

## Activity 8: Objects and Waves with Changing Speeds

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Name

Date

Class

### Key Question

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### Learning the Ideas

#### Calculating the Average Speed of an Object Not Moving at a Constant Speed

1. For the 10-s simulation run, how do the *average* speeds of the three cars compare? Explain your answer. Hint: You don't need to do any calculations to answer this question.

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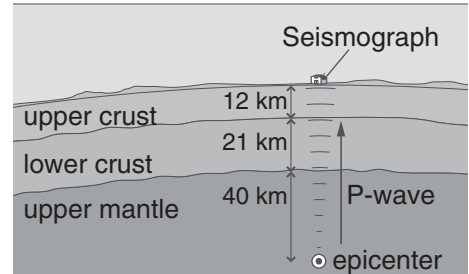
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2. Pick one of the three cars and calculate its average speed.



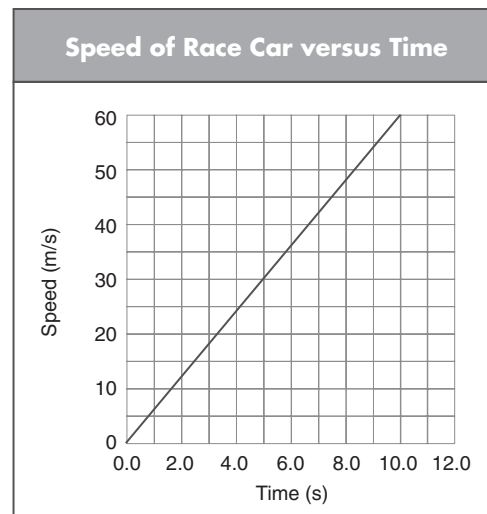
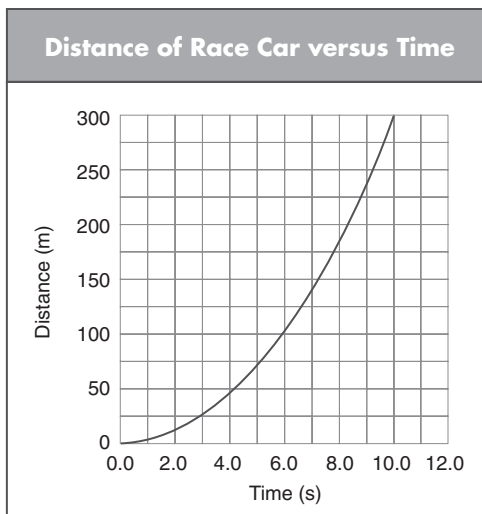
6. A seismograph detects P waves from an earthquake that originates in the upper mantle 73 km directly below the seismograph.

Because the P waves move through different types of rock, their speed is different in each layer depicted in the picture. It is 8.0 km/s in the upper mantle, 7.0 km/s in the lower crust, and 6.0 km/s in the upper crust. The P waves take 10 s to reach the seismograph. What is the average speed of the P waves?



**Distance versus Time and Speed versus Time Graphs**

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7. Complete the following statement:

The distance that the car travels \_\_\_\_\_ (*increases, decreases, remains the same*) as time increases.

8. Complete the following.

The speed of the car \_\_\_\_\_ (*increases, decreases, remains the same*) as time increases.

### **Average Speed when Direction of Motion Changes**

To find the average speed for situations in which an object's direction changes, you need to use the *total* distance traveled:

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

9. Suppose that starting from home, Alex travels along the road 9 mi. east (to the right). He then turns around and, rather than going back home, he rides to City Hall which is 3 mi. west (to the left) of his home. His total travel time is 3 h. What is his average speed?

### **What We Have Learned**

Remember the key question for this activity:



**How do you determine a speed for an object whose speed changes with time?**

Answer the key question.

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