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Line of Best Fit Lesson Plan

Course: Algebra 1A

Objectives: After this lesson, students will be able to recognize scatter plots, correlations (positive, negative, or no correlation), line of best fit, and mathematical models. They will be able to draw a line of best fit on a graph of data points, describe a correlation, think about interpreting real-world data, make reasonable predictions from a mathematical model, and use a graphing calculator to graph a set of data and see the line of best fit.

Reporting Categories: Equations of Lines

Related SOLs: A.5 – The student will create and use graphical representations to analyze a given set of data for the existence of a pattern.

A.9 – Graphing calculators will be used both as a primary tool for solution and to confirm an algebraic solution.

Vocabulary: scatter plot, correlations (positive, negative, and none), line of best fit, mathematical model.

Materials: Handouts, computer projector, document camera or software program which displays a graphing calculator, one yardstick, enough small rulers and graphing calculators for all students.

Time Required: Approximately 90 minutes.

Procedures:

0) Distribute handouts to students and start PowerPoint.

1) Stimulate interest by telling them that they will adopt the roles of marine biologists and ornithologists. Explain that they will be working with real-world data and that many real-world data sets are non-linear; therefore, understanding and applying the line of best fit is very important to them.

2) Activate background knowledge by reminding students that they have graphed data points which have a linear relationship. Tell them that they will now be introduced to data points which do not have a linear relationship, and they will see how a line of best fit helps scientists work with such data. (Approx. 5 min.)

3) Scaffold the lesson with key vocabulary terms, asking students what they know about each word before defining it. What does a set of non-linear data points look like? Define scatter plot. Refer students to their Frayer Model handout and engage them in note taking. Define correlation, line of best fit, and mathematical model. (Approx. 10 min.)

4) Refer students to the Practice handout, and walk around to assess. Show the slide with the answer and ask for a volunteer to hold up a large ruler to show the line of best fit on the screen. Go through the "Height vs. Test Scores" and "TV Watched vs. Test Scores" examples, asking for volunteers to explain their answers. (Approx. 10 min.)

5) Refer students to the Swimming Speeds handout, and work through the page using your corresponding PowerPoint slides. Ask for a volunteer to hold up a large ruler to show the line of best fit on the screen. Ask for volunteers to describe the correlation and answer the "What does it mean?" question. (Approx. 20 min.)

6) Refer students to the Bird Populations handout, and work through the page using your corresponding PowerPoint slides. Ask for volunteers to answer the questions at the bottom of the page. (Approx. 25 min.)

7) Pass out graphing calculators and refer students to the High-Tech Graphing handout. Explain that scientists use software programs to graph their data sets and find the line of best fit. You will be using a hand-held version. Using either a document camera or a program which displays the graphing calculator on the screen, work through the page and help students as needed. (Approx. 15 min.)

8) Conclude by recapping (with student participation) what we learned: new vocabulary words, why the line of best fit is important (many real-world data sets are non-linear), we can think about what the data means and model the data, and we gained experience with the type of software scientists use to graph their data and find a line of best fit. (Approx. 5 min.)

Homework: Workbook Section 5.6 (don't need to write the equation of the line of best fit).

Differentiation for Special Populations: This lesson is designed to meet the needs of visual, auditory, read-write, and kinesthetic learners. There is a practice activity with small numbers in case any students are intimidated by the larger numbers in the scientists' data sets. There is one student who prefers not to be involved in group work due to his social/emotional issues. There is no group work involved in this lesson.

Evaluation: Formative assessments will be made through student participation in the lesson, observation of in-class activities, and sharing of answers. Summative assessment will be based on understanding demonstrated in activity sheets and homework.

Citation: Some PowerPoint slides adapted from the McDougal Littell Algebra 1 online textbook.

Name_____

Lesson:

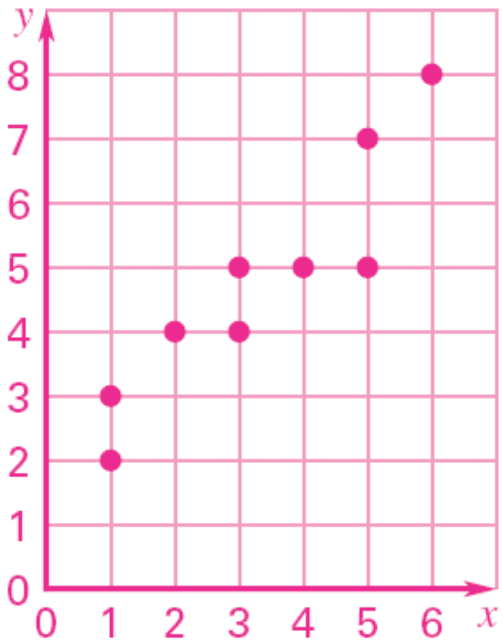
Line of Best Fit

You are the scientist……

PRACTICE

Make a scatter plot of the data in the table, draw a line of best fit, and describe the correlation of the data.

x	1	1	2	3	3	4	5	5	6
y	2	3	4	4	5	5	5	7	8

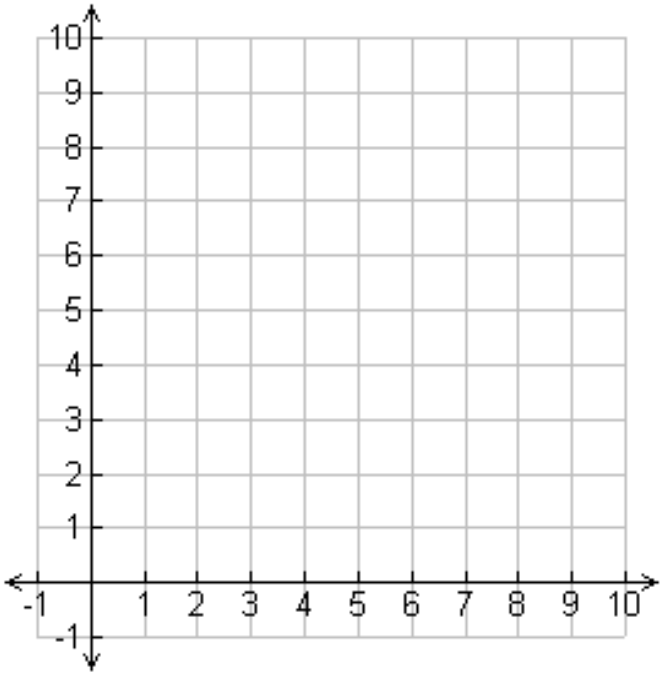


Is there a correlation in the data?

HEIGHT VS. TEST SCORES

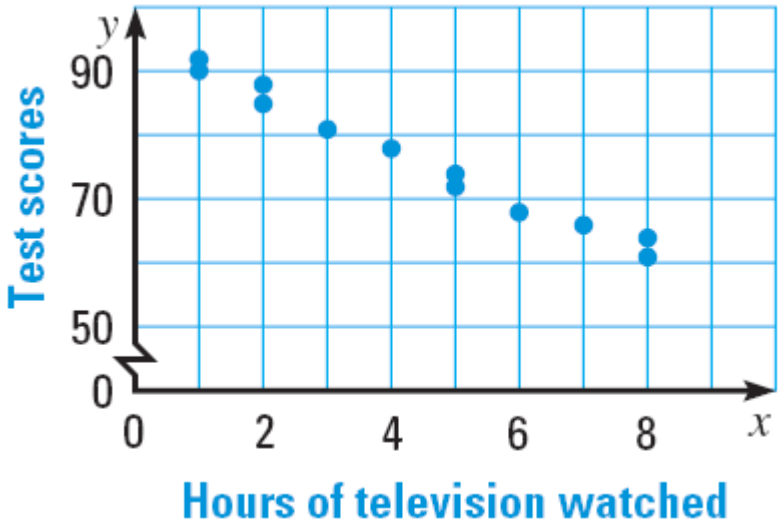
Label your axes and graph the data with height on the x-axis and test scores on the y-axis (increments on the graph are times 10).

Describe (in complete sentences) the correlation of the data and what it tells you.



Height (inches)	Test Scores
48	92
51	76
55	84
60	79
65	90
69	98

EXAMPLE – TV AND TEST SCORES



Write in complete sentences.

1) Describe the correlation of the data.

2) What does the data tell you?

3) Modeling: According to the data, what would an approximate test score be for a student who watched one hour of TV the night before a test?

What would an approximate test score be for a student who watched 3 hours of TV the night before a test?

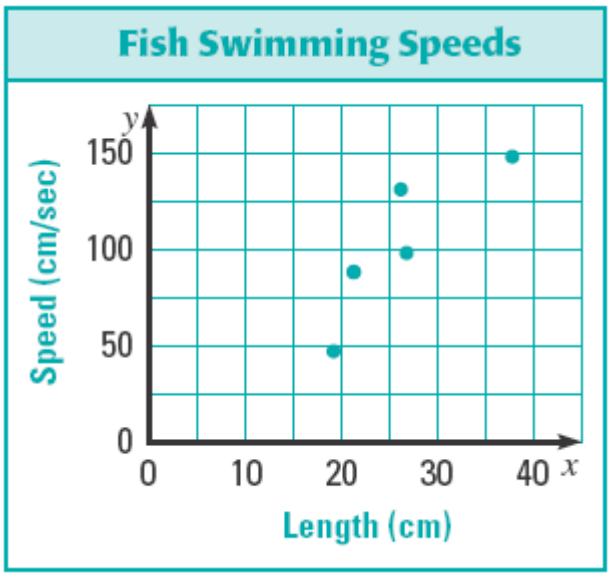
SWIMMING SPEEDS

You are a marine biologist. The Navy is doing underwater sonar testing along the coastline. Research shows that this is stressful for fish, and the Navy wants to know how long it will take the local fish species to swim away from the area during testing. You have conducted a study of the swimming speeds of five local fish species, and you are wondering whether or not there is a correlation with fish length. If there is, it will help you make predictions about how swimming speeds relate to fish size in general.

You have displayed your data in a table:

Fish	Pike	Red gurnard	Black bass	Gurnard	Norway haddock
Length (cm)	37.8	19.2	21.3	26.2	26.8
Speed (cm/sec)	148	47	88	131	98

Now you need to see a scatter plot of the data. Graph the data points and, if possible, draw a line of best fit.



On the back, write your answers in complete sentences (as a scientist would!)

1) Describe the correlation of the data (is there a trend?)

2) If so, what does it mean? What can you tell the Navy about your research?

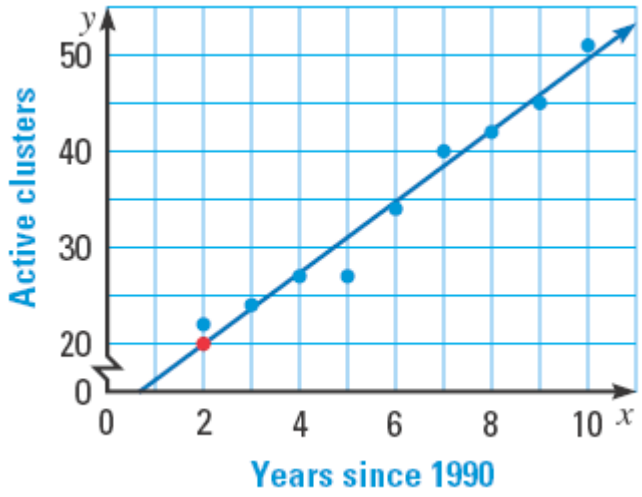
BIRD POPULATIONS

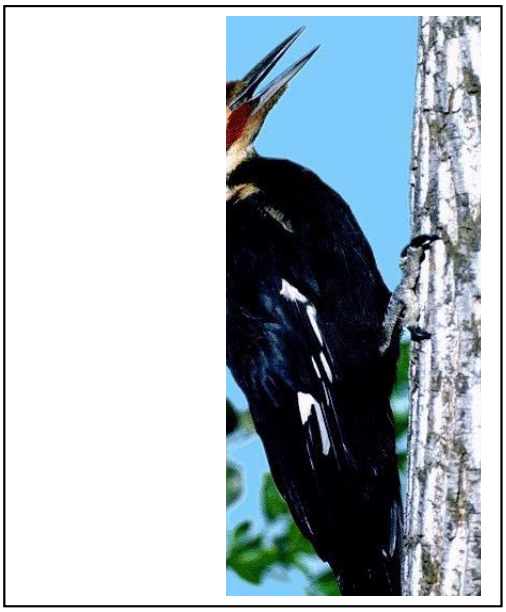
You are an ornithologist. You have been asked to provide data about the population of red-cockaded woodpeckers in a part of the De Soto National Forest in Mississippi. This woodpecker's population has been declining around the state, and the Governor wants to know whether or not the protected land of the National Forest has helped the woodpecker's population.

You have displayed your data in a table:

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
Active clusters	22	24	27	27	34	40	42	45	51

Now you need to see a scatter plot of the data. Graph the data points and, if possible, draw a line of best fit.





On the back, write your answers in complete sentences (as a scientist would!)

1) Describe the correlation of the data (is there a trend?)

2) If so, what does it mean? What can you tell the Governor?

3) Modeling: How many active clusters were there in June of 1993?

HIGH-TECH GRAPHING OF BIRD POPULATION DATA

Using the data describing De Soto National Forest's woodpecker population, we will find the line of best fit with a graphing calculator.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
Active clusters	22	24	27	27	34	40	42	45	51

Step 1 – Enter Data

First, clear your TI-83 calculator of all data by pressing "2nd" then "MEM" then 512. (For the TI-83-Plus, press 2nd MEM 712.)

Press STAT and select Edit (hit Enter).

Enter years since 1990 (2,3,4,5,6,7,8,9,10) into List 1 (L1). These will be the x values.

Enter number of active clusters into List 2 (L2). These will be the y values.

Step 2 – Choose Plot Settings

Press "2nd" then "Y=" and select Plot 1 (hit Enter). Turn Plot 1 on by pressing Enter. When "on" is blinking, use the down arrow to select the first type of diagram shown (scatter plot). It should be blinking. Xlist should say "L1", and Ylist should say "L2".

Step 3 – Make a Scatter Plot

Press "ZOOM" and then "9" to display the scatter plot so that the points for all data pairs are visible.

Step 4 – Describe the Correlation

Step 5 – Graph the Line of Best Fit

Press STAT. Select CALC, choose #4: LinReg(ax+b), then Enter and Select. The a- and b- values given are for an equation of the form y = ax + b. Rounding these values gives the equation y = 3.7x + 12.47. Press GRAPH.

Compare this to our other graph of the same data. Do they look the same?

Now you have experience with the type of software scientists use to graph their data and find a line of best fit!