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INTERPRETING AND PREDICTING FROM GRAPHS

Imagine that you are in a car traveling down a long, straight road. Every 10 seconds you record the car's speed. With the speed and time data, you could find some information about the car's acceleration. By studying a speed-time graph, you could determine when the driver pressed on the accelerator or when the brakes were used.

Figure 1 shows a simple speed-time graph of a car trip. The speed did not change with time. The speed was constant. This means that the car was not accelerating or decelerating. Acceleration measures how much the speed changes each second. Figure 2 is the speed-time graph of a car that was accelerating down the road. The slope, or incline of the graph, shows that the speed was increasing each second. Figure 3 is the speed-time graph of a car that was really accelerating down the road! The slope of the graph is large, showing a large change in speed every second. Can you see that the speed changes twice as fast in Figure 3 as in Figure 2? This difference means that the acceleration is twice as much.

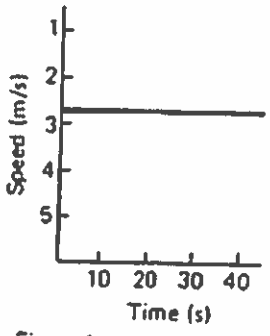

Figure 1.

Figure 4 shows a car that is decelerating, or slowing down. The speed is decreasing every second. By studying the slope of a speed-time graph, you can learn something about acceleration and deceleration.

Study the speed-time graphs for the car trips in Figures 5, 6, and 7. Then answer the questions that follow.

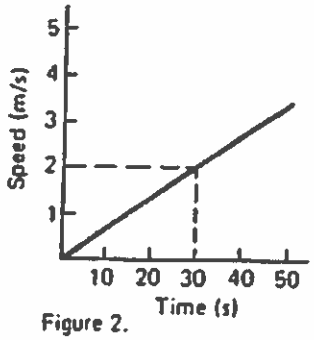

Figure 2.

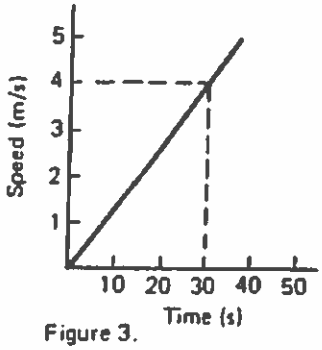

Figure 3.

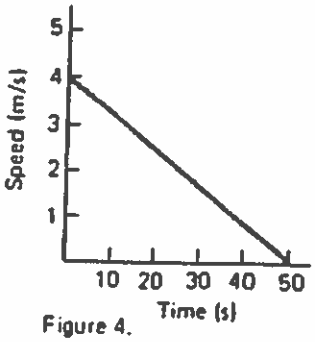

Figure 4.

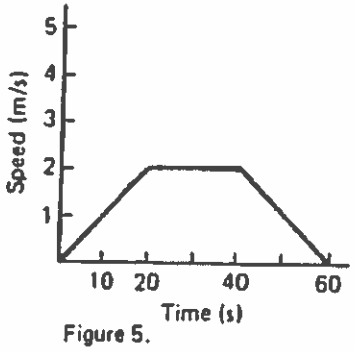

Figure 5.

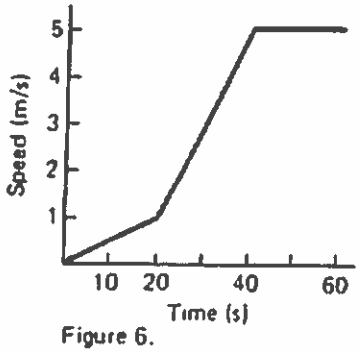

Figure 6.

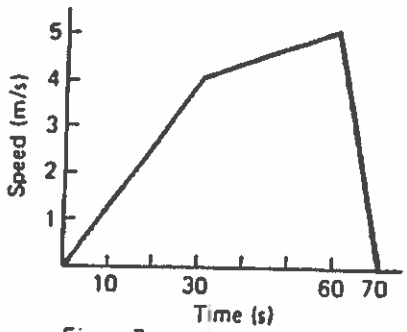

Figure 7.

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Questions

1. Describe the car trips. In doing so, tell when the driver accelerated, when the driver used the brakes and decelerated, and whenever possible, compare the accelerations and decelerations.

   a. Car trip in Figure 5. _____

   _____

   _____

   b. Car trip in Figure 6. _____

   _____

   _____

   c. Car trip in Figure 7. _____

   _____

   _____

2. Did the driver ever come to a panic stop? _____ If so, when? _____

   _____

Extra Credit

3. Now use your graphing skills to plot the speed-time graph of the following car trip: At the beginning the car is traveling in a straight line at a constant speed of 3 m/s. After 20 seconds, the car accelerates up to a speed of 5 m/s, taking 15 seconds more to reach the new speed. After a total of 35 seconds the car slows down or decelerates. It takes the car an additional 20 seconds to decelerate from 5 m/s to 0 m/s. Thus the total time for the car trip was 55 seconds.

   On the graph in Figure 8, draw a vertical speed axis and a horizontal time axis. Starting at a speed of 3 m/s, sketch the car trip on the graph.

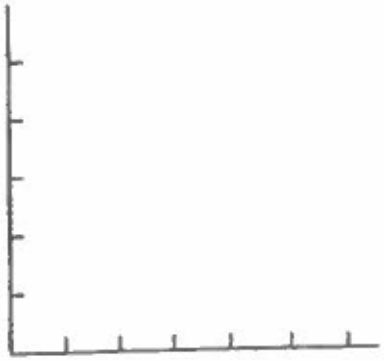

Figure 8.