Math Forum Teacher Packet
TI-PoW: Caliyah's Cart

Focus Activity: Change the Representation

http://mathforum.org/mathtools/activity/64767/

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: Caliyah's Cart

Caliyah's family is throwing a huge party. Her mom gets out the rolling cart they use when they need to get a lot of stuff from the store, and tells Caliyah, "I want you to take this to the store and fill it up with boxes of cheese crackers and bottles of fruit punch for the party. We'll need as much as you can get with $40.00 -- make sure you bring back any change."

Caliyah says, "Sure, I'll do that. But how many of each do you want me to get?"

Her mom replies, "Just get as many items as you can, but make sure not to overload the cart -- I don't want you pushing more than 30 pounds."

Caliyah whips out her TI-Nspire™ to help her organize her thinking. Bottles of fruit punch weigh about 4 pounds, and cost $1.50 each. Boxes of crackers weigh about 1 pound, and cost $4.00 each. She decides how many of each item she should get. How many did she decide? How did she know?

Standards

This problem presents an opportunity for students to think about tables and formulas, as well as linear relationships, systems of inequalities, and liner programming.

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

Algebra: Represent Equations and Inequalities

A.REI.12. Graph the solutions to a linear inequality in two variables as a halfplane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Grade 7: Expressions & Equations

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

Grade 8: Expressions & Equations

Analyze and solve linear equations and pairs of simultaneous linear equations.

The Strategy

This activity uses the strategy Change the Representation. Students move from numeric to tabular to graphical representations, building towards the linear programming algorithm (which itself combines graphing and algebraic techniques).

In this activity, the TI-Nspire™ technology is used to easily switch between representations, and students are asked to make sense of the same information across representations. For example,

formulas generated with a spreadsheet are graphed and compared to scatterplot data from the same spreadsheet. Students much use the scatterplot to check and make sense of their formulas.
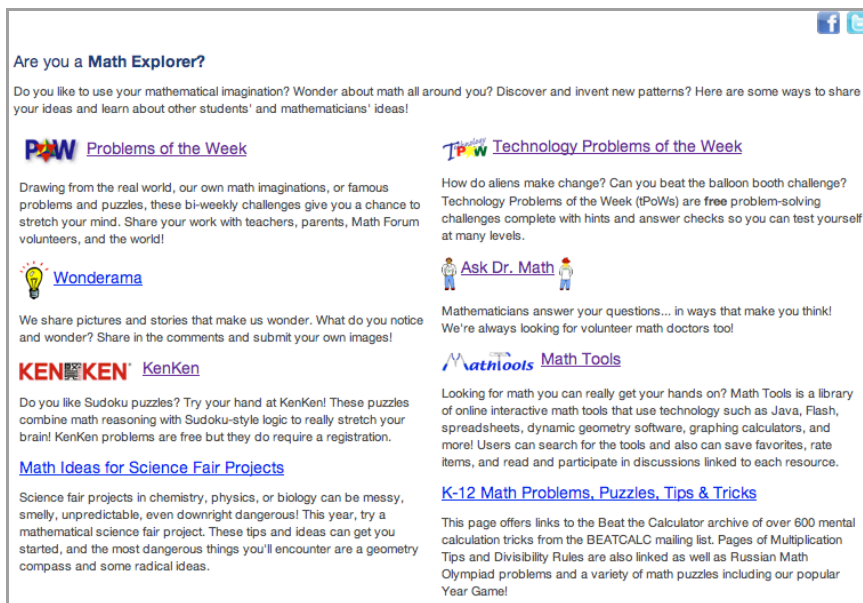
The TI-Nspire

In this activity we make extensive use the TI-Nspire™ technology's linked representations. Students generate data through guess and check or organized list-making. That data is automatically plotted and students reason about the boundaries of the plot.

The fundamental questions at the heart of linear programming (Are the points showing up randomly or in one region? What can our formulas tell us about the boundaries of the region? How does the region help us choose data points to test?) are made extremely accessible thanks to the dynamic linking of the table with student-generated data, the plotted points, and students' formulas.

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!
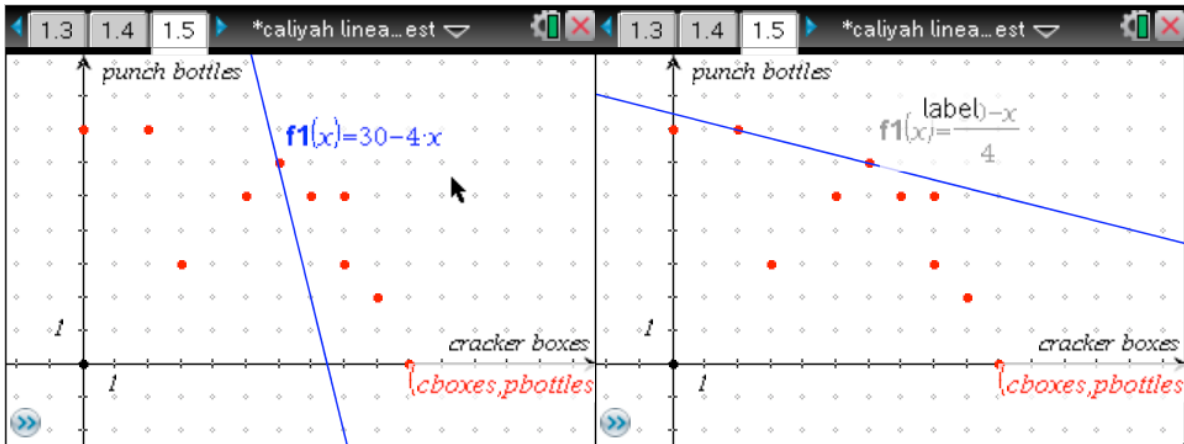
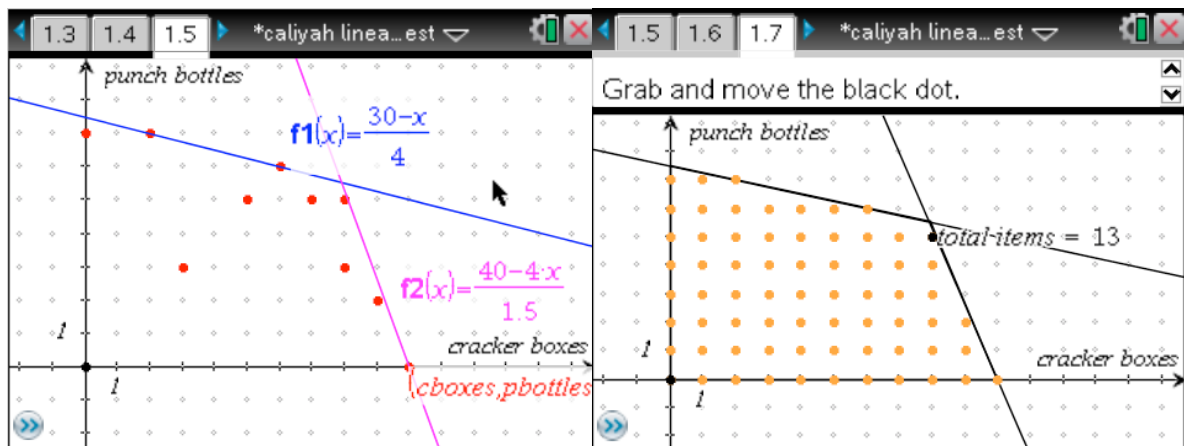# Possible Solutions
Key Screen Shots
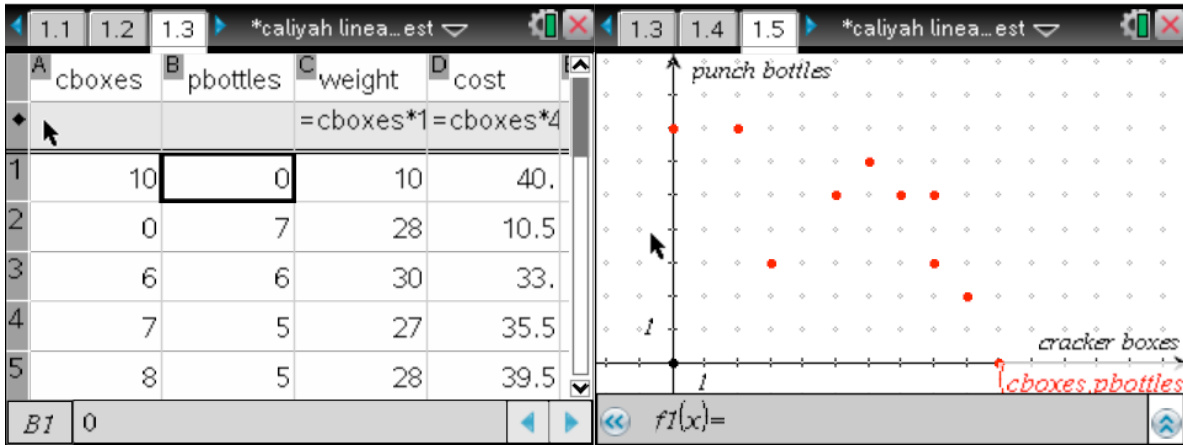
Guessing possible combinations

The automatic scatterplot

An incorrect boundary formula

A correct boundary formula

Both boundary formulas correct

The linear programming tool showing the max. no. of items