 kg·m/s
    4. 12.5 kg·m/s

25. Calculate the time required for a 6000-newton net force to stop a 1200-kilogram car initially traveling at 10 meters per second. [Show all work, including the equation and substitution with units.]

26. Which term identifies a scalar quantity?
    1. displacement
    2. momentum
    3. velocity
    4. time

27. A baseball bat exerts an average force of 600 newtons east on a ball, imparting an impulse of 3.6 newton•seconds east to the ball. Calculate the amount of time the baseball bat is in contact with the ball. [Show all work, including the equation and substitution with units.]

28. An air bag is used to safely decrease the momentum of a driver in a car accident. The air bag reduces the magnitude of the force acting on the driver by
    1. increasing the length of time the force acts on the driver
    2. decreasing the distance over which the force acts on the driver
    3. increasing the rate of acceleration of the driver
    4. decreasing the mass of the driver

29. A 3.0-kilogram object is acted upon by an impulse having a magnitude of 15 newton•seconds. What is the magnitude of the object's change in momentum due to this impulse?
    1. 5.0 kg•m/s
    2. 15 kg•m/s
    3. 3.0 kg•m/s
    4. 45 kg•m/s

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Momentum-Impulse

30. A 1.5-kilogram cart initially moves at 2.0 meters per second. It is brought to rest by a constant net force in 0.30 second. What is the magnitude of the net force?
    1. 0.40 N
    2. 0.90 N
    3. 10 N
    4. 15 N

31. A 0.0600-kilogram ball traveling at 60.0 meters per second hits a concrete wall. What speed must a 0.0100-kilogram bullet have in order to hit the wall with the same magnitude of momentum as the ball?
    1. 3.60 m/s
    2. 6.00 m/s
    3. 360 m/s
    4. 600 m/s