

CHAPTER 12 PROBLEM SET

NAME _____
 CLASS _____
 DATE _____

Speed, Acceleration, and Momentum

Study the sample problems. Then solve each of the speed, acceleration, and momentum problems on another piece of paper. Always show your work.

Speed	Acceleration	Momentum
What is the speed of a train that travels 230 km in 3 hours? $\text{Speed} = \frac{\text{distance}}{\text{time}}$ $S = \frac{d}{t}$ $S = \frac{230 \text{ km}}{3 \text{ h}}$ $= 76.6 \text{ km/h}$	What is the acceleration of a car that changes speed from 30 km/h to 90 km/h in 5 seconds? $\text{acceleration} = \frac{\text{final } v - \text{starting } v}{\text{time}}$ $a = \frac{v_f - v_s}{t}$ $a = \frac{90 \text{ km/h} - 30 \text{ km/h}}{5 \text{ s}}$ $= \frac{60 \text{ km/h}}{5 \text{ s}}$ $= 12 \text{ (km/h)/s}$	What is the momentum of a 10-kg ball traveling 2 m/s? $\text{Momentum} = \text{mass} \times \text{velocity}$ $= 10 \text{ kg} \times 2 \text{ m/s}$ 20 (kg)(m)/s

1. What is the speed of a bicyclist who travels 300 km in 10 hours?
2. What is the speed of a car that travels 1,200 km in 17 hours?
3. What is the speed of a runner who completes a 44-km marathon in 150 minutes?
4. What is the speed of a boat that travels 56 km in 4 hours?
5. What is the speed of a hockey puck that travels 16.6 meters over a frozen lake in 0.8 seconds?
6. The speed of a car increases from 10 km/h to 50 km/h in 9 seconds. What is its acceleration during this time?
7. What is the acceleration of a hockey puck when its speed increases from 1 m/s to 25 m/s in 1 second?
8. What is the acceleration of a cheetah whose speed increases from 20 km/h to 90 km/h in 30 seconds?
9. A plane increases its speed from 320 km/h to 750 km/h in 0.25 hours. What is its acceleration?
10. A bus in traffic increases its speed from 10 km/h to 23 km/h in 2 minutes. What is the average acceleration of the bus?
11. A freight train is traveling at 15 km/h as it passes through a town crossing. Half an hour later (0.5 hr) it is traveling at 80 km/h. What is its acceleration over this half hour?
12. What is the momentum of a 10-kg rock moving at 3 m/s?
13. What is the momentum of a 0.5-kg ball moving at 12 m/s?
14. A 2-kg toy truck is rolling along a level sidewalk at 3.5 m/s. What is the momentum of the toy truck?
15. A 1.4-kg bird is flying at 15.6 m/s. What is the momentum of the bird?
16. A 1.5-kg bowling ball is traveling at 24.8 m/s. What is its momentum?

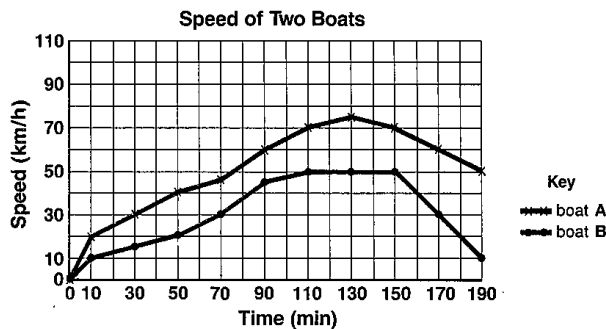
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Using a Graph to Learn about Motion

Graphs are often used to show how the motion of objects changes over a period of time. The graph below shows the speed of two boats on a still lake over a period of 180 minutes. Use the information in the graph to answer the following questions. Show your work and answers on a separate piece of paper.



1. What was the speed of both boats at 0 minutes?
2. What were the speeds of boats A and B at 10 minutes?
3. Which boat had greater acceleration during the first 10 minutes?
4. What was the speed of boat A at 30 minutes?
5. How long had boat B been traveling before it reached a speed of 30 km/h?
6. Which boat traveled at a greater speed throughout the 180-minute period?
7. What was the difference in the speed of boat B between 50 minutes and 70 minutes?
8. What was the average acceleration of boat B between 50 minutes and 70 minutes?
9. During which time period did boat B have greater acceleration than boat A?
10. At 90 minutes, how much faster was boat A traveling than boat B?
11. What was the average acceleration of boat A between 90 minutes and 130 minutes?
12. When was the speed of boat B constant? What was the acceleration of boat B during this time? Explain your answer.
13. Was the speed of boat A ever constant? Explain your answer.
14. When was the acceleration of boat A constant? Explain your answer.
15. What was the average deceleration of boat A between 130 minutes and 180 minutes?
16. What was the average deceleration of boat B between 150 minutes and 180 minutes?
17. Boat A has a mass of 300 kg. What was its momentum at 40 minutes?
18. Boat B has a mass of 400 kg. What was its momentum at 60 minutes?
19. A channel that feeds into the lake has a current flowing of 10 km/h due south. Boat A enters the channel from the lake with a velocity of 25 km/h due north. What is the velocity of boat A while it is in the channel?

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