Unit 4 – Lesson 7: Line of Best Fit

Objective: Students will determine the line of best fit in order to make predictions.

Notes:

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A graph</td>
<td>A graph of ordered pairs involving two sets of data. These plots are used to detect whether the two sets of data are related.</td>
</tr>
<tr>
<td>The trend line</td>
<td>The trend line that shows the relationship between two sets of data most accurately</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Types of Relationships:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Correlation</td>
</tr>
<tr>
<td>Negative Correlation</td>
</tr>
<tr>
<td>No Correlation</td>
</tr>
</tbody>
</table>

As one value increases, the other value also increases
As one value increases, the other value decreases
There is no relationship between the two sets of data

**Example 1:** Is there a relationship between the number of days you are absent and your grades in school? Let’s use the table to the right to create a scatter plot and find out.

a. What type of relationship do you think attendance and grades has?

____________________

b. Graph the scatter plot on the grid to the right. Be sure to label your axes.

c. What type of relationship does it have?

____________________

d. Use the calculator to determine the line of best fit for your data (directions on the next page). Draw the line.

e. What is the slope of the line? __________

f. What does it mean? __________________

g. What is the y-intercept of the line? _______

h. What does it mean? __________________

<table>
<thead>
<tr>
<th># of Days Absent</th>
<th>Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>94</td>
</tr>
<tr>
<td>3</td>
<td>84</td>
</tr>
<tr>
<td>5</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
</tr>
<tr>
<td>7</td>
<td>68</td>
</tr>
<tr>
<td>9</td>
<td>60</td>
</tr>
<tr>
<td>11</td>
<td>50</td>
</tr>
</tbody>
</table>
**Calculator Directions – Line of Best Fit**

To get the equation of the Line of Best Fit:

1. Go to **STAT → EDIT**
   a. Type your x values in the L1 column
   b. Type your y values in the L2 column
2. Go to **STAT → CALC** (arrow over once) → LinReg (ax+b) [4th option]
3. Type 2nd, 1 (to get the L1 list)
4. Type the , (button above the 7)
5. Type 2nd, 2 (to get the L2 list)
6. Hit **ENTER**

**IN WINDOW --- LinReg - y = ax + b**

a = Slope  
b = Y-intercept

To graph the scatter plot and line:

1. Go to **STAT → EDIT**
   a. Type your x values in the L1 column
   b. Type your y values in the L2 column
2. Go to 2nd → **Y=** (Stat Plot Option)
3. Hit **ENTER**
4. Hit **ENTER** again to turn Plot 1 **ON**
5. Go to **STAT → CALC** (arrow over once) → LinReg (ax+b) [4th option]
6. Type 2nd, 1 (to get the L1 list), 2nd, 2 (to get L2 list)
7. Type , again
8. Go To **VARS → Y-VARS** (arrow over once),  
   **ENTER** (on Functions option), **ENTER** (on Y1 option)

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**Using Line of Best Fit to Make Predictions**

A line of best fit can be used to make predictions about the data. You can do this in two different ways:

1. Use the graph of the line to estimate the y-value based on an x-value.
2. Use the equation for the line of best fit to calculate the y-value for a given x-value.

**Example 1 continued:** Go back to the scatter plot you drew in Example 1.

a. Using the line of best fit that we drew, predict what your grade would be if you were absent for four days.

b. Using the equation for the line of best fit, \( y = -4.54x + 99.48 \), predict what your grade would be if you were absent four days.

c. Using the line of best fit that we drew, predict how many days a student was absent if their grade is a 60.

d. Using the equation for the line of best fit, \( y = -4.54x + 99.48 \), predict how many days a student was absent if their grade is a 60.

**Example 2:** Use the scatter plot and line of best fit to the right to answer the following questions:

Based on the line of best fit...

a. How many hours would a student have to study to get a score of 90? _____

b. If a student studies for 30 hours, what will their test score be? _____

c. How many hours would a student have to study to get a score of 70? _____

d. If a student studies for 15 hours, what will their test score be? _____
Classwork:

1. Keith collected data in a chemistry experiment. He graphed the data points and drew a line of best fit, as shown to the right.
   a. What is the slope of the line of best fit? _________________
   b. Using the line of best fit, predict the x value when the y value is 16. __________
   c. Using the line of best fit, predict the y value when the x value is 3. __________

2. The table to the right shows the cost of a catered lunch brunch for different numbers of people.
   a. What is the slope? ______________________
   b. What does it mean? ________________________________________

   c. Write an equation for the Line of Best Fit (use your calculator). ______________________
   d. What is the cost of a lunch buffet for 120 people? ______________________

3. Use the scatter plot and line of best fit to the right to answer the following questions:
   a. Predict how many members will be in the chess club at 8 weeks: __________
   b. Predict how many weeks it will take to get 50 members in the chess club: ______________

4. The table shows the cost of visiting a working ranch for one day and night for different numbers of people.

<table>
<thead>
<tr>
<th>Number of People</th>
<th>Cost (Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>250</td>
</tr>
<tr>
<td>6</td>
<td>350</td>
</tr>
<tr>
<td>8</td>
<td>450</td>
</tr>
<tr>
<td>10</td>
<td>550</td>
</tr>
<tr>
<td>12</td>
<td>650</td>
</tr>
</tbody>
</table>

   a. What is the slope? ______________________ What does this mean? ______________________
   b. Write the equation for the line of best fit: ______________________
   c. Use the line of best fit to predict the cost for: 30 people - _________  50 people - _______
5. The scatter plot to the right shows the Salaries of Engineers based on Years of Experience.

a. Predict the y-intercept: ______________

b. Pick two points that lie on the line of best fit:

_________   ___________

c. Using those two points, calculate the slope:

\( m = \) __________

d. Write the equation for the line of best fit in slope-intercept form: ___________________

e. Using the equation, predict the salary of an engineer that has 30 years of experience:


f. After 25 years of experience, predict the salary an engineer would make: ______________

g. Using the graph, predict the years of experience an engineer has if they make $50,000:


h. Using the graph, predict the years of experience of an engineer that makes $85,000: ________

6. The table below shows the number of active woodpecker clusters in a part of the De Soto National Forest in Mississippi.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Clusters</td>
<td>22</td>
<td>24</td>
<td>27</td>
<td>27</td>
<td>34</td>
<td>40</td>
<td>42</td>
<td>45</td>
<td>51</td>
</tr>
</tbody>
</table>

a. What is the slope? ____________  What does it mean? _____________________________

b. What is the equation for the line of best fit? ________________________________________

c. Use the equation to determine the number of active clusters in the year 2010: ________

7. The scatter plot to the right show the relationship between the number of bags of popcorn that are sold and the price per bag.

a. What type of relationship exists for this data?

____________________________________

b. Which graph represents the line of best fit correctly? Circle it. Then, explain why the others are incorrect.