Name Date Class

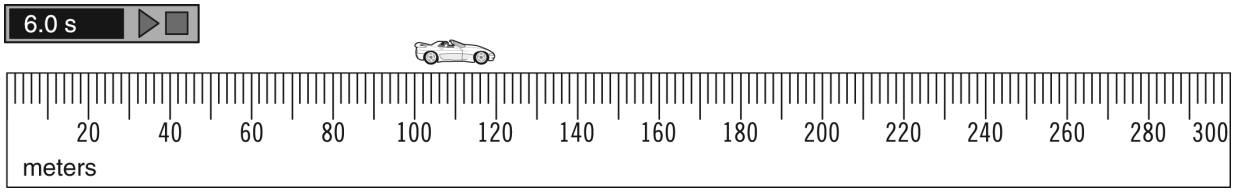
(Unit 2 Chapter 1, Activities 6–8)

Speed of Objects with Constant Motion

1. The position of an object is defined relative to a reference point. The distance an object travels is the difference between its final position and its starting position. Distance is always positive or zero.
2. The **speed** of an object with constant motion can be determined in one of two ways:

   a) By dividing the distance traveled by time elapsed. This can be written as an equation:

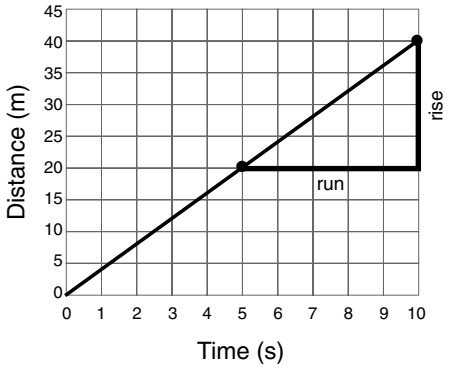
$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$



   b) By constructing a distance versus time graph, and measuring the slope of the line plotted on the graph.

3. The **slope** of a line can be found by picking any two points on the graph, measuring the rise (change in vertical variable) and the run (change in horizontal variable). The slope is equal to the rise divided by the run.

Finding the Rise and Run to Determine the Slope



4. For an object moving at a constant speed, the distance versus time graph is a straight line. You can say that there is a **linear relationship** between distance and time.

5. The speed of a compressional or transverse wave is determined by the medium that the wave travels through. The speed of a wave is not determined by its frequency or amplitude.

What evidence supports this idea?

6. Typically, waves travel at higher speeds through solids than through liquids, and at higher speeds through liquids than through gases.

What evidence supports this idea?

7. Because a wave travels through a medium at essentially a constant speed, the relationship between speed, distance, and time is the same for a wave as it is for an object:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Objects with Changing Speed

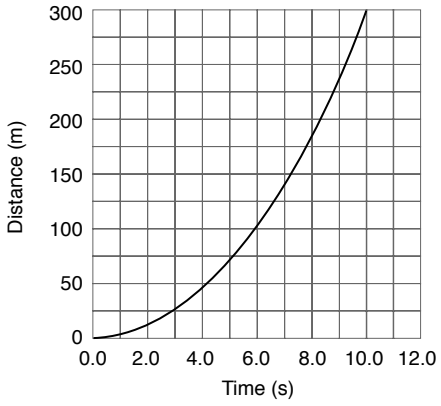
8. The **average speed** of an object or wave with changing speed can be found by dividing the total distance the object or wave travels by the time taken.

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Time}}$$

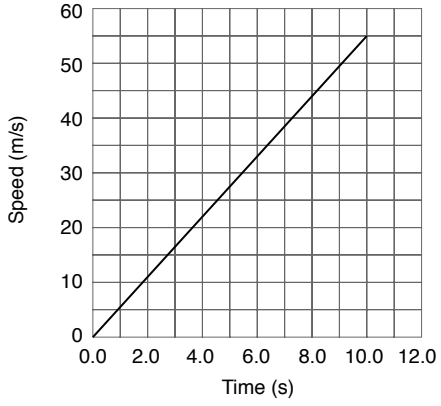
9. To find the **total distance,** the distances traveled by the object or wave between changes in direction are added together.

10. For an object moving with changing speed, the relationship between distance and time is a **nonlinear relationship.** This means that the plot of distance versus time is not linear (that is, it is not a straight line). The relationship between speed and time may be either linear or nonlinear. (In the speed-time graph below, it is linear.)

Distance of Race Car versus Time



Speed of Race Car versus Time



11. The **velocity** of an object describes both its speed and the direction of its motion. For example, a car leaving Baltimore for San Francisco at a speed of 100 km/hr has a velocity of 100 km/hr to the west.

12. The **acceleration** of an object describes how quickly its velocity is changing. Acceleration can describe a change in speed, a change in the direction of motion, or both.