Math Forum Teacher Packet

TI-PoW: Chirp! Chirp!

Focus Activity: Doing it Wrong

http://mathforum.org/mathtools/activity/64536/

Welcome!

This packet contains a copy of the original problem used to create the activity, rationale and explanation behind the "Doing it Wrong" 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: Chirp! Chirp!

I read once that you can figure out what the temperature is in degrees F (Fahrenheit) by counting the number of chirps that a cricket makes in 15 seconds. I couldn't remember the formula, but I did find some data.

chirps in 15 seconds	temperature in F
25	65
32	72

Question: What could the temperature be when a cricket is chirping 164 times a minute?

Extra: Write a formula that could be used to predict the temperature given the number of chirps per 15 seconds. Note: Use "c" for chirps and "t" for temperature.

Standards

This problem presents an opportunity for students to think about patterns, units of measurement and also to work on expressing the pattern as a formula that will lead them to thinking algebraically.

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

Grade 6: Expressions & Equations

6.EE.6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem.

Grade 7: Expressions & Equations

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Grade 8: Expressions & Equations

8.EE.7. Solve linear equations in one variable.

The Strategy

One of the main challenges students have with problem solving is getting started. Students are afraid to test an idea and have it be wrong. Maybe that's because we, their teachers, put so much emphasis on right answers.

This activity encourages students to generate wrong answers and wrong models for a problem. We hope to reduce the fear students feel when making a guess, and replace it with something fun: be wrong on purpose!

The activity is great for teachers because through learning what students know is wrong, we learn what they know about the right answer. Do your students know the answer can't be negative? Do they know that the temperature (when a cricket is chirping) is unlikely to be under 32 or over 105? Can your students tell you how they know from a graph or a table that a guessed point is likely wrong?

We hope this activity gives you a glimpse into your students' number sense and conceptual understanding, and gives your students permission to try ideas without fear of being wrong. In time, it can become a favored way to get unstuck – "I know this would be wrong… can I tell why it's wrong? What would be right-er?"

Check out the Noticing and Wondering activity related to this problem on the TI-PoWs page for more ideas about getting students started problem solving. You'll find even more activities like this one from the Problem Solving Activities link in the left menu bar.

The TI-Nspire

In this activity we take advantage of the TI- Nspire™ technology's linked representations. Students can make a wrong guess in the table representation, and they may notice that their guess doesn't fit the pattern. However, they may not "see" why their guess isn't right immediately. If they go to the next page and see their guess on the graph, they can see how it is not on the line defined by the given two points. Perhaps they might try to purposely guess points that are too high or too low. By doing that, they begin to get a sense of where the right answer does fall.

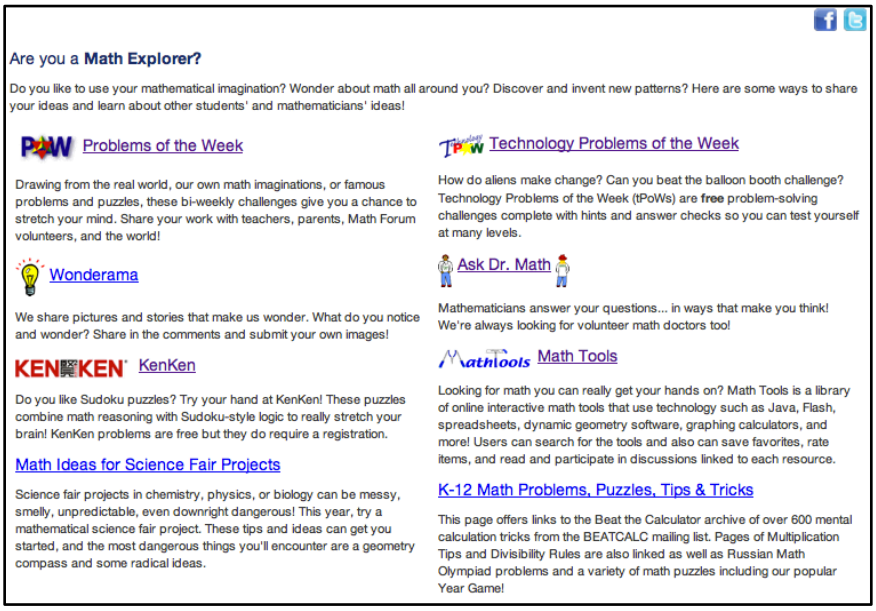
We also take advantage of the spreadsheet and graphing capabilities. Students can guess a wrong rule and immediately see values get calculated. Do those values match the given values? Or students can graph a line and see, "does this line go through the points?" If not, they can drag it to go through the points and watch the parameters in their rule change.

Exploring the situation through multiple, linked representation, without the pressure of getting the right answer, can be a powerful opportunity for learning!

Join Us!

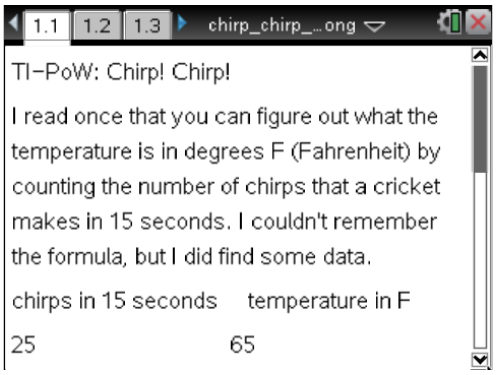
Do your students like to use their mathematical imaginations? Wonder about math all around them? Discover and invent new patterns? Here are some ways for them to share their ideas and learn about other students' and mathematicians' ideas!

http://mathforum.org/explorers/

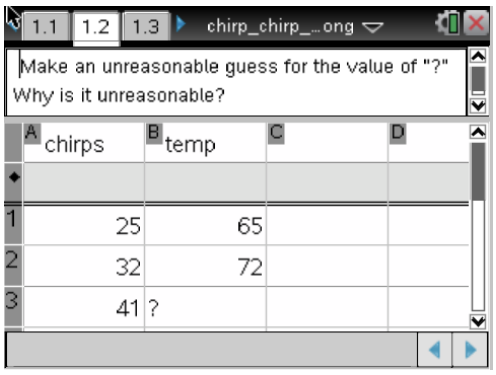


The Activity

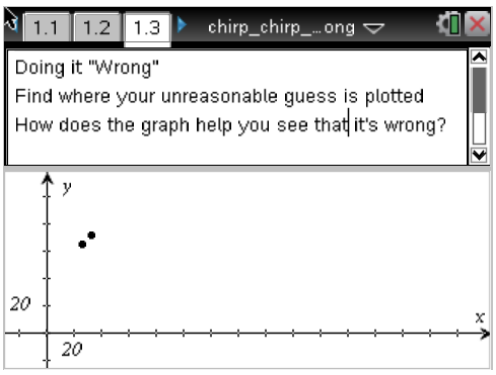
Screen Shots



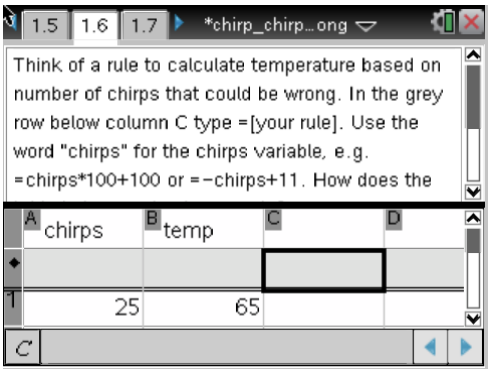
The problem



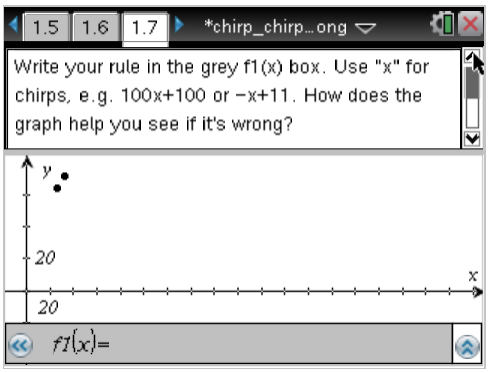
Making a wrong guess



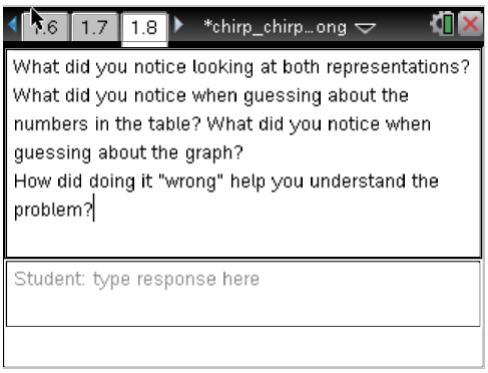
Visualizing the wrong guess



Guessing a wrong rule

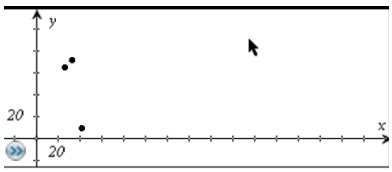
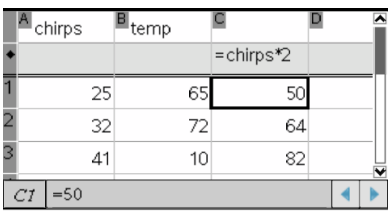
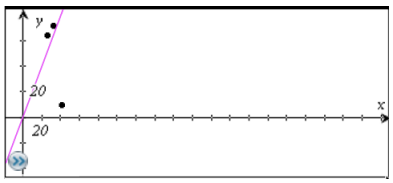


Visualizing the wrong rule



Reflecting

Possible Responses

Note: Students are not expected to answer the original questions in this activity. However, for reference, the correct answers are: When a cricket chiprs 164 times per minute (41 times per 15 seconds), the temperature is 81° A rule is $t = c + 40$	Wrong guesses and explanatons could include: - unreasonable temperatures, like 120° or -70° - guesses lower than 72, since the numbers seem to be going up - guesses that don't match the "temp is 40 more than chirps" pattern	 The guessed value is wrong because it makes a point that is off the line of the other two points. **Note: Graphs will vary.**
 The rule is wrong because the calculated values don't match the given values. **Note: Rules will vary.**	 The guessed rule is wrong because it doesn't go through the two original points. This line is too steep and isn't in the right place. **Note: Graphs will vary.**	**Note:** Student reflections will vary. Taking the time to reflect, orally or in writing, will help students consolidate their learning and be ready to tackle the original problem. Plus, they will have a new tool in their toolbox: try a wrong answer and see why it's wrong… How can a wrong answer put you on the path to a right answer?