

# The learner will understand and use graphs and data analysis.

# 4

*Notes and textbook references*

## ***4.01 Collect, organize, analyze, and display data (including scatterplots) to solve problems.***

**A.** Have students keep an hour by hour log for a 24 hour period. Ask the class to determine categories for these data (sleep, school, eating, play, and so on). Students need to round their categories to the nearest half hour or hour (nearest half hour is more precise, but may be very difficult for some students). Have each child construct a circle graph. Use these graphs to create a bulletin board and have students write about their day.

### **B. Foot Length, Shoe Size**

Have the students collect data on the length of their foot in inches, shoe size. Keep the girls and boys data separate. Make scatterplots of the data and find linear regressions equations to fit the data.

#### **QUESTIONS:**

1. A famous male basketball player is said to wear size 22 shoe. Determine the possible size of his foot.
2. A girl has a foot length of 10 inches. What size shoe would she wear?
3. Discuss whether you think shoe manufacturers would need real data to determine shoe sizing for their products.

#### **EXTENSIONS:**

1. Collect data on size of foot and height and find a linear model. Discuss the validity of the model if data was collected on male middle school students as compared to data from adult males.
2. What size shoe would the model predict for a female having a foot length of 48cm? To get a conversion formula, place a ruler with inches aside a ruler with centimeter. Find two places where you can see the scales meet. Record data (centimeter, inch). Find the linear equation using those two points, then convert the 48 cm to inches so that you can use the formula you have developed earlier.

## **4.02 Approximate a line of best fit for a given scatterplot; explain the meaning of the line as it relates to the problem and make predictions.**

### **A. Grades and Time Studying (Blackline Master IV - 1)**

Materials: graphics calculator

Activity: The purpose of this activity is to illustrate to students how decisions can be based on data. Is there a relationship between a chapter test grade and the time that a student studies the night before? Can the data analysis convince a student that studying the night before is worthwhile? (This investigation does not take in account other possible factors like daily preparation or taking notes in class.)

Without advance warning, the teacher should ask students on the day of a chapter test to write at the top of the first page the number of minutes that they studied the night before. After tests are graded, collect the data in a table (time studied in minutes, chapter test grade). Before giving it to students to analyze, ask them to tell you how much time is appropriate to study for a chapter test.

Questions:

1. Was the linear model a good fit? How did you determine this?
2. Can predictions made from this model be useful?
3. Based on the model, what amount of time is needed to make at least a C (77 average) on the test?

Extensions:

Explore collecting data on the amount of time watching TV in 14 days and the grade average over 14 day period.

### **B. Virtual Scatterplots**

This website is a virtual manipulative of a scatterplot. It allows you to enter data sets and the site graphs the data in a scatterplot as you enter it. A linear regression line is provided as well. Students may find it interesting to see how the line changes as you enter the data points. It also provides advanced information about the linear model such as the  $r$  value and the equation of the regression line.

[http://nlvm.usu.edu/en/nav/frames\\_asid\\_144\\_g\\_3\\_t\\_5.html?open=activities](http://nlvm.usu.edu/en/nav/frames_asid_144_g_3_t_5.html?open=activities)

### **C. Square Footage versus Price**

Students can use the internet to collect data from local realtors' websites regarding the square footage of a house and its price. Once they have collected the data students could enter the information into a spreadsheet (such as Excel) and then make a scatterplot. (This also meets computer competency goals.) Students could then print their scatterplot and determine a line of best fit based on the "spaghetti line" approach. Students then could discuss the meaning of the slope of the line as well as the intercepts. Have students use the line of best fit to make predictions.

It would be interesting to collect data from different areas of the state or nation to see how the scatterplots differ.

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references*

### **4.03**      *Identify misuses of statistical and numerical data.*

**A. Using Print Materials** Distribute magazines and newspapers to students and have them read at least three articles or advertisements and write at least one paragraph about each. They should address the question of how data are used to influence decisions.

**B.** Assign students the task of finding a graph from any written media (newspaper, magazine, etc.). In addition to bringing in the graph, students must write a few sentences analyzing the graph. Once you have a collection of graphs look over them for ones that might be misleading. Make an enlargement of these graphs on transparencies and discuss with the class how and why they are misleading.

**C.** This website contains an interesting article written by the National Highway Traffic Safety Administration that contains quite a bit of mathematics. The article discusses how statistics (and other mathematics) are manipulated to make the number of drunk driving accidents appear more numerous than they are. This may be a resource for your more advanced readers.

**<http://www.duigulag.com/stats.htm>**

**D.** A good kickoff to lessons of this nature would be a video by ABC News correspondent John Stossel who filmed a segment called “Fact or Fiction: Misleading Statistics” which encourages all people to think beyond the extravagance of some headlines. The 13-minute video may be purchased through [www.socialstudies.com](http://www.socialstudies.com) or it might be worth checking with your local TV station if they are an ABC affiliate to see if they may be able to get the segment for you.

**E. Which Graph Should You Use?** (Blackline Master IV - 2 )

Students will use two graphs based on the same data to make decisions about soda machines in their schools. As students discuss the differences in the graphs, they should recognize and talk about the differences in the scales and how that can misrepresent the data.

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