Up Shirt Creek

Systems of Equations Mastery Task

Teach Systems in a real-world setting.

Included with this project

- Teachers Instructional Guide
- Student Instructions
- Individual Data Analysis Worksheet
- Combined Data Analysis Worksheet
- Seven Enrichment Extension Ideas
- Sample Key
- Grading Rubric

Common Core State Standards

7.EE.A.1, 7.EE.A.2, 7.EE.A.3, 7.EE.A.4, 8.EE.B.5, 8.EE.C.7, 8.EE.C.8, 8.F.A.2, 8.F.A.3, 8.F.A.4, HSA.CED.A.1, HSA.CED.A.2, HSA.CED.A.3, HSA.REI.B.3, HSA.REI.C.5, HSA.REI.C.6, HSA.REI.C.7, HSA.REI.D.11, HSF.IF.B.6, HSF.IF.C.7

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Up Shirt Creek Mastery Task

Instructions for Teachers

Purpose

Up Shirt Creek Mastery Task gives students an opportunity to use systems of equations in a real-world context. Students will use linear equations to determine the expense and revenue of a start-up t-shirt shop called "Up Shirt Creek." They will use the information provided to find the rate of change of each linear equation and write these equations in slope intercept form. This information will then be used to complete a table of values and a graph the system. Students will decipher the significance of their findings and give meaning to the term "profit." This task creates depth and complexity to the understanding of values within a system of equations, and the use of systems find the "break even" point.

Students will:

1. Determine the cost of purchasing t-shirts from the wholesaler.
2. Calculate the income from selling t-shirts to the public.
3. Create equations in slope intercept form to represent expense and revenue.
4. Assess profit.
5. Find meaning in negative solutions regarding income, expense and profit.
6. Build a table of values to represent expense and revenue.
7. Graph the linear system based on the data.
8. Evaluate the "break even" point of the system.
9. Analyze the graph for profit margins.

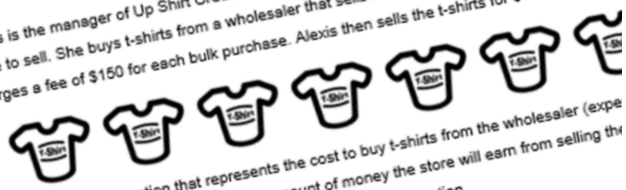
Organization

Six versions of the task are included for struggling and average students. A seventh version of the task is included for gifted or advanced students. Each version of the task is identical, only the values have been changed. This allows students to work collaboratively while still testing their individual understanding by completing their own calculations. Students can be placed in groups with ____ Period ____ al version of the task or students can be placed in ____ Date ____ gling

Name _____

Up Shirt Creek
Finding Profit Selling t-Shirts

Alexis is the manager of Up Shirt Creek, a clothing store. She is in charge of buying t-shirts for t store to sell. She buys t-shirts from a wholesaler that sells them for $5 each. The wholesaler al charges a fee of $150 for each bulk purchase. Alexis then sells the t-shirts for $15 each.



Part 1 Write an equation that represents the cost to buy t-shirts from the wholesaler (expe a second equation that represents the amount of money the store will earn from selling th (revenue). Describe what your variables represent in this equation.

a. Calculate the cost to buy 10 t-shirts from the wholesaler.
Write solution as an ordered pair.

b. Calculate the amount of money the store will earn from selling 10 t-shirts.
Write solution as an ordered pair.

c. Calculate the profit the store will make from selling 10 t-shirts.

d. What does your answer to part (c) mean?

e. Calculate the cost to buy 50 t-shirts from the wholesaler.
Write solution as an ordered pair.

f. Calculate the amount of money the store will earn from selling 50 t-shirts.
Write solution as an ordered pair.

g. Calculate the profit the store will make from selling 50 t-shirts.

h. What does your answer to part (g) mean?

thod B – assessment of learning

Method B saves the entire task for the end of the unit. Traditionally, this is where a formal exam comes in. If this project is used as a summative assessment it can raise rigor, save time and because the students work together, increase engagement. Even though students work together, most of the project is unique, so it s easy to determine mastery. The down side is grading by hand. Peer editing can still be used initially but if the oject is summative it must be graded by the teacher. Alternatively, this assignment may be used as a review k to prepare for a more traditional exam. It takes 2 to 3 days to complete when used as a project or ssment.

ency Sub Plans

Up Shirt Creek Mastery Task is an excellent choice for emergency sub plans. This project can be easily od by most substitute teachers. Let's face it, it is hard to find a sub who knows middle school or high th. It's practically impossible to find a math proficient sub at the last minute. You need a lesson that lerstood by both the sub and the students yet is engaging enough to keep students productive and e. Most adults can relate to the idea of income and expense and imagine roffered in this task.

iect takes two to three 50-minute blocks for students to complete. complete the task more quickly, they probably needed the GATE version has the students imagine that they are the entrepreneur. This allows them to factor lt include more than merely the cost of shirts. There are also extension ideas that may be r depth and complexity. The extension ideas are equally relevant to students completing s well as those completing the GATE version. Use the standard form of the task for grade, Pre-algebra, Algebra 1 or Geometry students and the GATE version for gebra 1, Honors Geometry and regular Algebra 2 students.

r keys for all six regular versions of the Up Shirt Creek Mastery Task. If you are ifted and advanced math students, each task will be unique. Add rigor by having 's work. This raises their depth of knowledge and creates a rich metacognitive f fix errors. Have students peer edit before submitting their project to th

Project Extensions

Below I have included some **ideas for extensions** of the *Up Shirt Creek* Mastery Task. The more creative the assignment the more challenging and rewarding the task.

A. Extension Questions: An easy project extension is to have students choose one of the questions below and solve. These extension questions can be used for both regular and advanced students.

1. You break even in half the time expected. Congratulations! How will you re-invest these profits to continue growth? Will you add a new line of products, add a location, purchase a competitor or something else? Explain with mathematical predictions.

2. It took you twice as long to "break even" than you predicted. How are you going to adjust your business model to increase your profit margin? Will you lower your costs or increase your revenue? How will you do this? Explain and include mathematical predictions.

B. Logo: Create a logo for your business. Feel free to change the name of your business. The logo should be in full color. Include a short explanation of why you chose this logo.

Sample logos:

C. Motto: Create a motto for your business. Include a short explanation of why you chose this motto. Examples: "Life's Good." "Quality is job one." "Don't be evil." "Just do it." "Finger lickin' good."

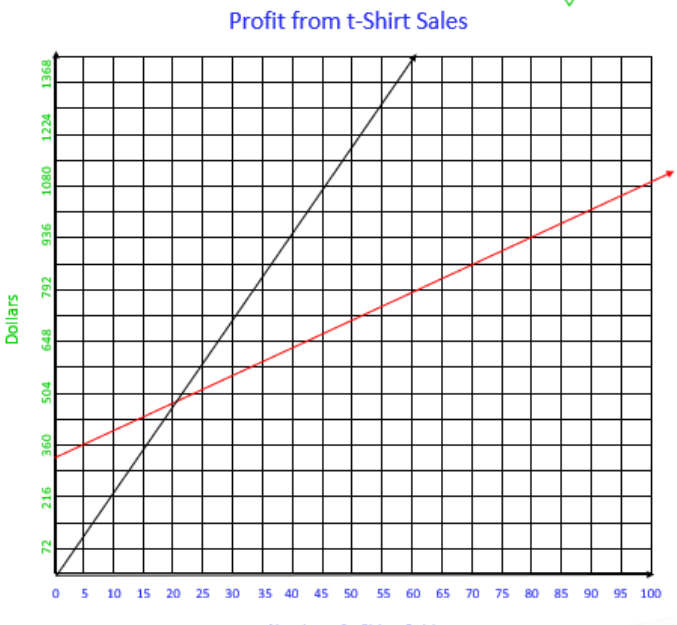
D. Jingle: Create a jingle for your business. It should have a tune and words. Perform your jingle or record a video of your jingle. Examples can be found at: https://www.youtube.com/watch?v=gZ1nfdO_3Aw or other youtube videos. Be catchy, corny, unique and unforgettable. Think of those tunes that you can't get out of your mind, even though you may want to.

E. Commercial: Make a Commercial for your business. Your commercial should emphasize those characteristics that make your business unique. Give customers a reason to patronize your store rather than your competition. Think of youtube videos that went viral. What made them unique? Use your cell phone, tablet or laptop to record your commercial.

Part 3 Create a graph of both the cost and income equations on the coordinate plane. Use the given bounds and intervals.

Variable Quantity	Lower Bound	Upper Bound	Interval
t-Shirts	0	100	5
Money	0	1440	72

BB Graph Key



Name _____ Key _____ Date _____ Perio

Producing and Selling T-Shirts
Using a Graph to Solve a Linear System

Alexis is the manager of Up Shirt Creek, a clothing store. She is in charge of buying t-s
store to sell. She buys t-shirts from a wholesaler that sells them for $5 each. The whol
charges a fee of $150 for each bulk purchase. Alexis then sells the t-shirts for $15 ea

Part 1 Write an equation that represents the cost to buy t-shirts from the wholesal
a second equation that represents the amount of money the store will earn from s
(revenue). Describe what your variables represent in this equation.

A) $y = 5x + 150$ — $y = 15x$
B) $y = 8x + 288$ — $y = 24x$
C) $y = 4x + 144$ — $y = 12x$
D) $y = 10x + 300$ — $y = 30x$
E) $y = 12x + 432$ — $y = 36x$
F) $y = 6x + 180$ — $y = 18x$

a. Calculate the cost to buy 10 t-shirts from the wholesaler.

A) $y = 5(10) + 150$ — $y = 200$
B) $y = 8(10) + 288$ — $y = 368$
C) $y = 4(10) + 144$ — $y = 184$
D) $y = 10(10) + 300$ — $y = 400$
E) $y = 12(10) + 432$ — $y = 552$
F) $y = 6(10) + 180$ — $y = 240$

b. Calculate the amount of money the store will earn from selling

A) $y = 15(10)$ — $y = 150$
B) $y = 24(10)$ — $y = 240$
C) $y = 12(10)$ — $y = 120$
D) $y = 30(10)$ — $y = 300$
E) $y = 36(10)$ — $y = 360$
F) $y = 18(10)$ — $y = 180$

Part 4 Making a Profit

a. Determine the number of t-shirts for which the cost to buy them is greater tha
income from selling them. **Explain your reasoning.**
Students may use any method of solving a system to find this answer, however t
graphing method is not precise enough for several versions.

A) $5x + 150 = 15x$ — $x < 15$
B) $8x + 288 = 24x$ — $x < 16$
C) $4x + 144 = 12x$ — $x < 18$
D) $10x + 300 = 30x$ — $x < 15$
E) $12x + 432 = 36x$ — $x < 18$
F) $6x + 180 = 18x$ — $x < 15$

b. Determine the number of t-shirts for which the income from selling them is greater than the cost to buy them. **Explain your reasoning.**

A) $5x + 150 = 15x$ — $x > 15$
B) $8x + 288 = 24x$ — $x > 16$
C) $4x + 144 = 12x$ — $x > 18$
D) $10x + 300 = 30x$ — $x > 15$
E) $12x + 432 = 36x$ — $x > 18$
F) $6x + 180 = 18x$ — $x > 15$

c. Determine the break-even point for buying and selling the t-shirts.

A) $5x + 150 = 15x$ — $x = 15$
B) $8x + 288 = 24x$ — $x = 16$
C) $4x + 144 = 12x$ — $x = 18$
D) $10x + 300 = 30x$ — $x = 15$
E) $12x + 432 = 36x$ — $x = 18$
F) $6x + 180 = 18x$ — $x = 15$

What is the t-shirt store's profit at the break-even point?

What is the point of intersection of the two li

(15, 225)
(16, 384)
(18, 216)
(15, 450)

Part 2 Complete the table to show the cost of buying t-shirts from the wholesaler and income for different numbers of t-shirts. ~ Version B is shown.

Quantity Name	Number of t-Shirts	Expense (Cost)	Revenue (Income)
Unit	t-Shirts	Dollars	Dollars
Expression	X	y = 8x + 288	y = 24x
	0	288	0
	10	368	240
	30	528	720
	45	648	1080
	70	848	1680
	80	928	1920