

CHAPTER
2

Content Outline
for Teaching

Motion

Underlined words and phrases are to be filled in by students on the Note-taking Worksheet.

Section 1 Describing Motion

- A. Motion—when an object changes its position relative to a reference point
 - 1. Distance—how far an object has moved
 - 2. Displacement—distance and direction of an object's change of position from a starting point

- B. Speed—distance an object travels per unit of time
 - 1. Rate—any change over time
 - 2. Calculation for speed: $speed = distance/time$
 - 3. Speed that doesn't change over time—constant speed
 - 4. Speed is usually not constant; usually an object has changing speed.
 - 5. Average speed—speed of motion when speed is changing:
 $speed = total\ distance/total\ travel\ time$
 - 6. Instantaneous speed—speed at any given point in time

- C. A distance-time graph displays motion of an object over time.
 - 1. Plot distance on a(n) vertical axis.
 - 2. Plot time on a(n) horizontal axis.

- D. Velocity—speed and direction of an object's motion

- E. Motion of Earth's crust—so slow we don't notice

Discussion Question

How do constant speed and changing speed differ? At constant speed, an object's instantaneous speed remains the same; at changing speed, an object's instantaneous speed varies.



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Section 2 Acceleration

A. Acceleration—change in velocity's rate

1. Positive acceleration—speed is increasing.
2. Negative acceleration—speed is decreasing.
3. When an object changes speed or direction, it is accelerating.

B. Calculating acceleration

1. Acceleration = change in velocity/time
2. Change in velocity = final velocity – initial velocity
3. Unit for acceleration—meters per second squared
4. Positive acceleration—positive number with a positive slope on a velocity-time graph
5. Negative acceleration—negative number with a negative slope on a velocity-time graph

C. Amusement park acceleration—Roller coasters

1. Changes in speed cause acceleration.
2. Changes in direction cause acceleration.

Discussion Question

Is a wooden roller coaster's swaying acceleration? Why or why not?

Yes, swaying is a change in direction.





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Section 3 Motion and Forces

- A. **Force**—a push or pull that one body applies to another
1. A force can cause an object's motion to change.
 2. When two or more forces combine at the same time, they create a **net force**.
 3. **Balanced forces** are equal in size and opposite in direction.
 4. Unbalanced forces are unequal in size and / or are not in the same direction.
- B. Inertia and Mass
1. **Inertia**—an object's resistance to any change in motion
 2. Objects with greater mass have greater inertia.
 3. Newton's first law of motion—an object moving at a constant velocity keeps moving at that velocity unless a net force acts on it; an object at rest will stay at rest unless a net force acts on it.
- C. Auto crashes—the law of inertia at work
1. A passenger not wearing a seat belt keeps moving forward at the car's speed even after the car stops.
 2. A passenger wearing a seat belt slows down as the car slows down and stops.

Discussion Question

Why does it take more force to pick up a glass full of water than it does a same-sized empty glass? A full glass has greater mass.

