Name Date **SKILL APPLICATION 5**

RECORDING AND INTERPRETING DATA

If you dropped a ping pong ball from a second floor window, its downward motion would be very complex. Whenever an object moves through the air, it experiences an air resistance force. The faster the object moves, the greater the air resistance force. You may have experienced this force while riding a bicycle.

Table 1 shows how the speed of a ping pong ball changes as it falls through the air. Can you see a pattern? By studying the data in the table you can get some information about the motion of the ball. For example, the speed of the ball increased during each second of the fall.

However, there is an interesting pattern to the ball's motion that you probably cannot see by just studying the data. Scientists use graphs to help them "see" a pattern in the data they get from experiments. Use the data in Table 1 to plot the graph in Figure 1. Connect points on your graph with a smooth, curving line. Have your teacher check your graph before you continue. Then see how much information you can find in the speed-time graph. Study the graph and answer the following questions:

TABLE 1.

Speed (cm/s)	Time (s)
32	1
57	2
75	3
88	4
95	5
98	6
100	7

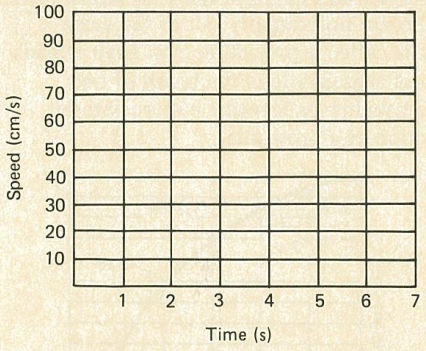

Figure 1.

1. Using your graph, find the speed of the ping pong ball at 1 s, 2 s, 3 s, 4 s, and 5 s. When was the speed of the ping pong ball increasing by the greatest amount each second? _____

_____

2. Study the slope, or incline, of your graph. Where on your graph is the slope, or incline, of the line the greatest? _____

3. When did the ping pong ball have the greatest acceleration? _____

4. When did the ping pong ball have the greatest force acting on it? (Note: Remember the relationship between force and acceleration.)_____

5. When was the speed of the ping pong ball increasing by the smallest amount each second?

_____

6. Where on your graph is the slope of the line most level? _____

7. When did the ping pong ball have the least acceleration? _____

8. When did the ping pong ball have the least force acting on it? _____

9. Imagine that two forces were acting on the ball, the gravity force (down) and air resistance (up). As the speed of the ball increased, what happened to the amount of the air resistance force? _____

10. What happened to the total force acting on the ball during the fall? _____

_____

11. Do you think the total force acting on the ball during its fall could ever be zero? If the total force is zero, what would the acceleration be? _____

12. If the ping pong ball were allowed to fall for a very long time, describe its speed near the end of the fall. _____

The ping pong ball is a free-falling body. Compare its fall to the motion of an object that is thrown horizontally out of the same window. This thrown object is called a projectile. You have already learned that the curved path of a projectile is the result of two forces—gravity and the force causing its forward motion. Study Figure 2. It describes the motion of a projectile.

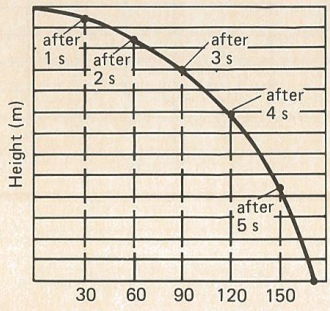

Figure 2.

13. In the space below, compare the labels on the graphs in Figures 1 and 2. _____

_____

14. How does the direction of motion of the free-falling body and the projectile differ? _____

_____

15. From the information in Figure 2 calculate the projectile's forward speed. _____

_____