



Don't be a
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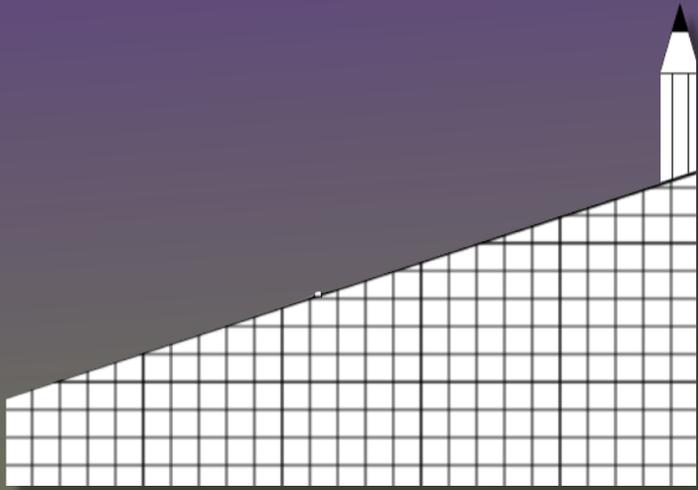
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Brad

Function Fun

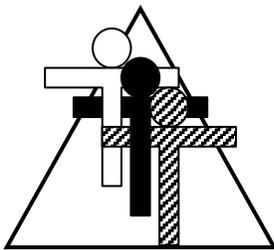
Unit 3: Applications of Linear Functions



By Brad Fulton
Educator of the Year, 2005
brad@tttpress.com www.tttpress.com
530-547-4687
P.O. Box 233, Millville, CA 96062

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Brad Fulton

Educator of the Year



PO Box 233, Millville, CA 96062
(530) 547-4687
brad@tttpress.com

- ◆ Consultant
- ◆ Educator
- ◆ Author
- ◆ Keynote presenter
- ◆ Teacher trainer
- ◆ Conference speaker

Known throughout the country for motivating and engaging teachers and students, Brad has co-authored over a dozen books that provide easy-to-teach yet mathematically rich activities for busy teachers while teaching full time for over 30 years. In addition, he has co-authored over 40 teacher training manuals full of activities and ideas that help teachers who believe mathematics must be both meaningful and powerful.

Seminar leader and trainer of mathematics teachers

- ◆ 2005 California League of Middle Schools Educator of the Year
- ◆ California Math Council and NCTM national featured presenter
- ◆ Lead trainer for summer teacher training institutes
- ◆ Trainer/consultant for district, county, regional, and national workshops

Author and co-author of mathematics curriculum

- ◆ Simply Great Math Activities series: six books covering all major strands
- ◆ Angle On Geometry Program: over 400 pages of research-based geometry instruction
- ◆ Math Discoveries series: bringing math alive for students in middle schools
- ◆ Teacher training seminar materials handbooks for elementary, middle, and secondary school

Available for workshops, keynote addresses, and conferences

All workshops provide participants with complete, ready-to-use activities that require minimal preparation and give clear and specific directions. Participants also receive journal prompts, homework suggestions, and ideas for extensions and assessment.

Brad's math activities are the best I've seen in 38 years of teaching!

Wayne Dequer, 7th grade math teacher, Arcadia, CA

"I can't begin to tell you how much you have inspired me!"

Sue Bonesteel, Math Dept. Chair, Phoenix, AZ

"Your entire audience was fully involved in math!! When they chatted, they chatted math. Real thinking!"

Brenda McGaffigan, principal, Santa Ana, CA

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Thanks and happy teaching,

Brad 

Function Fun

Part 3: Applications of Linear Functions

Overview:

This activity is part 3 in a five-part series on developing an understanding of and proficiency with functions. Part 1 offered an introduction helping students to understand slope and y-intercept when integrated across a multi-representational approach that included visual, graphical, tabular, linguistic, and equation models.

In part 2, the student developed even greater proficiency as negative and fractional slopes and y-intercepts are encountered.

Part 3 allows students to apply their understanding of functions in tackling three realistic problems: “Banking on Functions”, “The Great Yo-yo Festival”, and “A Nutty Function.” Only part 2, “The Great Yo-yo Festival” is included in this abbreviated free handout.

Part 4, *Quadratic Functions*, incorporates functions of the form $ax^2 + bx + c$ and is geared toward an algebra 1 course.

Part 5, *The King’s Pathway*, provides an engaging project your students can do to create their own beautiful functions based on their work with the previous sections.

Section 2: The Great Yo-yo Festival..... 1 class period

I still remember the confusion we faced as students when my high school algebra teacher introduced the $y = mx + b$ form of a linear function. He quickly stated that “ m represented slope, the change in y compared to the change in x or $(y_2 - y_1) \div (x_2 - x_1)$ or $\Delta y \div \Delta x$. He went on to say that b represented the y-intercept of the function or the y value when $x = 0$, $(0, y)$.” It was all perfectly clear...to him. Later when I was an algebra teacher myself, I decide there had to be a better way. Here is my approach.

Procedure:

1. Students may work individually or in small groups on this activity. Make sure the students have paper on which to work. Display a copy of the Yo-yo Festival Activity Master showing only the first problem. Read the problem together and ask the students to write an equation that represents the problem and solve it.
2. Ask the students what equations they wrote and what answer they got. While some equations may differ, they essentially will communicate the same idea. Write this form of the equation on the board:

$$y = 5 \cdot 27 + 34 = 169$$

Required Materials:

- Yo-yo Festival Activity Master
- Yo-yo Festival Student Worksheet
- $\frac{1}{4}$ inch grid paper
- Homework 7

Optional Materials:

- Calculators

- Ask them what the y represents in this equation. They will probably say it stands for yo-yos. Ask them to elaborate; there are three sets of yo-yos in this problem: the ones brought by the experts, the ones in the box, and the total yo-yos at the tournament. In this case, the variable represents the total yo-yos.
- Now display the second problem and ask them to write and solve an equation. Again, though their equations may differ somewhat, they are similar in what they communicate. Write this version on the board:

$$154 = 6 \cdot 22 + b$$

In this case $b = 22$. Some students may solve this by a guess-and-check method. If they have had experience solving equations, they should be encouraged to solve it algebraically.

$$\begin{array}{r} 154 = 6 \cdot 22 + b \\ 154 = 132 + b \\ -132 \quad -132 \\ \hline 22 = b \end{array}$$

- Ask them what they suppose the b represents. They will likely surmise that it also represents yo-yos, but in this case they are the yo-yos in the *box*.
- Display the third problem and ask them to repeat the task. In this case, focus them on this representation of the problem:

$$\begin{array}{r} 182 = m \cdot 31 + 58 \\ -58 \qquad \qquad -58 \\ \hline 124 = m \cdot 31 \\ 31 \quad 31 \\ \hline 4 = m \end{array}$$

- Ask them what the m represents. Some will see that it represents the *main* yo-yos brought by each expert.
- Next ask the students to solve the fourth problem. By now, students may be trying to second guess the teacher and write an equation that uses the variable e for *experts*. However, write it this way on the board:

$$\begin{array}{r} 214 = 7x + 46 \\ -46 \qquad \qquad -46 \\ \hline 168 = 7x \\ 7 \quad 7 \\ \hline 24 = x \end{array}$$

- Ask them what the x represents and they will realize it stands for the number of *experts*. If they ask why you didn't use e , you can jokingly reply that you have to have an x somewhere on the page or you're not doing algebra!
- Now show them the fifth problem. Most will say they cannot answer it because there is not enough information. Ask them how many total yo-yos there will be if one expert

comes. (40) What if two experts show up? (48). Continue in this manner until they see the pattern.

11. Pass out the Student Worksheet. Ask them to complete a t-table and graph for the problem.
12. When they finish ask them to find the formula. What do the variables y and x represent in the formula? (total yo-yos and the number of experts). Then write this equation on the board and ask them to write a sentence translating it into words:

$$y = mx + b$$

“The total number of yo-yos is equal to the main yo-yos times the number of experts plus the yo-yos in the box.”

Students now have a context for $y = mx + b$.

13. Assign the homework if you wish.

Answer Key

Questions 1-7 are based on the formula $y = 4x + 12$

1. 40
2. 52
3. 72
4. 120
5. 8
6. 1
7. 18

Questions 8-16 are based on the formula $y = 9x + 20$

8. 119
9. 92
10. 164
11. 1,316
12. 2
13. 0
14. 10
15. 2,234
16. about 109

At the annual yo-yo festival, all the yo-yo experts bring their favorite models. The festival also provides a box of spare yo-yos.

1. Last year there were 34 yo-yos in the box of spares. There were 27 experts, and each one brought 5 main yo-yos. How many yo-yos were there altogether?

$$y = 5 \cdot 27 + 34$$

2. This year each expert brought 6 yo-yos. The number of experts attending was 22. In all, there were 154 total yo-yos. How many were in the box?

$$154 = 6 \cdot 22 + b$$

3. Two years ago there were 182 yo-yos altogether, and 58 were in the box of spares. How many main yo-yos did each of the 31 experts bring?

$$182 = m \cdot 31 + 58$$

4. Three years ago there were 214 yo-yos altogether. The box contained 46 spares. Each expert was told to bring 7 main yo-yos. How many experts attended?

$$214 = 7x + 46$$

5. In the future all experts are to bring 8 main yo-yos. The box of spares will have 32 yo-yos. How many yo-yos will there be altogether?

$$y = \underline{\quad} \cdot \underline{\quad} + \underline{\quad}$$

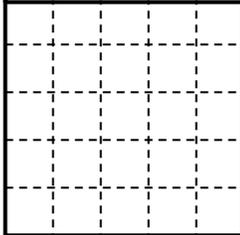
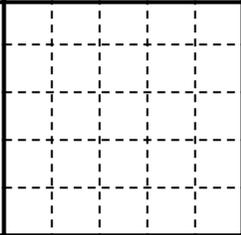
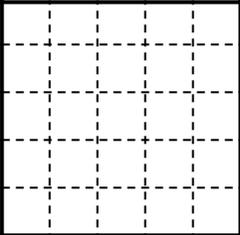
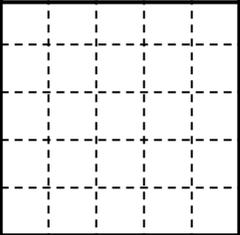
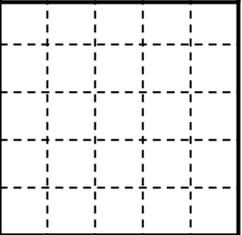
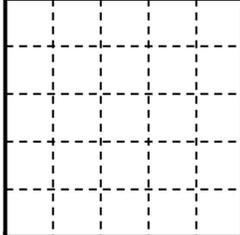
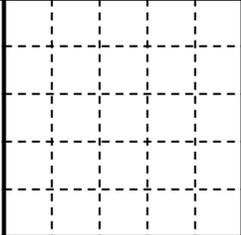
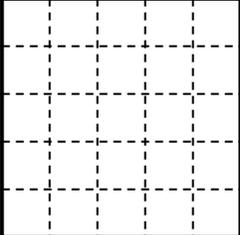
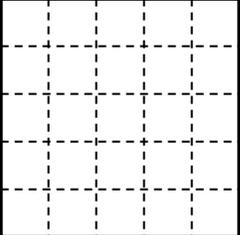
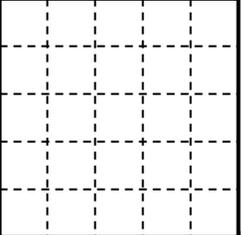
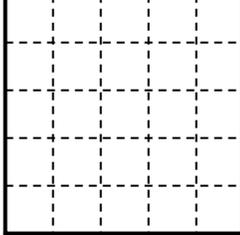
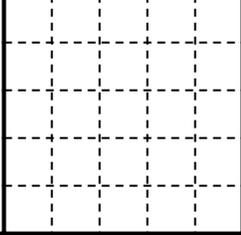
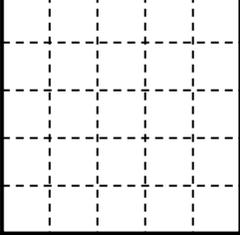
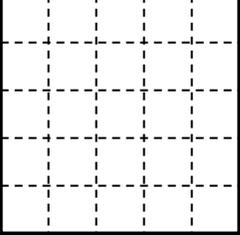
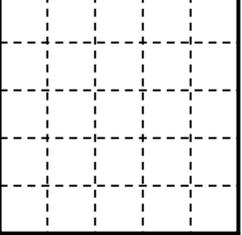
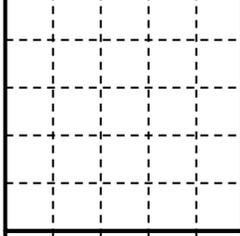
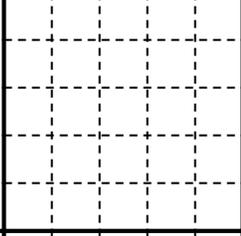
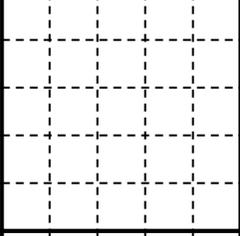
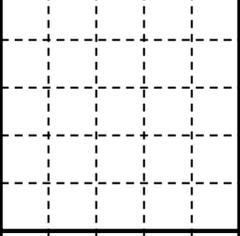
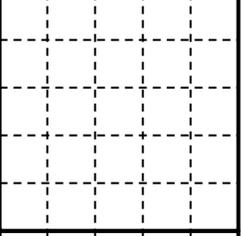
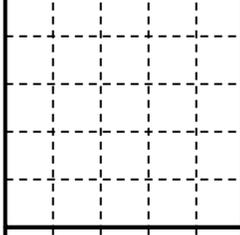
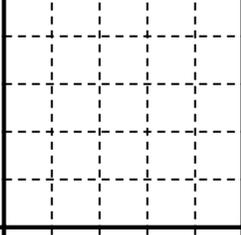
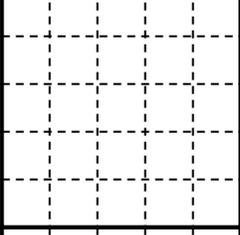
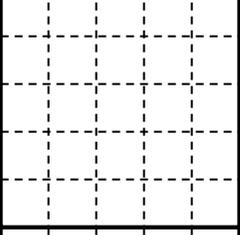
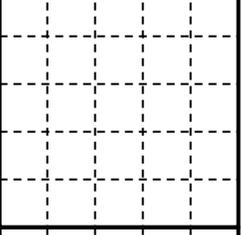
The Great Yo-yo Festival

Festival

Student Worksheet

Name _____

Date _____ Class _____



Formula:

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Similar activities include:

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- *Function Fun: Part 2 - Negative and fractional slopes and y-intercepts*
- *Function Fun: Part 4 - Exploring quadratic functions*
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- *Milk Carton Apartments: a simple function activity for hands-on learners*
- *Losing Your Marbles: slope, intercept, domain, range, independent and dependent variables, rise and run, fractional slopes, line of fit - all in a visual model.*

Feel free to contact me if you have questions or comments or would like to discuss a staff development training or keynote address at your site.

Happy teaching,

Brad