

Data and Decisions 6th grade
(approximately 2 day)

GLEs Addressed:

- #29. Collect, organize, label, display, and interpret data in frequency tables, stem-and-leaf plots,
and scatter plots and discuss patterns in the data verbally and in writing
(D-1-M) (D-2-M) (A-3-M)
- #30. Describe and analyze trends and patterns observed in graphic displays (D-2-M)
- #32. Calculate and discuss mean, median, mode, and range of a set of discrete data to solve real-life problems (D-2-M)

Objective(s):

1. The learner will collect and organize real-life data using a scatter plot.
2. The learner will plot data as coordinate points.
3. The learner will construct a line of best fit on a scatter plot.
4. The learner will calculate the mean, median, mode, and range.

Materials:

Daily problem **Transparency 3.1**

Student Activity 3.1/Questions

Grid Paper

Student Activity 3.2/Transparency 3.2/homework

Student Activity 3.3/iLEAP Connection

Transparency 3.3

Calculators (optional)

Rulers and measure with a string or tape measures with centimeters

Daily Problem Lesson 3

There are two daily problems her in case it takes two days for this lesson---one for each day. If it does not take two days you do not have to do both problems.

Tyrone scores 10, 7, 13, and 10 runs in his first four games. What is Tyrone's average?

Answer: 10

Miss Kinney's homeroom brought canned goods for the needy families before Christmas. On Monday, they brought 21 cans, Tuesday – 33 cans, Wednesday – 19 cans, Thursday – 10 cans, and on Friday – 42 cans. How many total cans did her homeroom bring for the needy families? Did the total number of cans brought on any of the days listed match the mean of the data? Explain how you determined the answer.

Answer: Sum is 125 cans giving a mean of 25 cans and it does not match any totals listed.

Lesson Procedures:

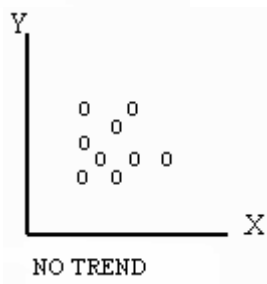
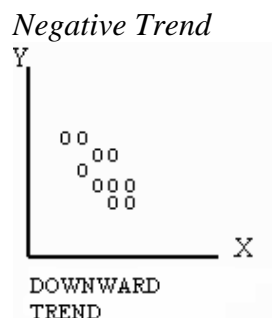
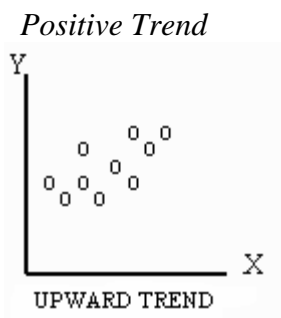
1. Discuss daily problem. Have students explain method of determining the answer. Make sure they answer the question, not just find the mean.

FYI – *Today's lesson explores one of many body ratios. The students will also measure the circumference of their head – measuring circumference can often be deceptive. A mature adult's height is about 3 times the circumference of the head; young school age children have about a 2.2 ratio of height to head circumference and adolescents about 2.8. A mature adult's height is about 2 times their leg length. As we go through the actions of this activity, we will find the mean of their height to head circumference ratio which should give a decimal equivalent close to the 2.8. The students will create a scatter plot representing the data collected and make observations from the data.*

2. Introduce the lesson by using the following situation: (sometime before class without knowledge of other students – fit the cap to one student's head)
I found this baseball cap on the floor yesterday. Is there any way that I can determine the height of the student that left the cap? (You may wish to make it a detective situation and the cap found at a crime scene.)
3. Discuss the situation and have the students predict how they think their height compares to their head circumference.
4. Review with the student how to measure to the nearest centimeter. Have pairs of students measure and record their height and head circumference to the nearest centimeter. Make a transparency for **Student Activity 3.1/Transparency 3.2** and the students come to the overhead and record their data on it as they complete these two measures. (we are only filling in the first two columns on the transparency at this time.) The students also need a copy of **Student Activity 3.1** and are to complete the chart of the data that is being recorded on the overhead –**or** –run a copy of the completed chart and give the completed chart to the class the next day. (do whatever works for you.) **Ask: What is the range of the head circumferences in the class? The heights? What does range mean?**
5. Pass out calculators. Have the students find the **mean, mode, median, and range** for the head circumference and height of the members of the class. Record at the bottom of their chart or on the back.
6. Write these averages as a height/head circumference ratio. Find the decimal equivalent and round to the nearest whole number to write the ratio. (*should be about 3*)
7. **Ask** - What does this decimal equivalent tell us about the relationship? (*It tells them how many average head circumferences would make the average height*)
8. We now want to graph our data. First we need to discuss how graphs must be drawn.

Discuss the labeling of the grid---MUST have name of graph and name on each axis. Suppose you are making a graph. After you label the axes, choose the scale- the number running along a side of the graph. The difference between numbers from one grid line to another is the interval. The interval will depend on the range of your data. There are cases when we will not start with 0 (origin) there just isn't enough paper to make your scale at zero and still have intervals that are useful. You may want to use a broken scale. You need to be very careful when you break the scale in a graph. Use a jagged line to show the break in a scale. See use **transparency 3.3** to help explain this to the students. The intervals must be the same for the x -axis, but a different interval can be used for the y -axis.

9. **Using the data on Student Activity 3.1 along with grid paper**– Distribute grid paper. Have the students plot the height to head circumference as coordinate points. (Quadrant 1 only) as coordinate points. *As a class decide and label the X and Y axes. [FYI –on this graph neither measurement is dependent upon the other so it doesn't matter how you label each axis. However, the y-axis (vertical axis) is where the dependant variables will be plotted; on the x-axis (horizontal axis) is where the independent variables will be plotted. For example, the amount of money you spend depends upon the number of candy bars you buy. Therefore, the money would be the y-axis and the number of candy bars would be the x-axis.] Discuss the scatter plot. Students should realize that an increase in height results in an increase in head circumference – but this may not come out right away. Give it time to develop – don't just tell them. The data points should go in an upper direction from left to right which is called an upward or positive trend.*
10. Students should write two observations that they see from their scatter plot.
Have the students place an 'x' on their graph where they think the comparison point would be for a person with a head circumference of 55 cm. Discuss answers and reasoning.
11. **Transparency 3.4** Discuss trends in data such as upward/positive trends, downward/negatives trends, and no trend. You may want to use other resources or have samples available for discussion. The sample graphs below give an example of how data is arranged on each.



12. Pass out a piece of spaghetti to each student. Students can use a piece of spaghetti or a ruler to place on their scatter plots to approximate a trend line or line of best fit. Looking at the scatter plot of the head circumference and height Recall that the line of best fit is that line which is as close to all the data as possible. **In other words, if the dots were M & M's and you have to divide them equally, where would you place your spaghetti? Make sure that your spaghetti touches the most M & M's as possible.** This will be a line that “splits” the data into two approximately equal groups in half. Discuss what this line tells us. (Helps us make predictions) *Ask: If someone is 220 cm tall, what would be a good estimate of their head circumference? How does the graph data help you determine this? (about 73 cm)* Looking back at Transparency 3.4, place a piece of spaghetti to determine the line of best fit for each of these.
13. Have students work in pairs or groups of 4 to complete **Student Activity 3.2/Questions**.
Discuss **Student Activity 2.1/Questions**.
15. **Optional Activity with TI 73 calculators and scatter plots.** Prior to lesson, create the following two tables and *link* them to the student calculators. It is not a lot of data, but should be enough for them to see the scatter plot drawn on the calculator.

(Score on test)	100	50	80	95	60	50	99	75	85	90
(Hours doing Hmwk in a week)	5	0	3	4	1	½	5	2	3	4

You just need to make sure you have linked to at least 3 or 4 calculators before class starts to have these students link to others. Use this as an opportunity to look at *exponential growth by power of 2*.

The students can easily learn to link and it will be something good for them to do and save you time. Use the small black cords that came in your box and they plug into the bottom of the calculators. The students should plug two together and one will be the receiver and the other the sender.

If you are the receiver you get ready first!!! Use the arrow keys to highlight the word “RECEIVER” and then press ENTER. Your calculator will say “WAITING”. Just sit tight! If you are the SENDER then the word is already highlighted so you need to press ENTER, you will see a

list of 'lists' you should find the first list (**SCORE**) you are to send by scrolling down and pressing ENTER, this puts a square next to that list, since you are sending two lists, scroll down to the second one (**HWRK**) and press ENTER. Once they both have a box next them, you will TRANSMIT. To do this use your arrow keys to highlight the word TRANSMIT and press ENTER. You should at this time see your calculator telling you it is sending and done.

Have the students look at the data once it is entered. Ask: *Can you make any observations from the data?*

Tell the students to press the 2ND KEY and the red Y=(PLOT) key. They will only use PLOT 1 so they should press enter. Use arrow keys to highlight ON and press ENTER. Scroll down and select the 1st type of graph, that is the scatter plot. The most difficult part is next, they should scroll down to the 'xlist' , go to 2ND, LIST and scroll down to find the '**SCORE**' list that was sent to them, press ENTER. They should then go to the 'YLIST' , go to 2ND, LIST once more and scroll down and FIND '**HMWK**' and press ENTER.

Now their graph is almost ready. Select the mark, it does not matter which one, however, the square gives the best mark for them to see. Press ENTER on the mark and then have them press GRAPH(TABLE) and it should draw their scatter plot. (*If there is a 'y=' plot on or any other of the plots, they many get an error message and they will need to turn these off.*)

Ask: *What kind of trend do you see? What comparison might we make that would give us a negative trend? (possible: hours watching movies and grades on test)*

16. Student Activity 3.3/iLEAP Connection

Answer- 1. a 2a. Graph b. positive trend c. about 73% d. 73.5% e. no mode

17. Closure – on Transparency 3.1

Modifications

Teacher Reflections

GRASP IT!

Students should be able to find the mean, median, mode, and range of data. Students should be able to find the decimal equivalent to a ratio.

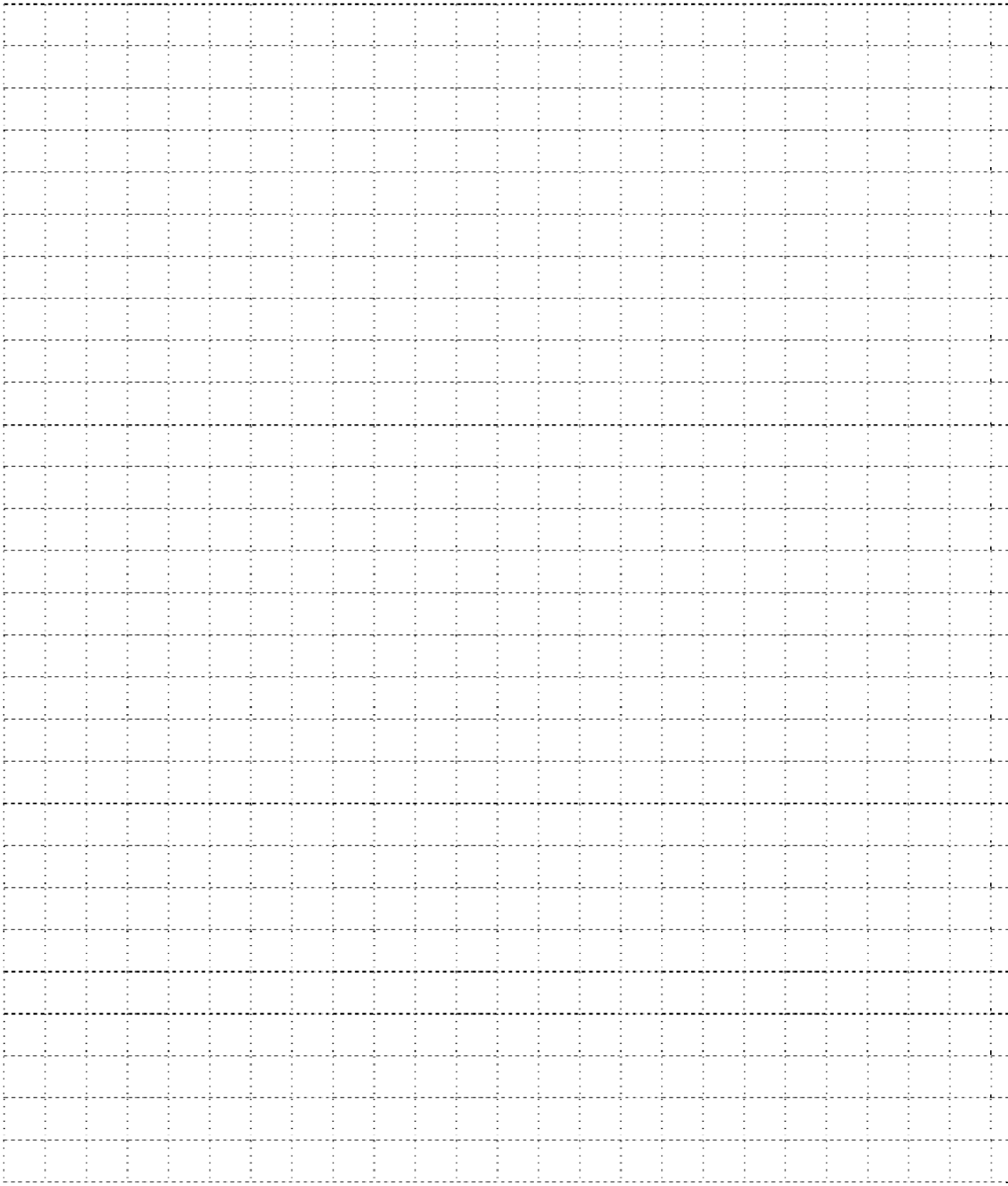
Daily Problem

Tyrone scores 10, 7, 13, and 10 runs in his first four games. What is Tyrone's average?

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Closure

Explain how we can determine who the cap might belong to if we know the size of the head.



Y

Student Activity 3.1/Transparency 3.2

Class Data Student name	Height (cm)	Head circum (cm)	Ratio: <u>Height</u> Head Cir.	Decimal Equivalent
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
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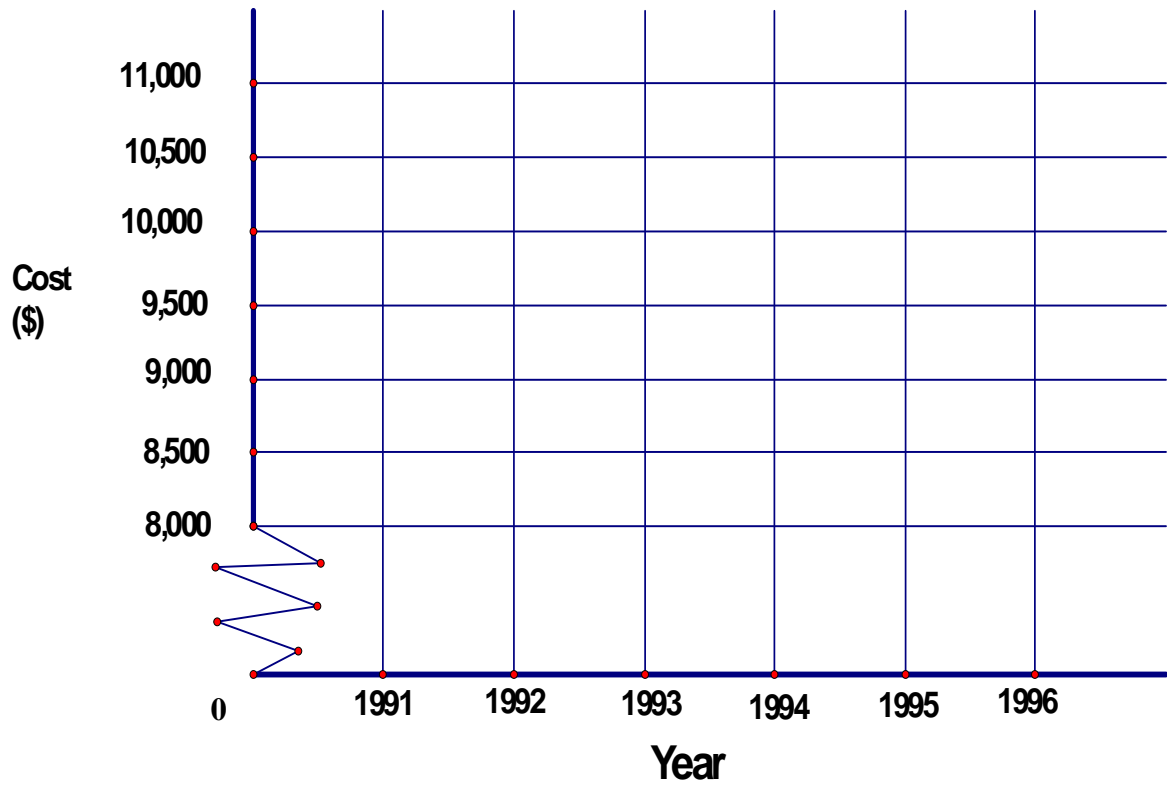
Student Activity 3.2/Questions

Name _____ Date _____ Hour _____

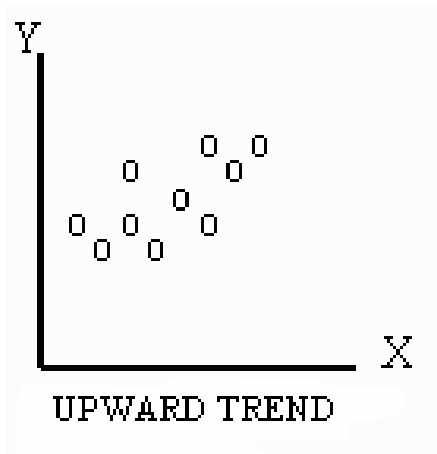
1. What does the graph tell us about the comparison of height to head circumference?
2. How can you use this ratio to determine a person's height if you know their head size?
3. Trace around the outside of the data points. What happens to the area as it goes across the page to the right?
4. What kind of graph did we use to represent the class data?
5. What did you notice about the decimal equivalents for the students in the class? (Round each to the nearest tenth.)
6. Explain how a scatter plot can be used to represent data.
7. Explain your choice of placement for your line of best fit.

Transparency 3.3

Average cost of Tuition and Fees

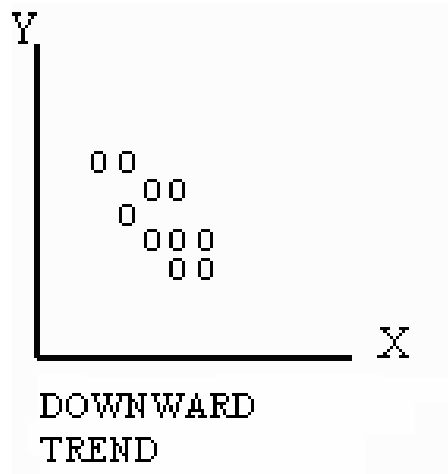


Transparency 3.4

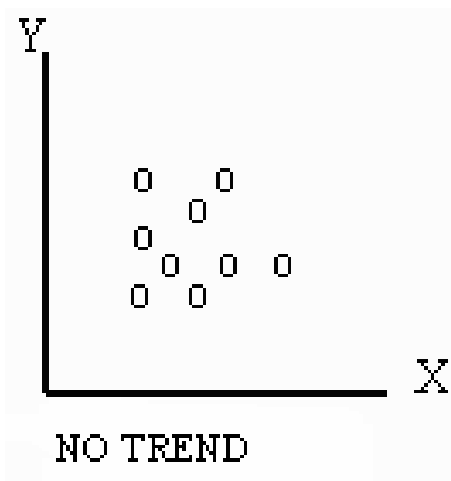


Trend

Positive



Negative Trend

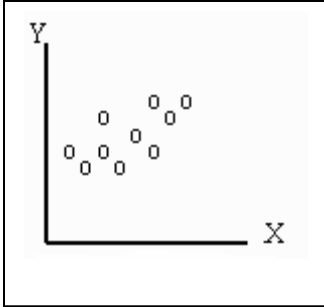


Student Activity 3.3/iLEAP Connection

Name _____ Date _____ Hour _____

Students may use a calculator.

Objective #3



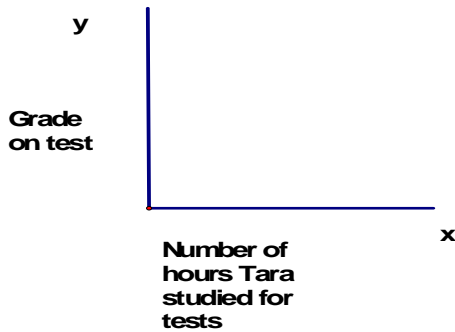
1. The data to the left represents the amount of time spent doing homework and test scores. What does the scatter plot suggest?

- a. upward positive trend
- b. downward negative trend
- c. no trend
- d. none of the above

Objective #2, 3, 4

2. Tara decided to keep track of the hours she studied for her math tests and the scores she received on each test during the second six weeks.

- a. Construct a scatter plot using the following data.
- b. If Tara's scatter plot showed a trend, draw a line of best fit.



Hours Studied	Grade on Test
1	59%
5	97%
3	90%
3	77%
2	64%
4	80%
2	70%
0	50%

- c. Find the mean of her test scores. Show your work.
- d. Find the median of her test scores. Show your work.
- e. Find the mode of her test scores.