Math Skills Laboratory

MATH ACTIVITY
   Working with Graphs
      Part 1: Drawing Graphs
      Part 2: Interpreting Graphs

MATH SKILLS LAB OBJECTIVES

When you complete this activity, you should be able to do the following:

1. **Draw a line graph to represent given information (numbers).**
2. **Use a line graph to extract certain information.**

LEARNING PATH

1. **Read the Math Skills Lab. Give particular attention to the Math Skills Lab Objectives.**
2. **Work the problems.**

ACTIVITY
Working with Graphs

MATERIALS

   For this activity, you'll need a ruler (English and metric) and suitable graph paper.
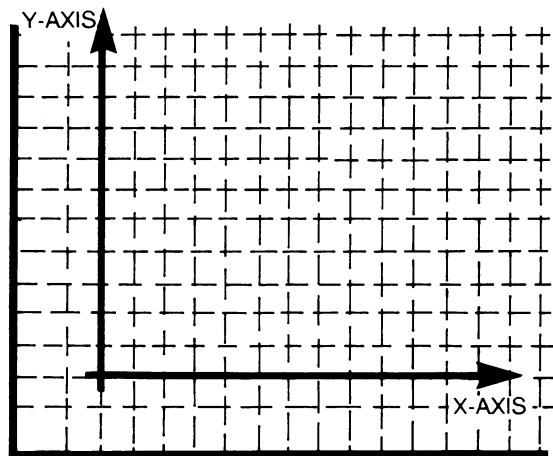
Part 1: Drawing Graphs

   Graphs are like pictures. A graph is a type of picture that lets you compare one quantity to another. For example, let's consider an object that moves along a straight line. If we record its speed for the first five seconds, we can produce a table of data like the one shown below.
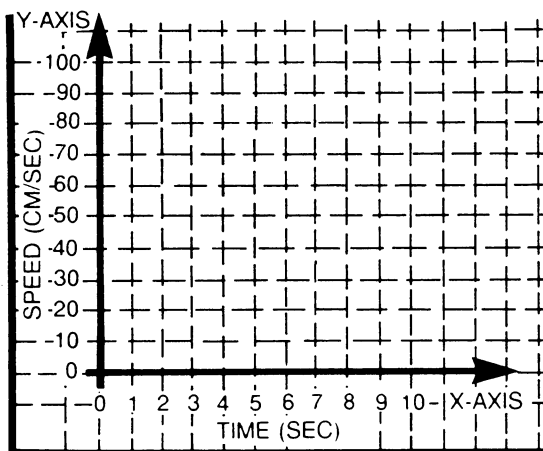
Time in seconds	Speed in cm/sec
0	0
1	12
2	24
3	36
4	48
5	60

   Then we can draw a graph that represents this data, as follows.

Step 1: On a piece of graph paper, draw a vertical (up and down) line called the "Y-axis." Then draw a horizontal (across) line called the "X-axis," as shown in the following illustration

Step 2: Next, set up a convenient scale along the Y-axis for the *speed* values. For example, if the largest speed value is 60, divide the vertical scale into units from 0 to 100. Also set up a scale along the X-axis for the *time* values. For example, if the largest time value is 5, divide the scale into units from 0 to 10. Label each axis appropriately, one for speed, one for time.

Step 3: Now, from the table of data, plot *each pair* of values on the graph. For example, when the time is 5 seconds, the corresponding value for the speed is 60 cm/sec. This pair of values is

entered on the graph as a single point. Here's how. See Figure 1a. The single point is located by "tracing" a vertical line upward from the 5-sec time point, then by tracing a horizontal line over from the 60-cm/sec speed point. The plotted point is formed where the two lines intersect.
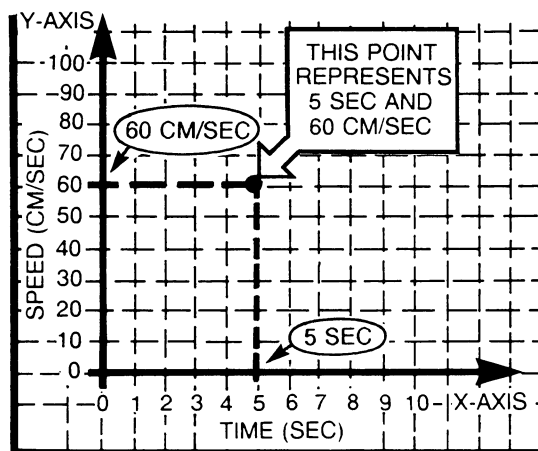

Fig. 1a

Step 4: Continue this point-plotting process for each of the four remaining pairs of values in the data table. When you're finished, you should have five points plotted. Now draw a straight line through these five points. Extend the line past the bottom point and the top point. (See Figure 1b.) The straight-line graph is now complete. It's "a picture" of how the object's speed changes as time increases.
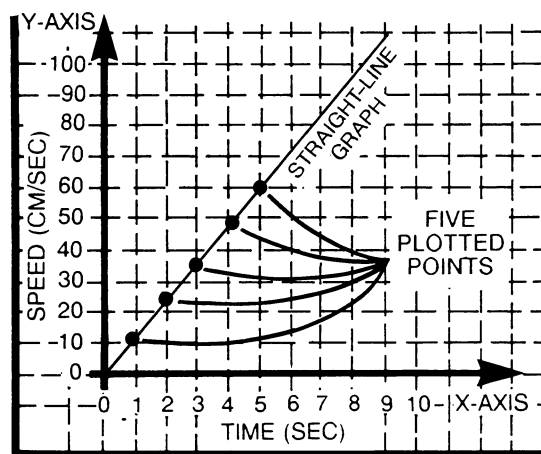

Fig. 1b

Part 2: *Interpreting Graphs*

Now that we've completed drawing the graph, let's use Figure 1b to obtain information about the speed of the object at times not given in the table of data. Consider the following questions:

Question 1: If the object whose speed has been plotted in Figure 1b were to continue traveling under the same conditions, what would its speed be at the seventh second?

Solution: See Figure 1c.

Step 1: Locate the 7-sec point on the X-axis and draw a vertical line up to the graph line. Mark the intersection point.

Step 2: Draw a horizontal line from the intersection point to the Y-axis. Read the speed on the Y-axis where the horizontal line touches the Y-axis. You may have to estimate. The answer is about 84 cm/sec.
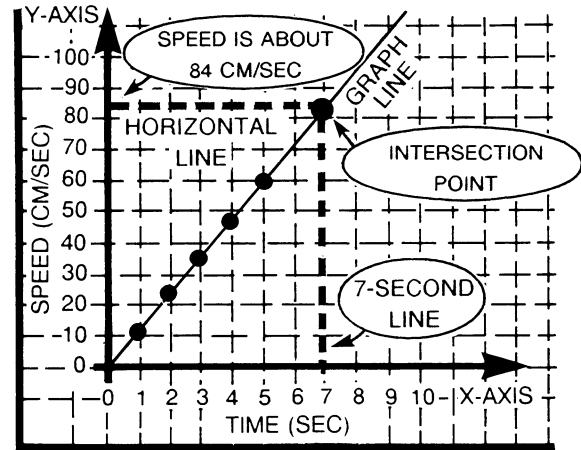

Fig. 1c

Question 2: If the same object were to continue moving under the same conditions, at what time in seconds would it reach a speed of 100 cm/sec?

Solution: See Figure 1d.

Step 1: Locate the 100-cm/sec speed point on the Y-axis. Draw a horizontal line from this point over to the graph line. Mark the intersection point.

Step 2: From the intersection point, draw a line vertically down to the X-axis. Read the correct time on the X-axis where the vertical line just touches the X-axis. You may have to estimate. The answer is about 8.5 sec.
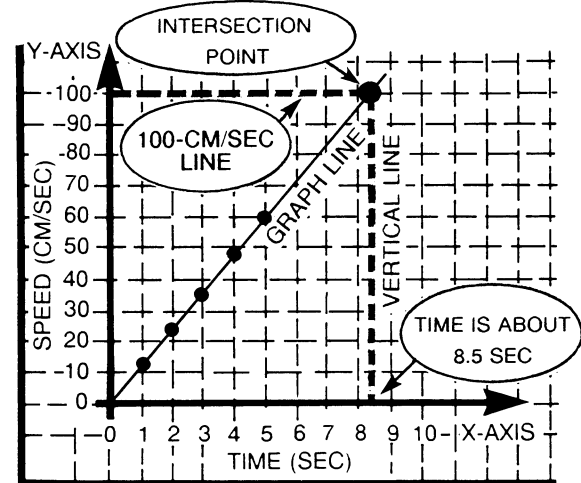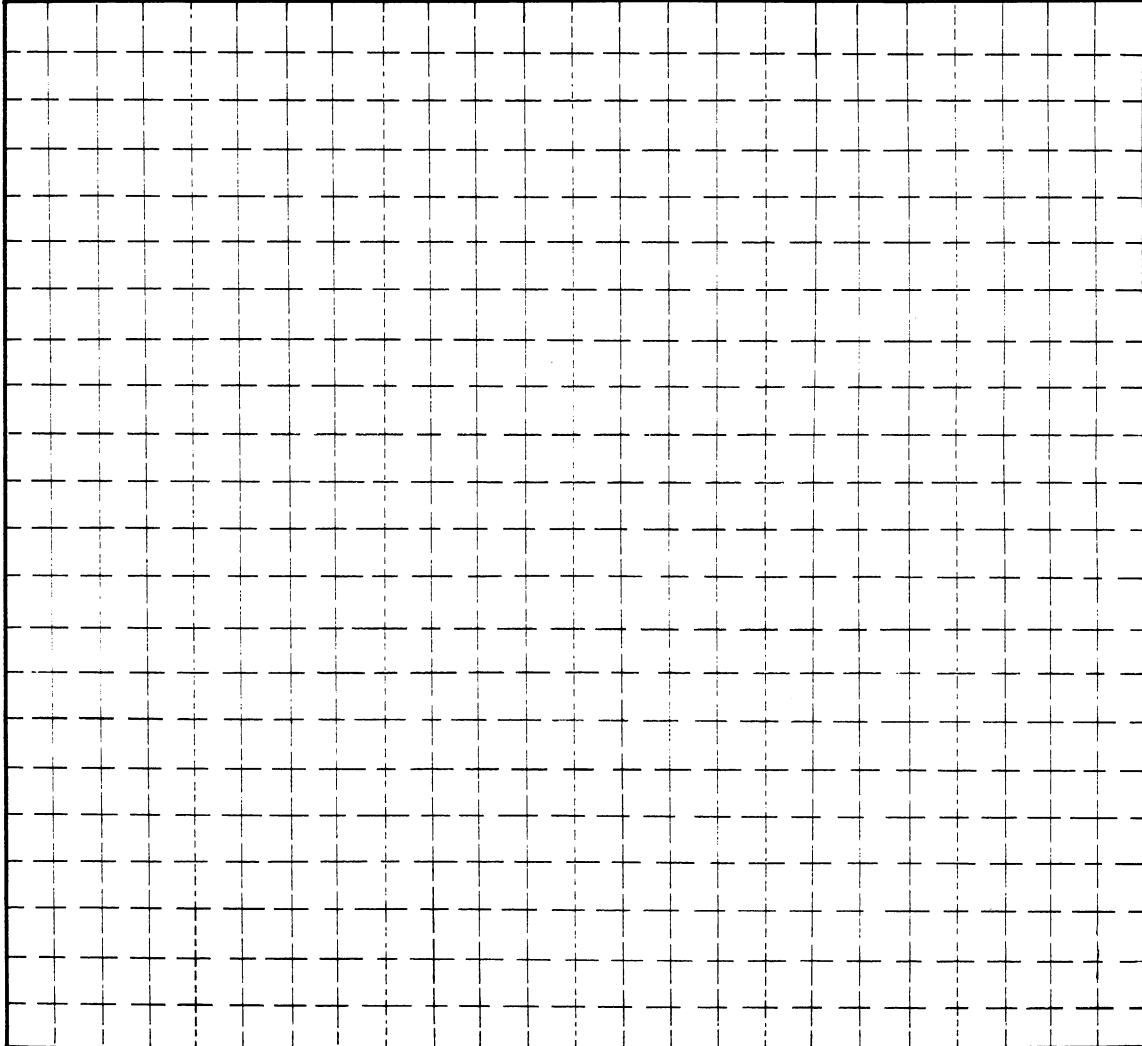

Fig. 1d

PRACTICE EXERCISES

Problem 1: *Making a Graph*

For a given wire, the electrical resistance (R) varies with wire length (L), according to the data given in the table shown.

Length of wire (in meters)	10	12	14	16	18
Resistance of wire (in ohms)	0.05	0.06	0.07	0.08	0.09

Plot the data on the grid paper provided. Label the axis with "resistance" along the Y-axis and "length" along the X-axis. Select appropriate scale divisions for each axis. Draw a straight line through the five points that you've plotted.

Problem 2: *Interpreting a Graph*

Use the graph drawn in Problem 1 to answer the following questions:

a. What would be the resistance of 13 meters of this wire?

b. If a piece of this wire has a resistance of 0.075 ohm, what is its length?

c. According to the graph, what should the resistance of 22 meters of this wire be? (**Note**: You may have to extend the straight line drawn in Problem 1 to answer this question.)