Grade 8 Mathematics
Data Analysis, Probability, and Discrete Mathematics:
Lesson 2

Read aloud to the students the material that is printed in **boldface type** inside the boxes. Information in regular type inside the boxes and all information outside the boxes should **not** be read to students. Possible student responses are included in parentheses after the questions.

NOTE: The directions read to students may depend on the available materials. Read only those parts of the lesson that apply to the materials you are using.

Any directions that ask you to do something, such as to turn to a page or to hand out materials to students, will have an arrow symbol (⇨) by them.

Purpose of Lesson 2:

- In this lesson, the tutor and the students will
  - ✓ organize and display data using line graphs and scatter plots,
  - ✓ obtain and use information from line graphs and scatter plots, and
  - ✓ match a graph to a described situation and vice versa.

Equipment/Materials Needed:

- Copies of Student Sheets 48 – 50
- Paper and pencils

Preparations before beginning Lesson 2:

- Run off one copy of Student Sheets 48 – 50 for each student.
- Have paper and pencils available.
- If students have not done Lesson 6 in Geometry (plotting points), you will have to omit the part on scatter plots or go back and do Lesson 6 first.

Lesson 2: Data Analysis

⇨ Give Student Sheet 48 to the students.

Say:

The graph on the top of the page shows a local business's profits for the first six months of the year. What type of graph is shown? (line graph) **What are line graphs used to show?** (trends, changes over time) **Approximately how much were the profits in January?** (Around $13,000 or $14,000) Students may need to discuss how they decided on this answer. The line starts a little less than halfway between 10,000 and 20,000. **I want you to write a question that could be answered by the information in the graph.** Allow students time to write a question. Have the students ask a question of other students.

Say:

If the current trend continues, what do you think the profits might be for July? Be ready to defend your answer. (Students should say an amount in the $60,000's or at least greater than $55,000. In the last few months, profits have gone up, so if the trend continues, profits should continue to go up.) The answer is not so important as just getting the students to think.

Say:

The graph at the bottom of the page shows the monthly sales for a snowball stand. Below the graph are 4 statements about the graph. Which statement is true? Allow students time to look at each statement. (C is correct.) **Why are the other statements incorrect?** (In A, the sales do not continue to increase after August. In B, the highest number of snowballs sold was in August, not July. In D, there was a decrease in the number of snowballs sold from April to May, not an increase.)

⇨ Note: If the students have not done Lesson 6 in Geometry – plotting points, you must do that one before going into this next part.

Say:

There is another type of graph that can be used to show trends. It is called a *scatter plot* or a *scattergram*. We use scatter plots to show whether two sets of data are related. In making a scatter plot, we have

to plot points on a grid. We then look to see whether the information is related in some way.

⇨ Give Student Sheet 49 to the students.

Say:

We are going to look at a survey of the numbers of hours students studied and their grades on a mathematics exam. The chart at the top of Sheet 49, shows the results of the survey. Let's use the chart to make a scatter plot of the data. First we need a title. What do you think we should call the graph? (Study Time versus Grades) **Put the title in the rectangle at the top of the graph.**

What are the numbers on the horizontal axis? (study times in hours) **In the box at the bottom, write this label. What are the numbers on the vertical axis?** (grades) **In the box on the side, write this label. Plot the points. Describe what you see.** (The points almost form a straight line. As study time increases, grades appear to increase. As you move to the right of the graph, the points are moving up.)

When both sets of data increase at the same time, we say that they are *positively related*. The scatter plot would slant upward to the right. Looking at the pattern of the points in this graph, we can predict that for this test, the more a student studied, the higher his/her grade was. If a student studied for 4.5 hours for the test, where would you expect his/her grade to be? (in the 90's)

Say:

We are going to look at a survey of the number of absences of students and their grades on a mathematics exam.
The chart at the bottom of Sheet 49 shows the results of the survey. Let's use the chart to make a scatter plot of the data. What is the title of the graph? (Absences versus grades) **What numbers are on the horizontal axis?** (absences) **What numbers are on the vertical axis?** (grades) **Plot the points. Describe what you see.** (The points almost form a straight line. As absences increase, grades appear to decrease. As you move to the right of the graph, the points move down.)
When one set of data increases and the other decreases, we say that the sets are *negatively related*. The scatter plot would slant downward to the

right. We could conclude from this graph that the more absences, the lower the grade on this test. What would you predict would have been the grade of a student who was absent 9 days? (below 60)

⇨ Give Student Sheet 50 to the students.

Say:

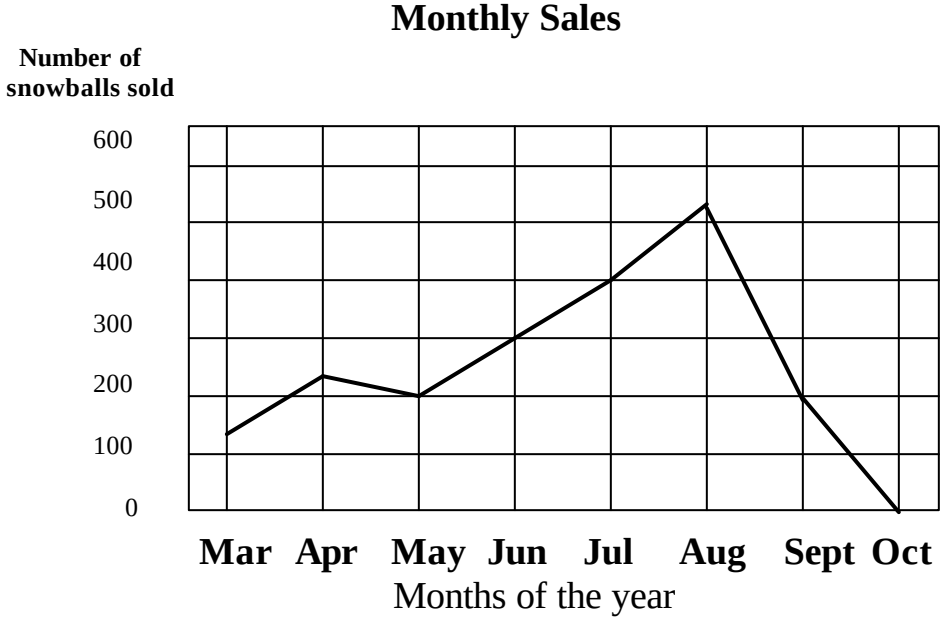
At the top of Sheet 50, we are going to look at a survey of the number of siblings (brothers and sisters) of students and their grades on a mathematics exam. The chart shows the results of the survey. Let's use the chart to make a scatter plot of the data. What is the title of the graph? (Number of Siblings versus Grades.) **What numbers are on the horizontal axis?** (number of siblings) **What numbers are on the vertical axis?** (grades) **Plot the points. Describe what you see.** (The points are scattered everywhere. As the number of siblings increases, grades don't follow any pattern. As you move to the right of the graph, the points are moving both up and down.) **When one set of data increases and the other does not increase or decrease, we say that the sets are not related. Could we make a prediction about the grade on the test of a student who had 9 siblings?** (No.) **Why not?** (There is just no pattern or trend to help us predict.)

Say:

On the bottom of Sheet 50 is a survey about the number of hours students watched TV and their grades on a mathematics exam. The results are shown in the chart. Make a scatter plot of the data. What do you see? (As the number of hours of TV watching increases, grades appear to go down.) **How are the data related?** (negatively related) **What does this plot tell you about a student who watched 4.5 hours of TV and the grade on this exam?** (The grade will probably fall below 65.) **Will this conclusion definitely be true?** (No. We are looking at trends and patterns. There could be exceptions, or the pattern could stop at a certain point.)

⇨ Have one student summarize today's lesson. You want the students to realize that line graphs and scatter plots show trends and help us make predictions. However, we may not have all of the information, so our predictions may turn out to be wrong; or since we are looking at such a small group of students, the grades may have happened by coincidence.

Student Sheet 48 (Data Analysis: Lesson 2)



The graph is a display of which information?

A. Sales on snowballs increased dramatically from May to August and continued to grow slowly from August to October.

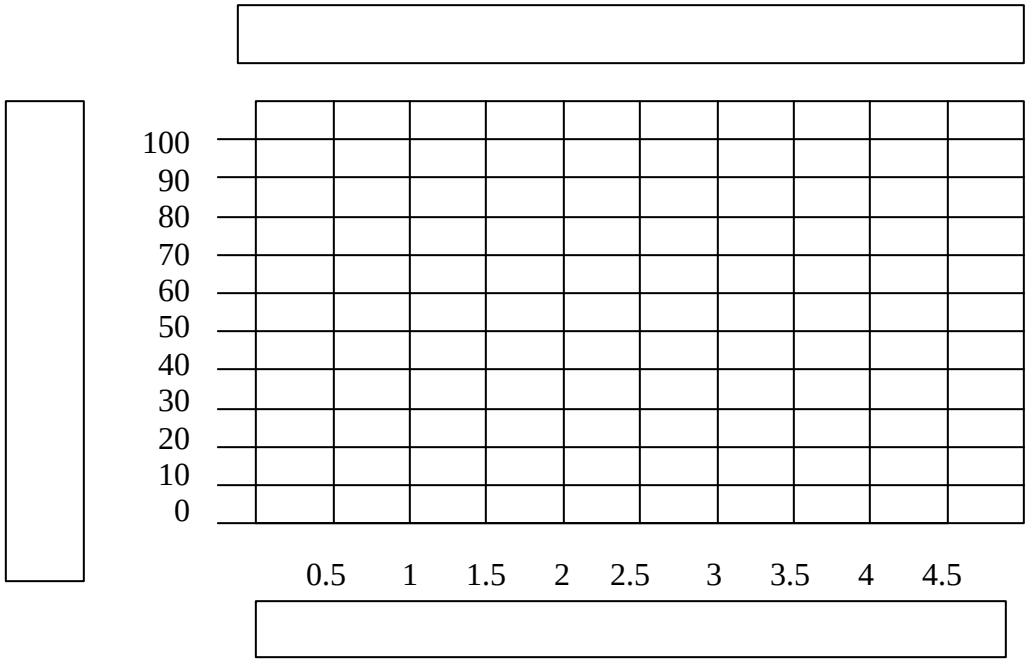
B. The highest number of snowballs sold was in July.

C. Sales on snowballs increased dramatically from May to August, but starting dropping after August.

D. There was an increase in snowballs sold from April to May.

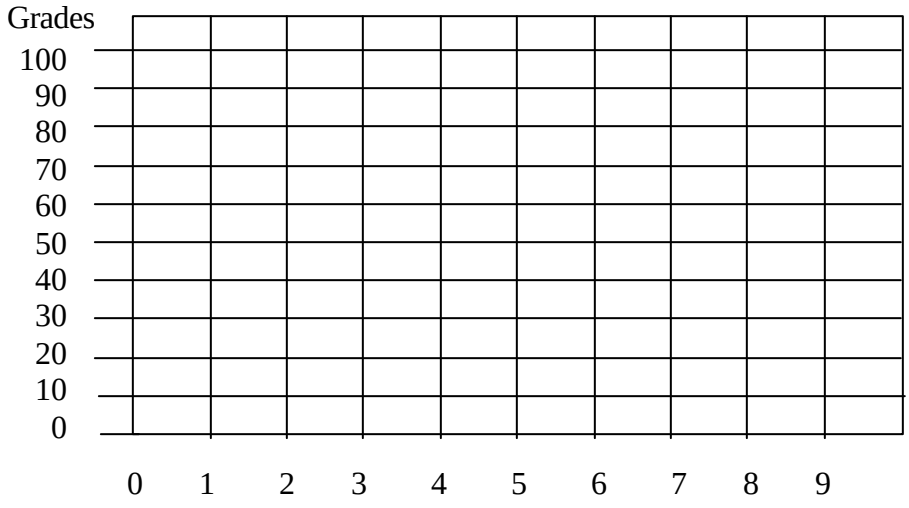
Student Sheet 49 (Data Analysis: Lesson 2)

Study time (hrs)	1	1.5	2	2.5	3	3.5	4
Grade	70	72	78	83	88	91	95



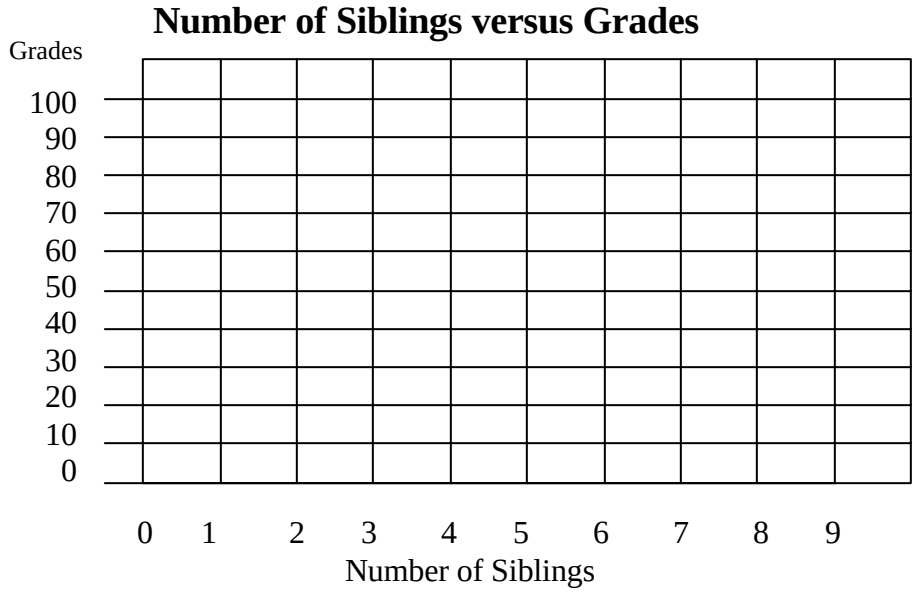
Absences	0	1	2	3	4	5	6	7	8
Grades	95	92	81	83	78	72	72	61	60

Absences versus Grades



Student Sheet 50 (Data Analysis: Lesson 2)

Number of siblings	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Grade	**70**	**84**	**98**	**80**	**95**	**76**	**71**	**85**	**72**



TV watching	**0**	**.5**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**
Grades	**95**	**92**	**87**	**83**	**80**	**75**	**72**	**68**	**65**