Velocity is a term that refers to both speed and direction. For this worksheet we will assume that the objects are traveling in a straight line and so velocity and speed can be considered the same.

1. What is the momentum of a truck with a mass of 4,000. kg and a speed of 35 m/s? Express your answer in kg · m/s.

$p = mv = (4{,}000.\ \text{kg})(35\ \text{m/s}) = 140{,}000\ \text{kg}\cdot\text{m/s}$

2. What is the momentum of a car with a mass of 1,000. kg and a speed of 35 m/s. Express your answer in kg · m/s.

$p = mv = (1000.\ \text{kg})(35\ \text{m/s}) = 35{,}000\ \text{kg}\cdot\text{m/s}$

3. An 8-kilogram bowling ball is rolling in a straight line toward you. If its momentum is 16 kg · m/s, how fast is it traveling?

$v = p/m = \frac{16\ \text{kg}\cdot\text{m/s}}{8\ \text{kg}} = 2\ \text{m/s}.$

4. A beach ball is rolling in a straight line toward you at a speed of 0.5 m/s. Its momentum is 0.25 kg · m/s. What is the mass of the beach ball?

$m = p/v = \frac{0.25\ \text{kg}\cdot\text{m/s}}{0.5\ \text{m/s}} = 0.5\ \text{kg}$

5. A 4,500.-kilogram truck travels in a straight line at 10. m/s. What is its momentum?

$p = mv = (4{,}500.\ \text{kg})(10.\ \text{m/s}) = 45{,}000\ \text{kg}\cdot\text{m/s}$

6. A 1,500.-kilogram car is also traveling in a straight line. Its momentum is equal to that of the truck in the previous question. What is the velocity of the car?

$v = p/m = \frac{45{,}000\ \text{kg}\cdot\text{m/s}}{1{,}500.\ \text{kg}} = 30.\ \text{m/s}$

7. Which would take more force to stop in 10. seconds: an 8.0-kilogram ball rolling in a straight line at a speed of 0.2 m/s or a 4.0-kilogram ball rolling along the same path at a speed of 1.0 m/s?

$p = mv = (8.0\,kg)(0.2\,m/s) = 2\,kg \cdot m/s$

$p = mv = (4.0\,m/s)(1.0\,m/s) = 4.0\,kg \cdot m/s$

8. The momentum of a car traveling in a straight line at 25 m/s is 24,500 kg·m/s. What is the car's mass?

$m = p/v = \frac{24{,}500\,kg \cdot m/s}{25\,m/s} = 980\,kg$

9. A 0.14-kilogram baseball is thrown in a straight line at a velocity of 30. m/s. What is the momentum of the baseball?

$p = mv = (0.14\,kg)(30.\,m/s) = 4.2\,kg \cdot m/s$

10. Another pitcher throws the same baseball in a straight line. Its momentum is 2.1 kg · m/s. What is the velocity of the ball?

$v = p/m = \frac{2.1\,kg \cdot m/s}{0.14\,kg} = 15\,m/s$

11. A 1-kilogram turtle crawls in a straight line at a speed of 0.01 m/s. What is the turtle's momentum?

$p = mv = (1\,kg)(0.01\,m/s) = 0.01\,kg \cdot m/s$