Math Forum Teacher Packet
TI-PoW: Mauna Loa

Focus Activity: Change the Representation

http://mathforum.org/mathtools/activity/64823/

Welcome!

This packet contains a copy of the original problem used to create the activity, rationale and explanation behind the "Change the Representation" focal activity, and some thoughts on why this activity works well with TI-Nspire™ technology.

All of the problems and activities are samples of the Math Forum's Problems of the Week, paired with activities from the Problem Solving and Communication Activity Series. We are highlighting activities and problems that make good use of TI-Nspire™ handhelds.

Teachers and/or students are able to electronically access this and similar problems after setting up a login (free) available from the Math Forum @ Drexel. Sign up using the link on the Technology Problems of the Week (tPoW) login page, or use your existing KenKen® or Problems of the Week login–see this page for details: http://mathforum.org/tpow/about.html

The Problem

TI-PoW: Mauna Loa

The Mauna Loa Observatory, located at 11,000 feet elevation in the middle of the Pacific Ocean, sits in a prime spot for measuring carbon dioxide levels in the atmosphere without local contamination. Operated by the National Oceanic and Atmospheric Administration's Climate Monitoring and Diagnostics Laboratory, the observatory has been measuring CO_2 levels (in parts per million) since 1958.

Monthly measurement data for 1958 through January, 2008 are given in this **TI-Nspire™** file to download using Mauna Loa Data.

Question 1: Using these data, develop a mathematical model to predict the CO_2 level for a month between 1995 and 2008.

Question 2: Now use your mathematical model to predict the CO_2 level for October 2008. Explain clearly how you used your mathematical model to arrive at your prediction.

You should give enough detail in your solution that someone else could read your solution, follow your methodology, and come up with a similar mathematical model for a different year/month.

Standards

This problem presents an opportunity for students to think about mathematical modeling, linear regression, and even periodic functions.

If your state has adopted the Common Core State Standards, this alignment might be helpful:

Statistics: Interpreting Data

S-ID: Summarize, represent, and interpret data on two categorical and quantitative variables

S-ID: Interpret linear models

The Strategy

This TI-PoW focuses on Change the Representation. We offer students both a table and a scatterplot to help them think about the problem. We offer less scaffolding with this TI-PoW, preferring to let the students explore different representational possibilities on the TI-Nspire™. See below for suggestions on maximizing the capabilities of the TI-Nspire™ software.

The TI-Nspire

Several powerful functions of the TI-Nspire™ software can support students to work on this TI-PoW. If you have Navigator software, presenting a "gallery" of student representations is quite simple and a great way for students to compare multiple representations of the same data.

Color is a great way to organize and see patterns in this data. We provide a spreadsheet sorted by month so that students can relatively easily create 12 spreadsheets of data, one for each month. Data from each spreadsheet can then be plotted on the same axes with plots of different months given different colors.

Another option is to plot the spreadsheet where data is sorted by month (x <- decimaldate, y <-

interpolated), select the scatterplot, and choose the Attribute points are connected. This will connect the January points to one another, the February points to one another, etc.

The TI-Nspire™ can also be used to find linear regressions. If students make separate spreadsheets for each month's data, they can find the best fit line for each month, or they can find an average best fit line for all months.

Join Us!

Do your students like to use their mathematical imaginations? Wonder about math all around them? Discover and invent new patterns? Here are some ways for them to share their ideas and learn about other students' and mathematicians' ideas!

http://mathforum.org/explorers/

Are you a **Math Explorer?**

Do you like to use your mathematical imagination? Wonder about math all around you? Discover and invent new patterns? Here are some ways to share your ideas and learn about other students' and mathematicians' ideas!

Problems of the Week

Drawing from the real world, our own math imaginations, or famous problems and puzzles, these bi-weekly challenges give you a chance to stretch your mind. Share your work with teachers, parents, Math Forum volunteers, and the world!

Wonderama

We share pictures and stories that make us wonder. What do you notice and wonder? Share in the comments and submit your own images!

KenKen

Do you like Sudoku puzzles? Try your hand at KenKen! These puzzles combine math reasoning with Sudoku-style logic to really stretch your brain! KenKen problems are free but they do require a registration.

Math Ideas for Science Fair Projects

Science fair projects in chemistry, physics, or biology can be messy, smelly, unpredictable, even downright dangerous! This year, try a mathematical science fair project. These tips and ideas can get you started, and the most dangerous things you'll encounter are a geometry compass and some radical ideas.

Technology Problems of the Week

How do aliens make change? Can you beat the balloon booth challenge? Technology Problems of the Week (tPoWs) are **free** problem-solving challenges complete with hints and answer checks so you can test yourself at many levels.

Ask Dr. Math

Mathematicians answer your questions... in ways that make you think! We're always looking for volunteer math doctors too!

Math Tools

Looking for math you can really get your hands on? Math Tools is a library of online interactive math tools that use technology such as Java, Flash, spreadsheets, dynamic geometry software, graphing calculators, and more! Users can search for the tools and also can save favorites, rate items, and read and participate in discussions linked to each resource.

K-12 Math Problems, Puzzles, Tips & Tricks

This page offers links to the Beat the Calculator archive of over 600 mental calculation tricks from the BEATCALC mailing list. Pages of Multiplication Tips and Divisibility Rules are also linked as well as Russian Math Olympiad problems and a variety of math puzzles including our popular Year Game!
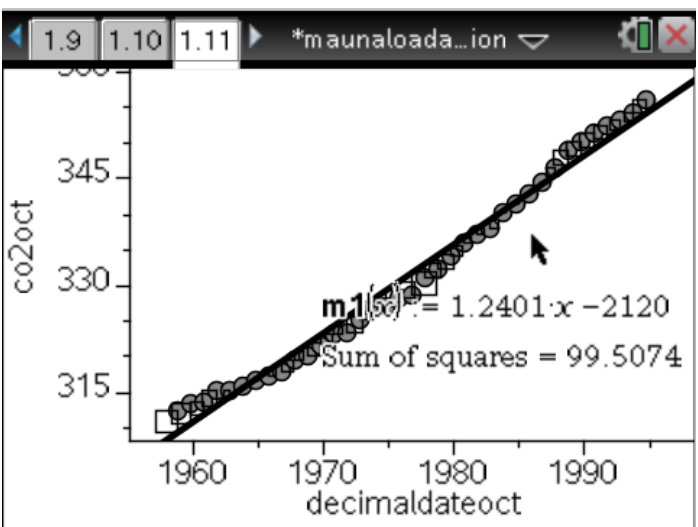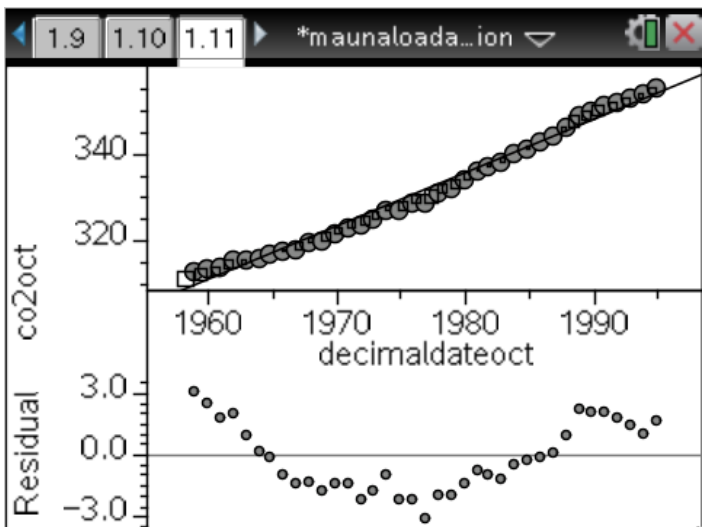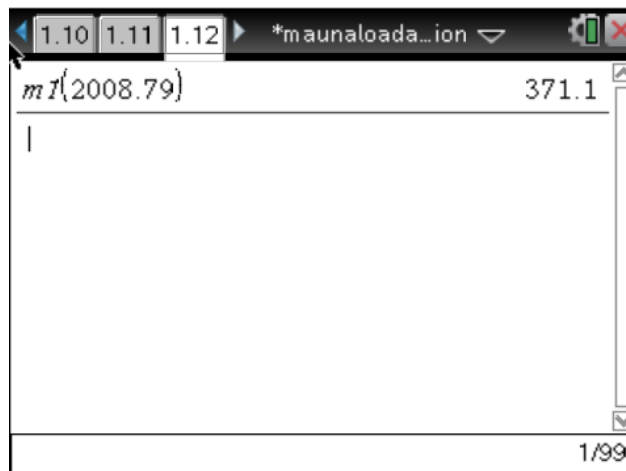
Possible Solution Strategies
Key Screen Shots
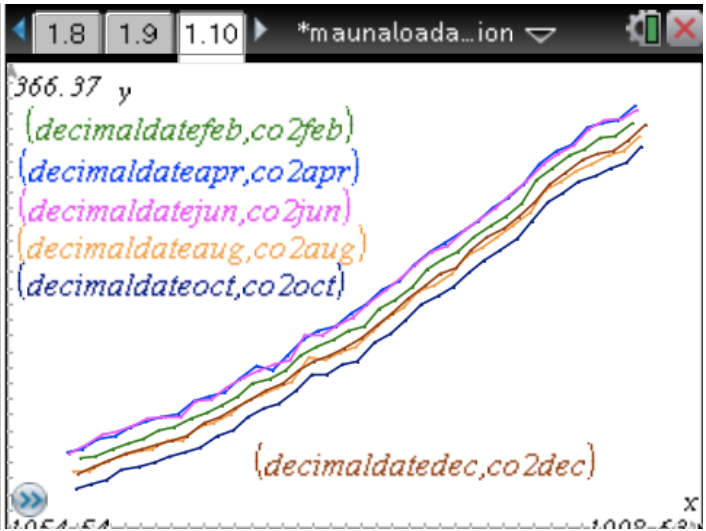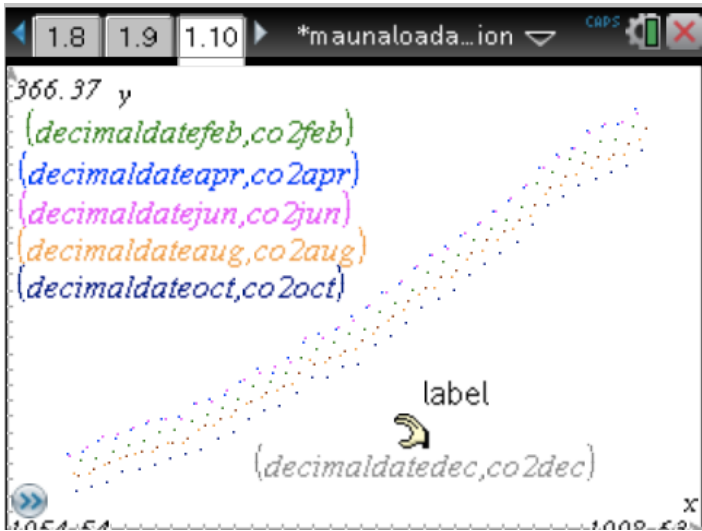
Color-coded by month

Connected

Finding least-squares residuals for October by hand

Finding least-squares regrssion for October with technology

Calculating the predicted CO2 levels for October 2008