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GENERAL SCIENCE INQUIRY

BLM G-9

Reading and Interpreting Graphs

Goal • Practise reading and interpreting various types of graphs.

Think About It

Scientists often use graphs to represent data. Graphs are a valuable tool that present data in a clear, precise manner and show the relationship between variables. There are several types of graphs that scientists may choose to use. In order to understand the information presented in graphs, you must be able to read and interpret them.

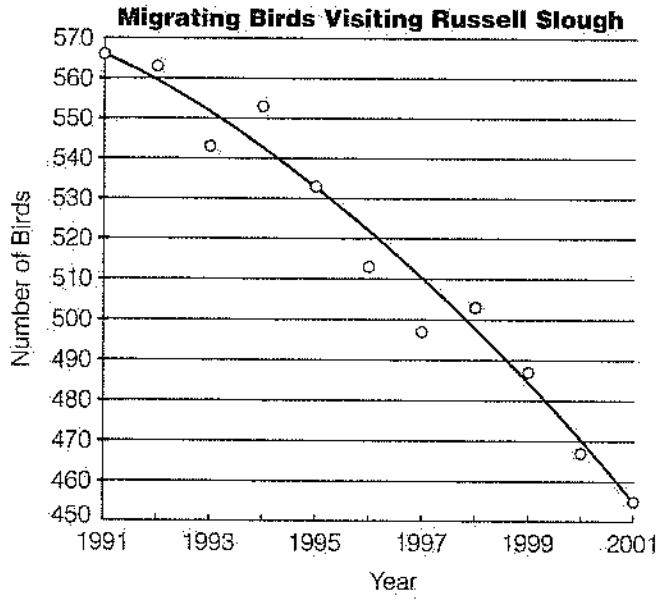
What to Do

Below are several types of graphs. A series of questions follows each graph. Use the graph to answer each set of questions.

Part A - Line Graphs

Single Line Graph

A group of scientists have been studying the effect of urban development on the number of migrating birds that visit a local slough every year. The data they have collected are represented in the line graph below.



1. a) How many migrating birds visited the slough in the first year of the study?

   b) How many migrating birds visited the slough in 1997?

   c) In what year did the fewest birds visit the slough?

Reading and Interpreting Graphs (continued)

2. Describe how the number of birds that visit the slough has changed over time.

3. Based on the information in the graph, what do you think we can expect to see happen to the number of birds visiting the slough over the next 10 years?

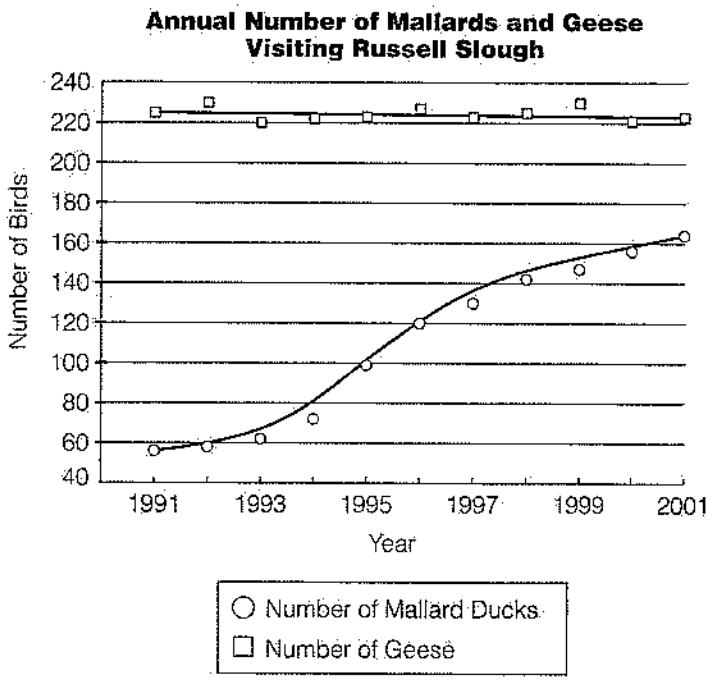
4. a) What is the responding variable in the study?

   b) What is the manipulated variable in the study?

Double Line Graph

A double line graph is used when you are working with two sets of data. Scientists have been recording data in an attempt to determine the effect of urban development on the number of mallards and geese visiting a local slough. The data that have been collected over a ten-year period are displayed in the chart and graph below.

Year	Number of Mallard Ducks	Number of Geese
1991	56	225
1992	58	230
1993	62	220
1994	72	222
1995	99	223
1996	120	227
1997	130	223
1998	142	225
1999	147	230
2000	156	221
2001	164	223



1. During which year was there the greatest difference between mallards and geese visiting Russell Slough?

2. How many more geese than mallards visited Russell Slough in 1997?

Reading and Interpreting Graphs (continued)

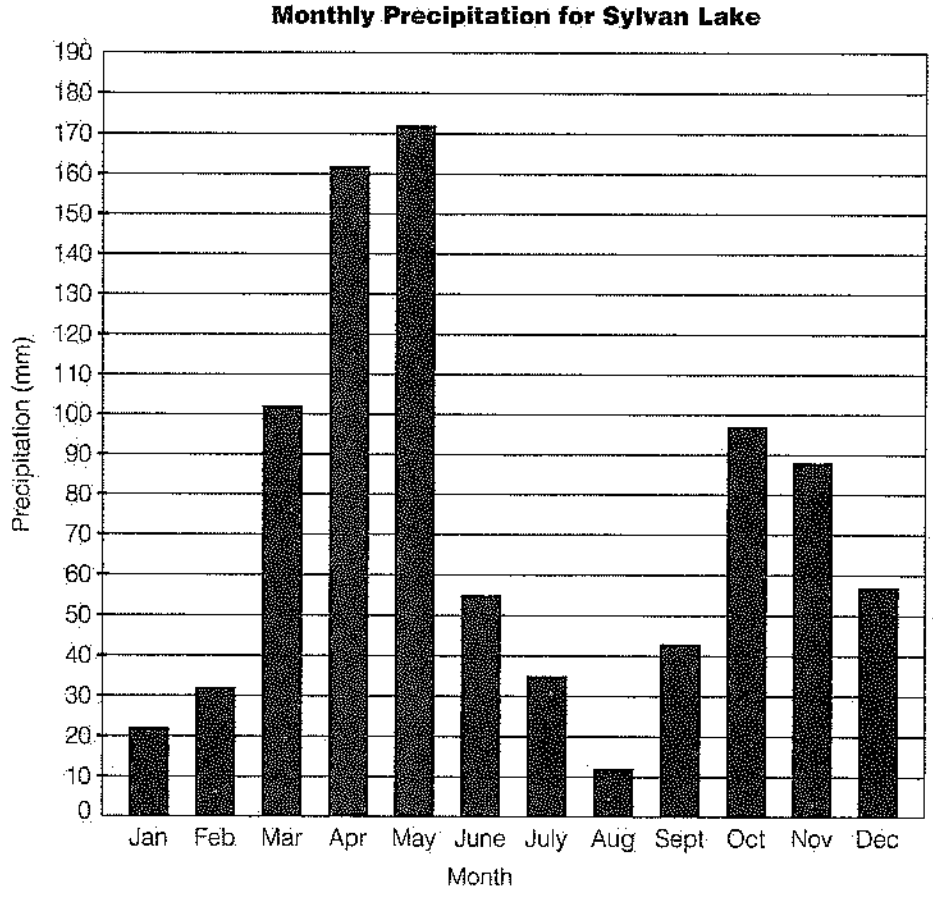
3. Describe the effect urban development has had on the number of geese visiting Russell Slough.

4. Describe the effect urban development has had on the number of mallards visiting Russell Slough.

5. Based on the information in the graph, predict what will happen to the number of mallards and geese over the next few years.

Part B - Bar Graphs

Like line graphs, bar graphs can also be used to represent one set of data or several sets. A scientist has been studying the monthly rainfall (rain or snow) in Sylvan Lake. The data collected are represented in the bar graph below.



1. Which month had the greatest amount of precipitation?

2. Which month had the least amount of precipitation?

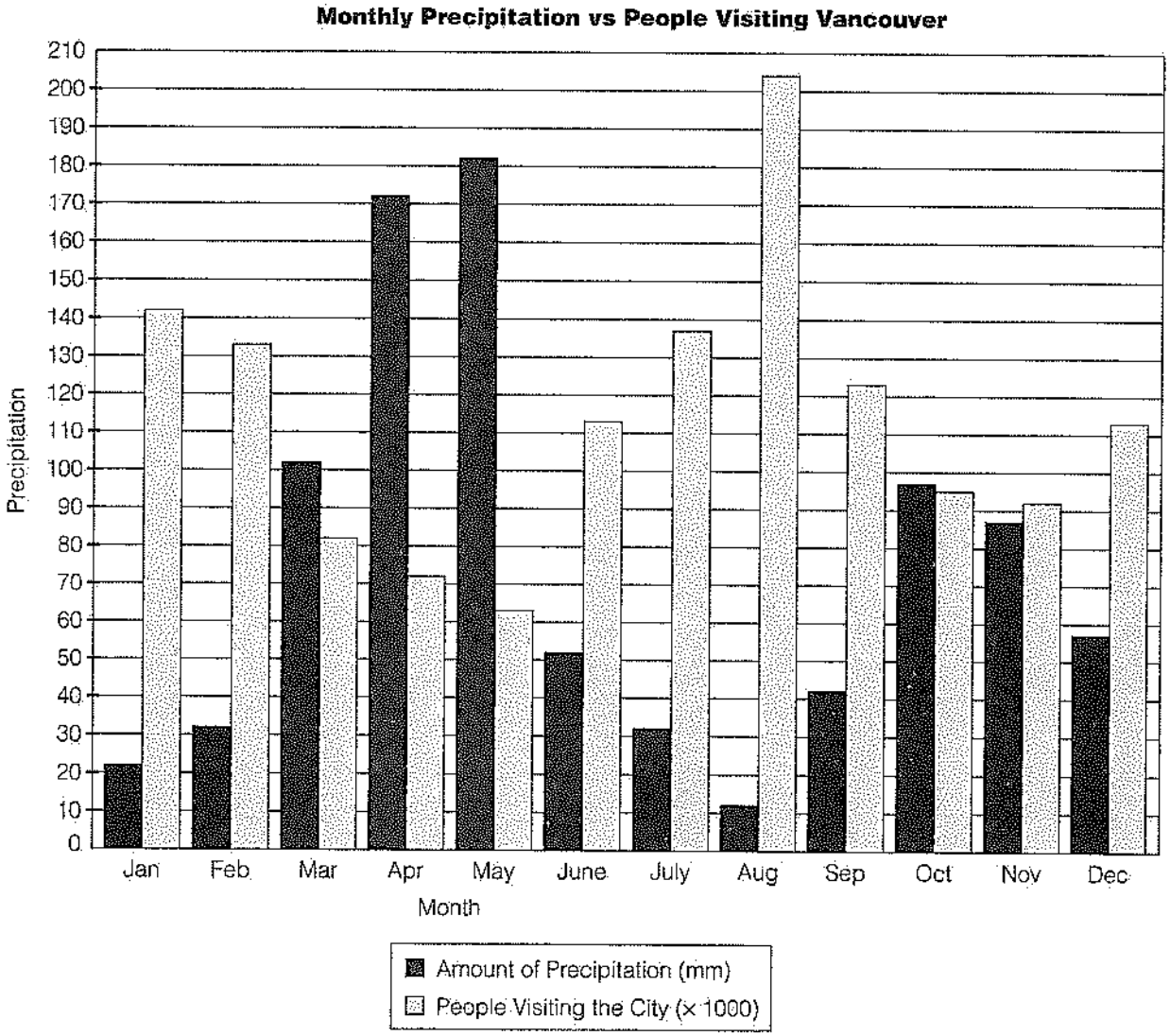
Reading and Interpreting Graphs (continued)

3. Which season had the greatest amount of precipitation?

4. What was the total precipitation for July?, November?

Double Bar Graph

A scientist has been comparing the monthly precipitation in city of Vancouver, British Columbia to the number of visitors to the city. The data collected are presented in the bar graph below.



1. State the relationship that the graphs show in terms of the amount of precipitation and the number of people who visit Vancouver.

2. How many people visited Vancouver in the following month: February? May? August? December?

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3. How much precipitation was there in January? June? November?

4. In which month did the greatest number of people visit Vancouver?

5. In which month did the least number of people visit Vancouver?

6. Which month had the greatest amount of precipitation?

7. Which month had the least amount of precipitation?

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Making and Interpreting Charts/Tables (continued)

Interpreting Charts

Use the charts to answer the questions.

Effect of Time of Day on Shadow Length

Time of Day	Shadow Length (cm)
8:00 a.m.	155
9:00 a.m.	142
10:00 a.m.	133
11:00 a.m.	124
12:00 p.m.	115
1:00 p.m.	124
2:00 p.m.	133
3:00 p.m.	143
4:00 p.m.	155

1. What is the relationship between time of day and shadow length?

_____

2. At what time of day is the shadow the shortest?

_____

3. Based on the data in the chart, would you predict that the shadow at 5:00 p.m. would be longer or shorter than it was a 4:00 p.m.? Why?

_____

_____

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Constructing Graphs

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Goal • Practise developing graphs.

Follow these general guidelines when drawing graphs.

- Always include a title. Use the variables as a title, e.g., Effect of Amount of Light on Plant Growth.
- Always label the manipulated variable on the *x*-axis and the responding variable on the *y*-axis.
- If there are units, place them with the heading at the top of the column.
- Use "tick" marks to show which lines the scale numbers relate to.

Line Graphs

Use the following steps to construct line graphs from the data below.

1. Identify the manipulated and responding variable.

2. Draw and label the *x*- and *y*-axis on grid paper (remember to place the manipulated variable on the *x*-axis and the responding variable on the *y*-axis).

3. Give your graph a title.

4. Study the data in the chart and decide on a scale for the *x*- and *y*-axis. The scale will probably not be the same for each. When choosing your scale remember that the graph should fit on one piece of graph paper and that it should be large enough to fill most of the page. Your scale must increase by regular amounts for the entire axis (i.e. increase by twos, by fives, by tens, etc.). Your scale need not start at zero if it is not suitable for your data.

5. Mark the scale on the axes and make sure you have placed "ticks" so that it is easy to see which line the scale number goes with.

6. Plot the points on the graph. Draw a small circle around them. If you are plotting more than one set of data on the graph, use difference shapes or colours to surround the points.

7. Do not draw a straight line from one point to the next. Doing this makes a broken line graph. These are rarely used in "real" science. Draw a smooth line through the points, as close to each point as you can. This is called a "Line of Best Fit." This type of line shows the trend of the data. Graphs in science are used for showing relationships and for making predictions. The "Line of Best Fit" serves both purposes.

Constructing Graphs

(continued)

Draw a line graph for the following data tables.

Highway #	Number of Cars
1	425
2	542
3	356
4	465
5	225
6	102
7	278

Day	High (°C)	Low (°C)
1	23	5
2	26	11
3	25	9
4	27	6
5	22	13
6	29	8
7	21	14