Applied Statistics

Domain	**Functions and Modeling**	
Cluster	**Explore expressions, functions, and models to describe numbers or relationships.**	
Standard(s)	M.ASHS.21	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include intercepts, intervals where the function is increasing, decreasing, positive, negative, relative extrema, symmetries, and end behavior. Instructional Note: Emphasize the selection of a model function based on the behavior of the data in context.

Content Examples

Linear Regression Equations with the TI-84Plus
https://youtu.be/kxklQNQ9Vc8

Relevant Content

Fitting Lines to Data
Correlation

Vocabulary

- Function: A relationship between two variables such that each independent variable value corresponds with exactly one value of the dependent variable
- Intervals expressing where the function is increasing, decreasing, positive, or negative. Can be represented using interval notation or inequalities. Consider the behavior based on the values of the independent variable of the function.
- Symmetries: About the x- or y-axis or the origin
- Intercept: Point where the graph intersects or touches the x- or y-axis
- Relative extrema: Points where a maximum or minimum occurs on an interval where the function changes from increasing or decreasing or vice versa
- End behavior: The behavior of the graph of as approaches and as approaches

Modeling with Polynomials - An Introduction

Modeling with Polynomials - An Introduction (#2)

Representing Functions of Everyday Situations:
https://www.map.mathshell.org/lessons.php?unit=9260&collection=8

Assessment Links or Tasks

- Regression Lines:
  https://www.statsmedic.com/intro-day25
- Assessing Regression Model:
  https://www.statsmedic.com/intro-day27
- Fitting Models to Curved Relationships:
  https://www.statsmedic.com/intro-day28
- *Linear Regression Project*
- Representing Functions of Everyday Situations:
  https://www.map.mathshell.org/download.php?fileid=1740
- End Behavior of Polynomial Functions:
  https://education.ti.com/en/timathnspired/us/detail?id=B8590AD7EB76400181DDB136E39FC474&t=405EB61A88E7486BAE4F879F4D933A55
- Card Sort: Modeling:
  https://teacher.desmos.com/activitybuilder/teacherguide/5798ea85bef943016af8a240
- Graphing Stories:
  https://teacher.desmos.com/activitybuilder/teacherguide/58797d35d81a612605304b1f

An Exploration of Linear Regression

West Virginia math4life

It's 7:30 AM...When will your phone die?

Materials:
Your cell phone, or any other electronic device that has a chargeable battery that can display battery life

Data Collection Instructions:

1. Charge your device to full battery, and record the time that you first unplug it from the charger
2. Every hour after this, check your battery life percentage (you can set alarms on your phone to remind you every hour!) and record the time and the battery life (you can even record this data IN your phone in a note, or screenshot each hour!)
3. Make sure to take note of the time when your battery finally dies (let it die completely!)
4. For comparison data, the next time you fully charge it again, instead of checking every hour, check every 4 hours.
5. Bring this data to class on _____ (this day may change, but it will not be earlier than _____)

   This is the bare minimum required for data collection. However, you may run as many experiments and collect data as many times as you want, as questions arise from your group's discussion and as you are planning your data presentation. Remember, formulating good questions is sometimes more important than formulating good answers!

Project Instructions:
When you bring your data back to class, you will present your data to your pod and discuss all your team members' data. You will record your team's data on graphs and compare analyze the scatter plots. You will use the calculator and perform a linear regression and answer questions based on your results. You will then work together to produce a presentation of your pod's data, results, and conclusions (this can be anything from a poster to a multimedia presentation). Your team will also be responsible for producing a written technical report/reflection on the project. Finally, you will give a 5-minute presentation to the class on your findings and conclusions. The specific requirements and rubric/point values are explained on the back.

Your presentation and technical report will be due _____.

Presentation Requirements *(50 Points)*

Presentation includes at least one scatter plot for each person's data, with the regression line and regression equation shown	10 points
Presentation includes explanation of the slope and y-intercept of each regression equation and how it relates to your data	5 points
Presentation includes the correlation coefficient of each regression, and an explanation of the implications of this r-value on conclusions you can make	5 points
Presentation includes comparison between each person's data, and comparison between any more experimental iterations you ran, and the conclusions from these comparisons	10 points
Presentation includes your group's ideas of other variables besides time that play into this experiment and the affect these have on your results	5 points
Presentation addresses final question: Is your phone battery's decline linear? "How" linear? If so or if not, what implications does this have? How different was your final conclusion from your original hypothesis?	10 points
Presentation is professional in appearance, clear, neat, easy to follow; full group presents to class and participates	5 points

Technical Report / Reflection Paper *(50 points)*

<table>
<tr><td colspan="2">Cover page
Your group's project title, your names, date</td><td>1 point</td></tr>
<tr><td colspan="2">Introduction/abstract
Introduction should give a brief overview of the data you collected, the overarching questions you explored, the additional questions you formulated/wondered/explored along the way, your perceptions that changed along the way, and the conclusions you were able to make</td><td>2 points</td></tr>
<tr><td colspan="2">Figures, graphs, tables, equations
Included when appropriate; formatted and positioned in paper such that they look professional and are easy to read and interpret</td><td>2 points</td></tr>
<tr><td colspan="2">Methodology
Explains your data collection processes, your use of technology to record and analyze data, the different experiments you ran, how your group worked together, how and why you formulated additional questions that arose throughout this exploration</td><td>5 points</td></tr>
<tr><td>Results and discussion</td><td rowspan="2">These sections should include not only all your findings, but the implications of these findings: what the regression equations told you, what the r-values told you, how the theoretical equations relate to the actual data you collected, what predictions can you make, how certain you can be about your predictions and why you think so, what comparing different data sets told you, what other variables you think play into your findings, and if you think a linear regression is appropriate for this situation. Did any of your ideas change throughout this exploration? Did any other questions arise throughout the exploration that you decided to investigate?</td><td>15 points</td></tr>
<tr><td>Conclusions</td><td>10 points</td></tr>
<tr><td colspan="2">Reflection
Basically wraps up what you learned from this project, how you worked together in your group, how this project relates to what you have already learned in algebra, and how this project has changed the way you look at math</td><td>5 points</td></tr>
<tr><td colspan="2">Spelling, grammar, punctuation, etc.</td><td>10 points</td></tr>
</table>

**Each group member will also complete an individual evaluation of your other group members and their participation/involvement/contribution to the group. If a group member is unanimously evaluted low, depending on the severity of the evaluations, this will result in letter-grade reduction(s).*

Created by Gwynne Flatley