

Task: Brandon's Band		Algebra I
<p>Brandon and his band want to record a CD of their music. The recording studio charges \$750.00 for the session and \$3 for each CD. The studio requires that bands spend a minimum amount of \$1200.</p> <p>a.) Write an equation for the cost of the CD's in relation to the number of CD's.</p> <p>b.) Write and solve an equation or inequality that can be used to determine the minimum number of CD's they would need to buy if they only want to spend the minimum amount?</p> <p>c.) The band decides to buy 200 CD's, how much money will they be spending? They are planning on selling them to recoup their expenses at the recording studio as well as make a little profit. What is a reasonable amount of money they should charge for each CD? At that price, how many CD's will they have to sell to recoup their expenses?</p> <p>d.) If the band sells all the CD's at that price, what is the total profit that the band will make (after expenses)?</p>		
<p>Teacher Notes</p>		
<p>Some of the vocabulary embedded in the problem, may pose a problem for students. It would be necessary for students to understand terms such as recoup and profit.</p> <p>The students have the freedom to assign variables for each of the problem. It is important that the students are able to define the variables used throughout the problem.</p>		
Common Core State Standards for Mathematical Content	Common Core State Standards for Mathematical Practice	
<p>A-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</i></p> <p>A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>A-CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. <i>For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.</i></p>	<p>Mathematical Practices</p> <ol style="list-style-type: none"> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. 	

Essential Understandings	
<ul style="list-style-type: none"> • Letters are used in mathematics to represent generalized properties, unknowns in equations, and relationships between quantities. • In mathematical relationships, the value for one quantity depends on the value of the other quantity. • Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found. • Techniques for solving equations, can be applied to solving inequalities, but the direction of the inequality sign needs to be considered when negative numbers are involved. 	
Explore Phase	
Possible Solution Paths	Assessing and Advancing Questions
<p>Part a.)</p> <p>$C = 3N$</p> <p><i>Note: Any variables could be used in this equation. It is important that the students be able to define them.</i></p>	<p>Assessing Questions</p> <p>Can you define what your variables are representing?</p> <p>How does this equation show the relationship between the number of CD's and the cost?</p> <p>What does the 3 represent in your equation?</p> <p>Advancing Questions</p> <p>What would be the cost of 3 CD's? 5 CD's? 20 CD's?</p> <p>Can you make a table or graph to represent this relationship?</p>
<p>Part b.)</p> <p>$3c + 750 = 1200$ (or equivalent representation)</p> $\begin{array}{r} -750 \quad -750 \\ 3c = 450 \\ c = 150 \end{array}$ <p>$750 + 3c \geq 1200$</p> $\begin{array}{r} -750 \quad -750 \\ 3c \geq 450 \\ c \geq 150 \end{array}$	<p>Assessing Questions</p> <p>What does your variable represent?</p> <p>Can you explain all of the components of your equation?</p> <p>What does your answer mean in reference to the problem?</p> <p>Advancing Questions</p> <p>Since you wrote an equation, how would your answer have been different if you had written an inequality? <i>or vice versa</i></p> <p>How many CD's would they have to buy if the minimum charge was only 1000?</p>
<p>Parts c. and d.)</p> <p>$3(200) + 750 = T$</p> <p>$600 + 750 = T$</p> <p>$1350 = T$</p>	<p>Assessing Questions</p> <p>Can you explain how you determined how much money they had to spend at the recording studio to buy 200 CD's?</p> <p>Do you feel that is a reasonable amount to charge for a CD? Why?</p> <p>Can you explain what the variables mean in each of your equations?</p>

The total cost of the recording studio and 200 CD's for the band will be \$1350.

Note: In order to make any profit, the CD's must be sold for more than \$6.75. Some, not all possible solutions are shown below.

If the band decides to sell their CD's for **\$10.00 each**.

$$10c = 1350$$

$$c = 135$$

They would have to sell their 135 CD's to recoup their cost.

$$200 - 135 = 65$$

Therefore the 65 remaining CD's would all be profit.

$$65 (10) = P$$

$$650 = P$$

They would make a profit of \$650.

If the band decides to sell their CD's for **\$15.00 each**.

$$15c = 1350$$

$$c = 90$$

They would have to sell 90 CD's to recoup their cost.

$$200 - 90 = 110$$

Therefore the remaining 110 CD's would all be profit.

$$110 (15) = P$$

$$1650 = P$$

They would make a profit of \$1650.

If the band decides to sell their CD's for **\$20.00 each**.

$$20c = 1350$$

$$c = 67.5$$

They would have to sell 68 CD's to recoup their cost.

$$200 - 68 = 132$$

Therefore the remaining 132 CD's would all be profit.

$$132 (20) = P$$

$$2640 = P$$

They would make a profit of \$2640.

Advancing Questions

What if you lowered the price of each CD by \$1.75? Would you still make a profit? How much?

Combining the recording cost and the cost of the 200 CD's. How much would they have to make on each CD just to break even?

If the band is wanting to make at least a \$2000 profit, could you determine the minimum amount they would need to charge per CD?

Possible Student Misconceptions	
<p>Students may not remember to include the \$750 for the recording studio.</p> <p>Students may not use the information in part c and subtract the number of CD's it takes to recoup their expenses from 200.</p>	<p>Assessing Questions Can you explain to me what the band actually has to pay for?</p> <p>Advancing Questions How could you represent that information in your equation or inequality?</p> <p>Assessing Questions What does profit mean? How would you determine the profit in a business? Can you explain to me your answer from part c?</p> <p>Advancing Questions Is it possible to answer part d without doing part c first? Why or why not? How can we use the information you found in part c, to help us answer part d?</p>
Entry/Extensions	Assessing and Advancing Questions
<p>If students can't get started....</p>	<p>Assessing Questions Can you tell me what the problem is about? If the band was going in to record and only buy 1 CD, how much money would they spend? 2 CD's? 5 CD's? 20 CD's?</p> <p>Advancing Questions Is there a direct relationship between the number of CD's and the cost? How can you represent this using an equation? What would the graph look like?</p>
<p>If students finish early....</p>	<p>Advancing Questions If the band needed to make \$1500 profit from selling CD's, how many CD's should they buy from the studio when they go in to record?</p> <p>If the band decided to charge their closest friends only half price for a CD, how would that affect their profit?</p>

Discuss/Analyze

Whole Group Questions

- What strategies did most of us use to solve this problem? Did anyone else use a different strategy, or can you think of another strategy that we could have used?
- What type of relationship is represented in part a? How would it look if we graphed it?
- Were there any constraints that were given in this task? If so, what?
- There were several different prices that the groups thought were reasonable to charge for a CD. What were some of the factors that went into your group's decision when you set your price? How did the price you charge for the CD affect your profit?
- Can someone share a common mistake that your group made, and how you determined it was wrong?