Oct/Nov

Algebra 1

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|  | Mon | Tue | Wed | Thu | Fri |
| Week 9 | Unit 3  Modeling Linear Data | | | **10**  **Unit 2 Test**  Page 4  **HW:** 2 PDSA paper / tracking sheet filled out and ready to do STUDY part in class tomorrow | 11  **Homecoming Assembly**  Introduction to Unit 3 Learning Team Activity  PDSA unit 2  **HW:** 3.1 Notes & Check for Understanding |
| Week 10 | 14  **FALL BREAK**  **NO SCHOOL** | 15  3.1 Q & A  **HW:** 3.2 Notes & Check for Understanding | 16  Late Start  (20 min class)  LT Workday | 17 / 18  **Early Release**  **P/T Conferences**  *Reflection 3.1*  3.2 Q & A  HW: 3.3 Notes & Check for Understanding | |
| Week 11 | 21  *Reflection 3.2*  3.3 Q & A  **HW:** 3.4 Notes & Check for Understanding | 22  *Reflection 3.3*  3.4 Q & A | 23  *Reflection 3.4*  LT project due at end of period – Team Evals due tomorrow | **24**  Team Evals Due at start of period  3 Review | **25**  Unit 3 Test  all DOK levels  **HW:** 3 PDSA paper / tracking sheet filled out and ready to do STUDY part in class tomorrow |

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| **Unit 3: Modeling Linear Data** | |
| **ENDURING UNDERSTANDINGS** | |
| ∙ Linear models can help us understand the relationship between two quantitative variables.  ∙ Correlation does not imply causation. | |
| ESSENTIAL QUESTIONS | KEY CONCEPTS |
| * How can a linear model be used to explore the relationship between two variables? * How can the line of best fit be used to predict data values? * Are there limitations to the accuracy of predictions far into the future? * How can a calculator be used to compute the correlation coefficient and what does it mean? * What is the difference between correlation and causation? | 1. If a scatter plot has a linear association, then a linear model can be drawn and used to identify and interpret the meaning of the slope (constant rate of change) and the intercept (constant term) between the data sets. 2. Technology is used to compute and interpret the correlation coefficient of a linear model. 3. The correlation coefficient measures the strength of the relationship between two variables. 4. Correlation does not imply causation. |
| STUDENT FRIENDLY OBJECTIVES | ACADEMIC VOCABULARY |

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| * TSW fit a linear function to a data set and use the function to solve problems. * TSW use the line of best fit to predict. * TSW determine the kind of function that would best fit the data * TSW use technology to plot residuals to informally assess the fit of a function. * TSW can explain why correlation does not imply causation. | | |  |  |  | | --- | --- | --- | | quantitative data | causation | least squares regression line | | qualitative data | causal | fit | | scatter plot | correlation coefficient | linear model | | residual(s) | negative correlation | line of best fit | | no correlation | positive correlation | outlier | | extrapolation | distribution |  | |
| STANDARDS COVERED | | |
| Interpreting Categorical  & Quantitative | **S-ID.6.** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or chooses a function suggested by the context. Emphasize linear, ~~quadratic, and exponential models.~~*  b. Informally assess the fit of a function by plotting and analyzing residuals.  c. Fit a linear function for a scatter plot that suggests a linear association. | |
| **S-ID.7.** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. | |
| **S-ID.8.** Compute (using technology) and interpret the correlation coefficient of a linear fit. | |
| **S-ID.9.** Distinguish between correlation and causation. | |

**Exit Outcomes Skills:**

* I keep track of my assignments and important dates on my calendar or on my planner.
* I take notes (teacher prepared & impromptu), complete assignments & vocabulary on time.
* I set goals in my planner.
* I manage my time using my planner.
* I keep an organized notebook.
* I self reflect on my performance in my class using my notes, check for understanding, reflections, and activities.
* I ask for help when I need it (teacher, learning team, parent/guardian, HW Lab).
* I spent extra time using the additional resources provided.
* I am an active participate and an asset within my learning team.

**Goal Tracking Sheet:** \*This should be filled in each time feedback is given.  \* Use the exit outcome skills as a guideline to reflect on your results

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ #:\_\_\_\_\_\_\_\_

**PLAN**

**Student Goal** My goal is to achieve a\_\_\_\_\_\_\_\_\_\_ score on the “Chapter 3: Modeling Linear Data” unit test.

**Action Steps** List at least 3 things you plan on doing to be successful in reaching your goal this unit.

(i.e. use flashcards to study and understand vocabulary, reflect on CFU problems that I miss, seek extra help when I do not understand a concept, ask question in class when I can’t find my mistake, try/preserver through all my CFU problems, use additional resources provided to make sure I understand topic, review pretest, etc.)

**STUDY**

**Act**

**Do**

|  |
| --- |
| **Suggestions for improvement:** |
| **Student (What will I do)** |

|  |  |  |
| --- | --- | --- |
| **Activities/**  **Assignments** | **Unit Concepts** | [https://encrypted-tbn0.google.com/images?q=tbn:ANd9GcQdpVrlS9P3GVQ2sGKC13_xyr8FydBnepuuiVQQvN_dUIAmc2ei7A](http://www.google.com/imgres?um=1&hl=en&biw=1024&bih=587&tbm=isch&tbnid=2nocVW5ycs7bkM:&imgrefurl=http://en.wikipedia.org/wiki/File:OCR-A_char_Plus_Sign.svg&docid=JD5k8ALWiXzKZM&imgurl=http://upload.wikimedia.org/wikipedia/commons/3/30/OCR-A_char_Plus_Sign.svg&w=744&h=1052&ei=YdbYT4v_MYHg2QXL6o2kDw&zoom=1&iact=hc&vpx=219&vpy=2&dur=906&hovh=267&hovw=189&tx=99&ty=181&sig=117890709682966998579&page=1&tbnh=109&tbnw=74&start=0&ndsp=21&ved=1t:429,r:1,s:0,i:155)**Was it helpful**  **/** |
| Reflection 3.1 | #1 |  |
| Reflection 3.2 | #1 |  |
| Reflection 3.3 | #1, #3, #4, |  |
| Reflection 3.4 | #2, #3, #4 |  |
| LT Task #1 | #1 – #4 |  |
| LT Task #2 | #1 – #4 |  |

**STUDY**

Was I on track to meet my goal (use the tracking paper to support your response)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Did I meet my goal? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What concepts #’s were my best scores? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What concepts #’s were my lowest scores? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What action steps caused there to be a difference? Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What should I try next unit to be more successful? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Give feedback for the teacher. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **3.1 Line Graphs** | |
| **Notes** | DVUSD Algebra Flexbook: pg 2- 7.  In statistics, a **variable** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  This characteristic assumes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_for different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the population, whether it is the entire population or sample. The value of the variable is referred to as an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ A collection of these observations of the variable is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Variables can be quantitative or qualitative.  A **quantitative variable** is one that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A quantitative variable can be classified as discrete or continuous.   * **Discrete Variable** is one whose values are all countable and does not include any values \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ two consecutive values of a data set. An example of a discrete variable is the number of goals scored by a team during a hockey game. * **Continuous Variable** is one that can assume any countable value, as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the values between two \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a data set. An example of a continuous variable is the number of gallons of gasoline used during a trip to the beach.   A **qualitative variable** is one that cannot \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Some examples of a qualitative variable are months of the year, hair color, color of cars, a persons status, and favorite vacation spots.        Variables can also be classified as **dependent** or **independent**. When there is a linear relationship between 2 variables, the values of one variable \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_upon the values of the other variable. In a linear relation, the values of\_\_\_\_\_\_\_\_ depend upon the values of \_\_\_\_\_\_\_\_\_\_. Therefore, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ variable is represented by the values that are plotted on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the independent \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is represented by the values that are plotted on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  **Example A: View table in Flexbook and correctly complete the table below.**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Variable** | **Quantitative** | **Qualitative** | **Discrete** | **Continuous** | | Number of members in a family |  |  |  |  | | A person’s marital status |  |  |  |  | | Length of a person’s arm |  |  |  |  | | Color of Cars |  |  |  |  | | Number of errors on a math test |  |  |  |  |   **Example B:**  Sally works at the local ballpark stadium selling lemonade. She is paid $15.00 each time she works, plus $0.75 for each glass of lemonade she sells. Create a table of values to represent Sally’s earnings if she sells 8 glasses of lemonade. Use this table of values to represent her earnings on a graph.  The first step is to write an equation to represent her earnings and then to use this equation to create a table of values. The equation is y =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, where y represents her \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and x represents the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ she sells.  **Number of Glasses of Lemonade Earnings**  The dependent variable is the money earned, and the independent variable is the number of glasses of lemonade sold. Therefore, money is on the y-axis, and the number of glasses of lemonade is on the x-axis.   |  |  | | --- | --- | | 0 | $15.00 | | 1 | $15.75 | | 2 | $16.50 | | 3 | $17.25 | | 4 | $18.00 | | 5 | $18.75 | | 6 | $19.50 | | 7 | $20.25 | | 8 | $21.00 |   From the table of values, Sally will earn $21.00 if she sells 8 glasses of lemonade.  Now that the points have been plotted, the decision has to be made as to whether or not to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_them. Between every 2 points plotted on the graph are an\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_number of values. If these values are meaningful to the problem, then the plotted points can be joined. This type of data is called **continuous data**. If the values between the 2 plotted points are not meaningful to the problem, then the points should \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ be joined. This type of data is called **discrete data**. Since glasses of lemonade are represented by whole numbers, and since fractions or decimals are not appropriate values, the points between 2 consecutive values are not meaningful in this problem. Therefore, the points should not be joined. The data is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
| **Check for Understanding** | 1. The local arena is trying to attract as many participants as possible to attend the community’s “Skate for Scoliosis” event. Participants pay a fee of $10.00 for registering, and, in addition, the arena will donate $3.00 for each hour a participant skates, up to a maximum of 6 hours. Create a table of values and draw a graph to represent a participant who skates for the entire 6 hours. How much money can a participant raise for the community if he/she skates for the maximum length of time? 2. Write an equation to represent the scenario: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 3. Define the variables:   x represents \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  y represents \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   1. Complete the table below.  |  |  | | --- | --- | | **Number of Hours of Skating** | **Money Earned** | | 0 |  | | 1 |  | | 2 |  | | 3 |  | | 4 |  | | 5 |  | | 6 |  |  1. Graph to show the relationship between numbers of hours skated and money earned. 2. Dependent Variable is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 3. Independent Variable is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 4. Reflect: Does this graph represent continuous or discrete data? Justify. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **Additional Resources** | * <http://www.ck12.org/flx/render/embeddedobject/52706> * <http://www.ck12.org/flx/render/embeddedobject/52707> * <http://www.ck12.org/flx/render/embeddedobject/1400> |
| **3.2 Scatter Plots** | |
| **Notes** | DVUSD Algebra Flexbook: pg 8 – 15.  **Scatter Plot:** Represents data that has no \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_which can be used to draw a line of best fit for the data. The line of best fit can be used to make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Often, when real world data is plotted, the result is a \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The general direction of the data can be seen, but the data points do not all fall on a line. This type of graph is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A scatter plot is often used to investigate whether or not there is a relationship or connection between 2 sets of data. The data is plotted on a graph such that one quantity is plotted on the x-axis and one quantity is plotted on the y-axis. The quantity that is plotted on the x-axis is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and the quantity that is plotted on the y-axis is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  This scatter plot shows the price of peaches and the number sold:    The connection is obvious when the price of peaches was \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the sales were\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, but when the price was low, the sales were high. Remember that correlation does not imply \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. There is a relationship between the number of peaches sold and the price of peaches, but the data does not determine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Other variables such as weather, number of orchards, etc., could affect the price of peaches. The determination that one thing causes another requires a controlled experiment.  The following scatter plot shows the sales of a weekly newspaper and the temperature:  There is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_connection between the number of newspapers sold and the temperature.  Another term used to describe 2 sets of data that have a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or a relationship is **correlation.** The correlation between 2 sets of data can be\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and it can be\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  The following scatter plots will help to enhance this concept.  If you look at the 2 sketches that represent a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_correlation, you will notice that the points are around a line that slopes upward to the right. When the correlation is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the line slopes downward to the right. The 2 sketches that show a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ correlation have points that are bunched together and appear to be close to a line that is in the middle of the points. When the correlation is weak, the points are more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and not as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  When correlation exists on a scatter plot, a **line of best fit** can be drawn on the graph. The line of best fit must be drawn so that the sums of the distances to the points on either side of the line are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and such that there are an equal number of points above and below the line.  A line of best fit can be used to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_from the graph, but you must remember that the line of best fit is simply a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of where the line should appear on the graph. As a result, any values that you choose from this line are not very accurate. The values are more of a ballpark figure.  In the sales of newspapers and the temperature, there was no connection between the 2 data sets. The following sketches represent some other possible outcomes when there is no correlation between data sets:    \*An exponential function or quadratic function can also be a good fit for the data as shown below:  https://scholar.vt.edu/access/content/group/43c8db00-e78f-4dcd-826c-ac236fb59e24/STAT2004/Chapt11_files/Quadratic01.PNG[http://www.karger.com/Article/ShowPic/345194?image=000345194_f03.GIF](http://www.google.com/url?sa=i&rct=j&q=&esrc=s&frm=1&source=images&cd=&cad=rja&docid=3OMuQ6L8PiFvfM&tbnid=RyA2c3ZYmbCfuM:&ved=0CAUQjRw&url=http://www.karger.com/Article/Fulltext/345194&ei=pf1FUufcD8fJqQGk3IHgDQ&bvm=bv.53217764,d.aWc&psig=AFQjCNF85P9tpqn-U4sRaheD3D60aPMF1g&ust=1380405007875970) |
| **Check for Understanding** | The following table represents the sales of Volkswagen Beetles in Iowa between 1994 and 2003:   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Year | ‘94 | ‘95 | ‘96 | ‘97 | ‘98 | ‘99 | ‘00 | ‘01 | ‘02 | ‘03 | | Beetle  Sold | 50 | 60 | 55 | 50 | 70 | 65 | 70 | 65 | 80 | 90 |   (a) Create a scatter plot and draw the line of best fit for the data. Hint: Let 0 = 1994, 1 = 1995, etc.  (b) Use the graph to predict the number of Beetles that will be sold in Iowa in the year 2007.  (c) Describe the correlation for the above graph. |
| **Additional Resources** | * <http://www.ck12.org/flx/render/embeddedobject/52704> * <http://www.ck12.org/flx/render/embeddedobject/52705> * <http://www.ck12.org/flx/render/embeddedobject/1395> |
| **3.3 Scatter Plots and Linear Correlation** | |
| **Notes** | DVUSD Algebra Flexbook: pg 16 – 23.  We may notice that the values of two variables, such as verbal SAT score and GPA, behave in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_way and that students who have a high verbal SAT score also tend to have a high GPA (see table below). In this case, we would want to study the nature of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between the two variables.    These types of studies are quite common, and we can use the concept of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to describe the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between two variables.  **Correlation** measures the relationship between **bivariate** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Bivariate data are data sets in which each subject has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ observations associated with it. In our example above, we notice that there are two observations (verbal SAT score and GPA) for each subject (in this case, a student).  If we carefully examine the data in the example above, we notice that those students with high SAT scores tend to have high GPAs, and those with low SAT scores tend to have low GPAs. In this case, there is a tendency for students to score similarly on both variables, and the performance between variables appears to be related.  Scatterplots \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_these bivariate data sets and provide a visual representation of the relationship between variables. In a scatterplot, each point \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_a paired measurement of two \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for a specific subject, and each subject is represented by one point on the scatterplot.    **Correlation Patterns in Scatter plot Graphs**  When the points on a scatter plot graph produce a lower-left-to-upper-right pattern (see right), we say that there is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ correlation between the two variables. This pattern means that when the score of one observation is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, we expect the score of the other observation to be high as well, and vice versa.  When the points on a scatter plot graph produce a upper-left-to-lower-right pattern (see right), we say that there is a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_correlation between the two variables. This pattern means that when the score of one observation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,we expect the score of the other observation to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and vice versa.    When all the points on a scatter plot lie on a straight line, you have what is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ correlation between the two variables (see right).  A scatter plot in which the points do not have a linear trend (either positive or negative) is called a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_correlation or a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_correlation (see right).  When examining scatter plots, we also want to look not only at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the relationship (positive, negative, or zero), but also at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the relationship. If we drew an imaginary \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ around all of the points on the scatter plot, we would be able to see the extent, or the magnitude, of the relationship. If the points are close to one another and the width of the imaginary oval is small, this means that there is a strong \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between the variables (see above).  If the points are far away from one another, and the imaginary oval is very wide, this means that there is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ correlation between the variables (see right).  **Correlation Coefficients**  While examining scatterplots gives us some idea about the relationship between two variables, we use a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_called the correlation coefficient to give us a more precise \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the relationship between the two variables. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ coefficient is an index that describes the relationship and can take on values between..1:0 and +1.0, with a positive correlation coefficient indicating a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ correlation and a negative correlation coefficient indicating a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_correlation.  The absolute value of the coefficient indicates the magnitude, or the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, of the relationship. The closer the absolute value of the coefficient is to 1, the stronger the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. For example, a correlation coefficient of 0.20 indicates that there is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ linear relationship between the variables, while a coefficient of ..0:90 indicates that there is a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_linear relationship.  The value of a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_positive correlation is 1.0, while the value of a perfect negative correlation is..1:0.  When there is no linear relationship between two variables, the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_coefficient is 0. It is important to remember that a correlation coefficient of 0 indicates that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_relationship, but there may still be a strong relationship between the two variables. For example, there could be a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_relationship between them.  **The Properties and Common Errors of Correlation**  Correlation is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the linear relationship between two variables-it does not necessarily state that\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_variable is caused by another. For example, a third variable or a combination of other things may be causing the two correlated variables to relate as they do. Therefore, it is important to remember that we are interpreting the variables and the variance not as causal, but instead as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  When examining correlation, there are three things that could affect our results: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the group, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  **Linearity**  While many pairs of variables have a linear relationship, some do not. For example, let’s consider performance anxiety. As a person’s anxiety about performing increases, so does his or her performance up to a point. (We sometimes call this good stress.) However, at some point, the increase in anxiety may cause a person’s performance to go down. We call these non-linear \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ curvilinear relationships. We can identify curvilinear relationships by examining scatterplots (see below). One may ask why curvilinear relationships pose a problem when calculating the correlation coefficient. The answer is that if we use the traditional \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to calculate these relationships, it will not be an accurate index, and we will be underestimating the relationship between the variables. If we graphed performance against anxiety, we would see that anxiety has a strong affect on performance. However, if we calculated the correlation coefficient, we would arrive at a figure around zero. Therefore, the correlation coefficient is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ always the best \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to use to understand the relationship between variables.    **Homogeneity of the Group**  Another error we could encounter when calculating the correlation coefficient is homogeneity of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_When a group is homogeneous, or possesses similar characteristics, the range of scores on either or both of the variables is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. For example, suppose we are interested in finding out the correlation between IQ and salary. If only members of the Mensa Club (a club for people with IQs over 140) are sampled, we will most likely find a very low correlation between IQ and salary, since most members will have a consistently high IQ, but their salaries will still vary. This does not mean that there is not a relationship-it simply means that the restriction of the sample \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the magnitude of the correlation coefficient.  Finally, we should \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sample size. One may assume that the number of observations used in the calculation of the correlation coefficient may \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the magnitude of the coefficient itself. However, this is not the case. Yet while the sample size does \_\_\_\_\_\_\_\_\_\_\_\_\_\_affect the correlation coefficient, it may affect the accuracy of the relationship. The larger the sample, the more accurate of a predictor the correlation coefficient will be of the relationship between the two variables.  **Example A**  If a pair of variables have a strong curvilinear relationship, which of the following is true:  a. The correlation coefficient will be able to indicate that a nonlinear relationship is present.  b. A scatterplot will not be needed to indicate that a nonlinear relationship is present.  c. The correlation coefficient will not be able to indicate the relationship is nonlinear.  d. The correlation coefficient will be exactly equal to zero.  **Solution:**  If a pair of variables have a strong curvilinear relationship  a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  b.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  c.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  d.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Example B**  A national consumer magazine reported that the correlation between car weight and car reliability is -0.30. What does this mean?  **Solution:**  If the correlation between ­­­­­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ it means that as the weight of the car goes up, the reliability of the car goes down. This is not a perfect linear relationship since the absolute value of the correlation coefficient is only \_\_\_\_\_\_\_\_\_.  **Vocabulary**  **Bivariate data** are data sets with two observations that are assigned to the \_\_\_\_\_\_\_\_\_\_ subject.  **Correlation** measures the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and magnitude of the linear relationship between bivariate data.  When examining **scatterplot graphs,** we can determine if \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are positive, negative, perfect, or zero. A correlation is strong when the points in the scatterplot lie generally along a straight line.  The **correlation coefficient** is a precise measurement of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between the two variables. This index can take on values between and including..1:0 and +1.0. When calculating the correlation coefficient, there are several things that could affect our \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, including **curvilinear relationships, homogeneity** of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and the size of the group. |
| **Check for Understanding** | 1. Give 2 scenarios or research questions where you would use bivariate data sets.   |  |  | | --- | --- | |  |  |   2. In the space below, draw and label four scatter plot graphs. One should show a:  a. positive correlation b. negative correlation  c. perfect correlation d. zero correlation  3. In the space below, draw and label two scatter plot graphs. One should show a:  a. weak correlation b. strong correlation.  4. What does the correlation coefficient measure?  5. For each of the following pairs of variables, is there likely to be a positive association, a negative association, or no association. Explain.  a. Amount of alcohol consumed and result of a breath test.  b. Weight and grade point average for high school students.    c. Miles of running per week and time in a marathon.  6. Identify whether a scatter plot would or would not be an appropriate visual summary of the relationship between the following variables. Explain.  a. Blood pressure and age  b. Region of the country and opinion about gay marriage.  c. Verbal SAT score and math SAT score.  7. Which of the numbers 0, 0.45, -1.9, -0.4, 2.6 could not be values of the correlation coefficient. Explain.  8. Which of the following implies a stronger linear relationship +0.6 or -0.8. Explain.  9. Explain how two variables can have a 0 correlation coefficient but a perfect curved relationship.  10. The following observations were taken for five students measuring grade and reading level.   1. **A table of grade and reading level** a. Draw a scatter plot for these data.   **for five students**   |  |  |  | | --- | --- | --- | | **Student Number** | **Grade** | **Reading Level** | | **1** | **2** | **6** | | **2** | **6** | **14** | | **3** | **5** | **12** | | **4** | **4** | **10** | | **5** | **1** | **4** |  1. What type of relationship does this correlation have   11. Sketch and explain the following:   |  |  | | --- | --- | | a. A scatter plot for a set of data points for which it would be appropriate to fit a regression line. | b. A scatter plot for a set of data points for which it is not appropriate to fit a regression line. | |
| **Additional Resources** | * <http://www.ck12.org/flx/render/embeddedobject/1104> |
| **3.4 Linear Regression Equations** | |
| **Notes** | DVUSD Algebra Flexbook: pg 24 – 30.  Here you’ll learn how to use a Texas Instruments calculator to create a scatter plot and to determine the equation of the line of best fit. You’ll also learn how to determine if a linear regression equation is a good fit for the data.  Scatter plots and lines of best fit can also be drawn by using technology. The TI-83/84 is capable of graphing both a scatter plot and of inserting the line of best fit onto the scatter plot. The calculator is also able to find the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**(r) and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (r2) for the linear regression equation.  The correlation coefficient will have a value **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the correlation coefficient is to -1 or 1, the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. If the correlation coefficient is ­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, this implies a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and if the correlation coefficient is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, this implies a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The coefficient of determination is just the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and, therefore, it is always positive. The closer the coefficient of determination is to 1, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  **Example A:**  The following table consists of the marks achieved by 9 students on chemistry and math tests. Create a scatter plot for the data with your calculator.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Marks** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | | **Chem.** | 49 | 46 | 35 | 58 | 51 | 56 | 54 | 46 | 53 | | **Math** | 29 | 23 | 10 | 41 | 38 | 36 | 31 | 24 | ? |     **Example B:**  Draw a line of best fit for the data that you plotted in Example A. Use the line of best fit to calculate the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_for Student I’s math test mark.  The calculator can now be used to determine a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_for the given values. The equation can be entered into the calculator, and the line will be plotted on the scatter plot.    From the line of best fit, the calculated value for Student I’s math test mark is\_\_\_\_\_\_\_\_\_\_\_\_.  **Example C:**  Determine the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_for the linear regression equation that you found in Example B. Is the linear regression equation a good fit for the data?    The correlation coefficient and the coefficient of determination for the linear regression equation are found the same way that the linear regression equation is found. In other words, to find the correlation coefficient and the coefficient of determination, after \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_press      **NOTE: If you are using a TI-84 and are calculating the correlation coefficient for the first time, you need to turn your Diagnostics on. When your calculator is on, push the 2nd (blue) button and the 0 at the same time to bring up the catalog. Scroll down to Diagnostic and hit enter twice. This will allow you to see all of the statistics above.**  In the example above, the equation of the line of best fit, or regression equation is  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(rounding a and b to the nearest tenth). As the image suggests, the regression equation is in the form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. In this case, the slope is approximately\_\_\_\_\_\_\_\_\_\_. What does this mean in the context of the data? Remember the slope can be read for every\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. In this case, for every \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gain in math, there is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gain in chemistry. The intercept, or constant term in this model \_\_\_\_\_\_\_\_\_, which is approximately \_\_\_\_\_\_\_\_\_\_\_. A direct interpretation of this would be if you scored a zero on the math test, the model will predict a score a -35.3 on the chemistry test. Does that seem likely? Or are there \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the variables in this model?  Similarly, there are limits to the prediction value of the model. Suppose you score a 5 on the math test. The model will predict a score of -28.8 on the chemistry test. Since you can’t score less than a zero, this model is only accurate for scores on both tests which are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  You can see that r, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, is equal to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, while r2, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, is equal to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This means that the linear regression equation is a moderately good fit, but not a great fit, for the data. |
| **Check for Understanding** | 1. The data below gives the fuel efficiency of cars with the same-sized engines when driven at various speeds.  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Speed m/h | 32 | 64 | 77 | 42 | 82 | 57 | 72 | | Fuel  m/gal | 40 | 27 | 24 | 37 | 22 | 36 | 28 |  1. Draw a scatter plot and a line of best fit using technology. 2. What is the equation of the line of best fit? 3. What is the correlation coefficient and the coefficient of determination of the linear regression equation? 4. Is the linear regression equation a good fit for the data? Justify. 5. If a car were traveling at a speed of 47 m/h, estimate the fuel efficiency of the car. 6. If a car has a fuel efficiency of 29 m/gal, estimate the speed of the car. 7. Interpret the slope and intercept of the model. Is this model always accurate? |
| **Additional Resources** | * <http://www.ck12.org/flx/render/embeddedobject/52708> * <http://www.ck12.org/flx/render/embeddedobject/52709> * <http://www.ck12.org/flx/render/embeddedobject/1399> |