

Solutions and More Teaching Tools for: “Using Math to Start a Poultry Farm” by Mustafa

(pp. 28-29 of the “Math” issue of *The Change Agent*)

Note for Teachers:

This article and the activities that go with it offer numerous opportunities to students to practice critical thinking and problem-solving, finding evidence in the text, and computational skills. Math and English teachers can co-teach this or teach it independently.

If you are an English teacher...

You can easily use the “Before you read” discussion questions and Question #1 in the “After you read” section. You could also try doing all or part of Question #2. Setting up a spreadsheet is a great way for students to practice organizing information (in this case about income and expenses).

Try additional activities, such as:

1. Ask students to write their own articles about how they would start a poultry farm based on Mustafa’s experience or why they wouldn’t start a poultry farm. (They might make different choices like a different number of chickens, or not going organic.)
2. Students might write a letter to Mustafa, offering him advice about his poultry farm and mentioning details from the article. [See a letter-writing template and model, as well as a grading rubric, on pp. 5-6 of this packet.]
3. Students could speculate on what it would cost to start up their own business of whatever type. This could be a good project for small groups, which they could then present to the class. This activity would include many skills, such as research (about the type of business and the related costs), reading, writing, using a spreadsheet, and preparing a powerpoint or other presentation.



ELA Standards include:

Reading Anchor 1: Read closely; cite textual evidence

Writing Anchor 1: Write an argument using valid reasoning and evidence for claims.

Writing Anchor 6: Use technology to produce and present and to collaborate with others.

Writing Anchors 7 & 8: Conduct research; gather relevant information from multiple sources.

Speaking and Listening Anchor 1: Participate in conversations that build off of others’ ideas.

S&L Anchor 4 & 5: Present information, findings, etc. appropriate for purpose and audience. Use digital media and visual displays of data to express information.

Language Anchors 1-3: Show command of grammar, punctuation, and vocabulary.

continued on next page

If you are a math teacher...

You could treat this as one long word problem! Try reading the text out loud to your students. Ask them to just listen. Then read it again. This time students should circle words they don't know and put a question mark next to phrases or paragraphs they have questions about. After the second reading, go back and teach the unfamiliar words, and get the whole group to respond to any questions that students have.

After students have a good understanding of the text, try the "After you read" questions. Here are the questions, along with possible solutions.

Math skills include:

Arithmetic, algebraic thinking, using fractions, setting up formulas in a spreadsheet, and calculating area.

Solutions to questions:

QUESTION #1. How did Mustafa arrive at the total of \$14,000 to start the poultry farm? Which expenses were one-time expenses and which were repeating?

SOLUTION #1. Here (below) are the expenses in the order that they appear in the text. The last column indicates whether the expense is "1-time" (1) or "repeating" (R). (Note that \$14,000 is a rounded version of his total. Discuss the reasons for rounding.)

| Item | Cost in \$ | 1-Time or Repeat? |
|------------------|---------------|-------------------|
| Replace Fence | 1062 | 1 |
| 100 bags of feed | 3500 | R |
| PVC pipe | 400 | 1 |
| Solar panel | 900 | 1 |
| 500 chickens | 8135 | R |
| TOTAL | 13,997 | |

Find a blank version of this table on this [worksheet](#).

A partial screen shot of one version of a spreadsheet (that could accompany questions #3 and #4). Develop this or something similar with your students. Download the actual spreadsheet [here](#) <changeagent.nelrc.org/wp-content/uploads/2018/09/mustafa-solution-sheet.xls > and adapt it to meet your needs. You can also download this [worksheet](#).

QUESTION #2. How much money does he earn from the farm in five months? How much does it cost him to run the farm for five months? (Assume that a \$35 bag of feed weighs 50 pounds and that a chicken eats 1/4 pound of feed every day.) At his current rate of income and expenses, how long will it take Mustafa to become profitable? If you are missing information to answer this question (such as, how many days are in each month and the hourly rate he pays himself for his labor), make a reasonable guess. Make a spreadsheet to show your work.

SOLUTION #2. You could approach this problem using a paper or digital spreadsheet. The sample spreadsheet we created in Excel is [here](#). (Download it and adapt it as needed.) You decide how simple or complex to make the activity based on your students, the amount of time you have, and your access to computers. Some things to keep in mind when you do the spreadsheet:

continued on next page

- a) We decided to use 30 as the average number of days in a month. Here is another way to do it: Give the months their real names (instead of calling them Month 1, Month 2, etc.), and in that case you know exactly how many days are in each month — which will affect your earnings from selling eggs.
- b) Calculating the cost of the chicken feed could be a whole lesson. See sidebar (right) for some teaching ideas and strategies for finding the solution.
- c) Mustafa doesn't say anything about what he pays for rent! We put it in, and we estimated it at \$1000 per month.
- d) Nor does Mustafa say what he pays himself for his labor. We assumed \$10.20 per hour (which is the Colorado minimum wage in 2018).
- e) Encourage students to experiment and add expense lines, eg., maintenance, insurance, etc.

QUESTION #3. What reasonable changes could he make to bring in more revenue in less time? Show the changes in your spreadsheet.

SOLUTION #3. Answers will vary. Some possibilities include: paying himself less, delaying or reducing loan repayment amounts, buying more chickens, etc.

QUESTION #4. How much could he reasonably pay back to his uncle each month? Assuming his uncle is not charging interest, how long would it take him to pay off the \$14,000 loan?

SOLUTION #4. In our scenario, we have Mustafa paying his uncle \$1000 per month starting on Month 3 and ending on Month 16. There are many other conceivable scenarios. You could add a complication here by changing the assumption about interest! You'll have to guess what the interest rate might be and whether it compounds annually. (That would be a fun formula to create and work with!)

Find the Cost of Chicken Feed

Start by asking students what they know and what they want to find out.

Here's what they know:

- the cost of one bag of feed (\$35)
- the amount of feed per bag (50lbs)
- the amount a chicken eats per day ($\frac{1}{4}$ lb)
- the total number of chickens (500)
- the number of days in a month (avg.: 30)

Here's what they want to find out:

- How much it costs to feed 500 chickens per month.

At this point, you could ask students to brainstorm strategies for how to solve the problem. Here is one helpful approach:

- Use simple versions of the numbers so that you can see the relationships. For example, if the bag weighed 10 pounds and chickens at a $\frac{1}{4}$ lb of feed per day, how many chickens would one bag feed per day? Some students would be able to say that a 10-pound bag would feed 40 chickens. Ask them how they got that. Ask them to transfer that thinking to the harder number in Mustafa's situation. Continue solving the problem, possibly modeling with easier numbers.

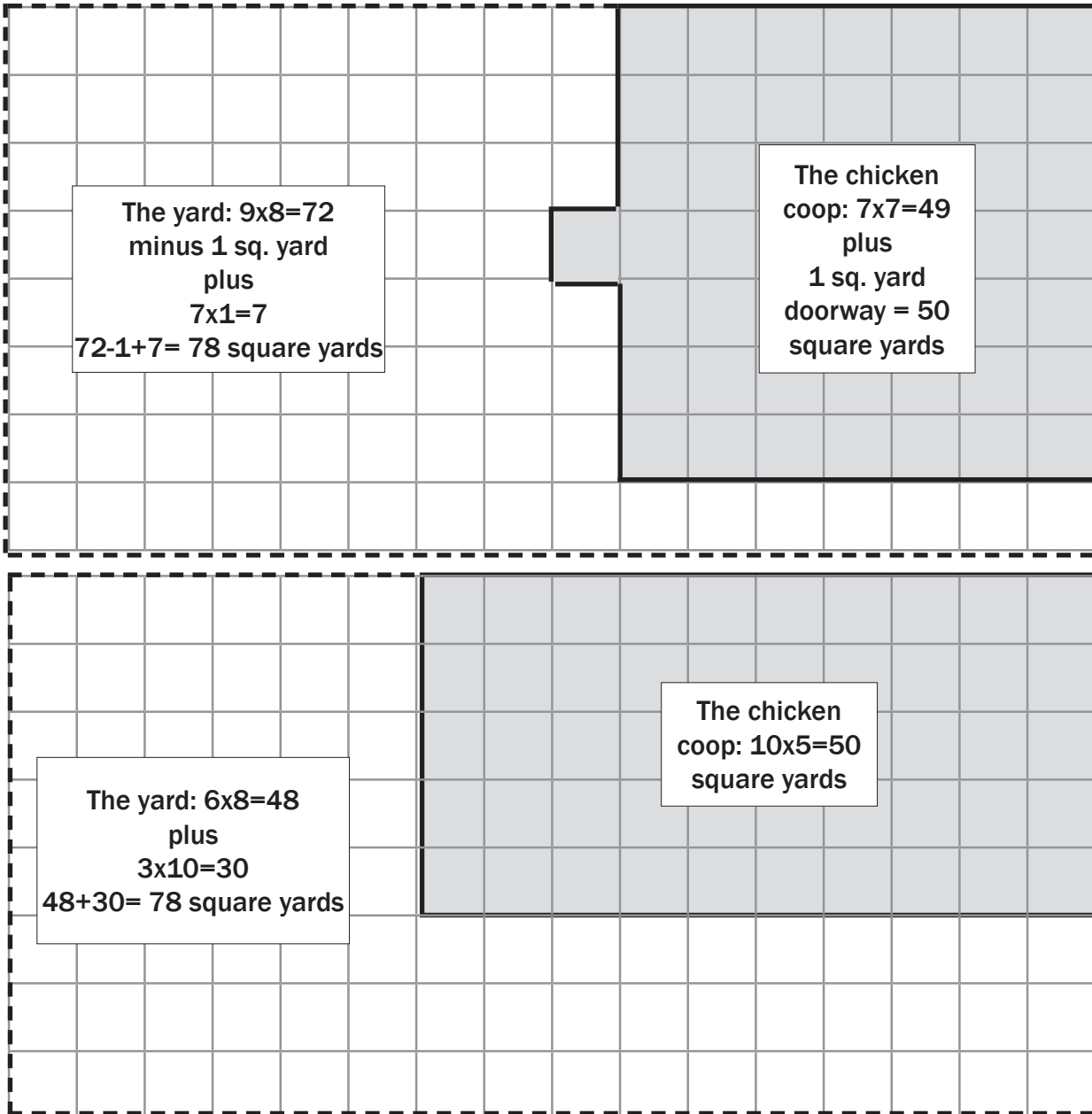
At some point, your steps might look something like this:

- $50 / .25 = 200$ (so one bag feeds 200 chickens)
- $500 / 200 = 2.5$ (so you need 2.5 bags per day of chicken feed)
- $2.5 \times \$35 = \87.5 (amount it costs per day to feed the chickens)
- $\$87.5 \times 30 = \2625 (amount it costs per month to feed the chickens)

QUESTION #5. Find the total square yards that Mustafa has for 500 chickens. Diagram the indoor & outdoor spaces. (Diagrams may vary.) On average, how many chickens fit in each square yard?

SOLUTION #5. Below are two (of possibly many) diagrams. To find the average number of chickens that would fit in each square yard, divide the total number of chickens (500) by the total square yards (128). You get 3.9 chickens per square yard.

Plot Out the Poultry Farm: Two Possible Answers



Find a blank version of this table on this [worksheet](#).

Letter-Writing Template and Model

Share either or both of these with students. Share the rubric on the next page.

As a practice, use the rubric to “grade” the model.

Template:

| | |
|--|--------------|
| | Today's Date |
| Name | |
| Address | |
| City, State, Zip | |
| Salutation, | |
| Indented body paragraph #1 – should include a few sentences. In the first paragraph you should introduce yourself and say why you are writing. | |
| Indented body paragraph #2 – should include a few sentences. The second paragraph should include more substance and details about why you are writing. | |
| Indented body paragraph #3 – should include a few sentences. The third paragraph should conclude the letter and perhaps say something about next steps if appropriate. | |
| Sincerely, | |
| [<i>your signature here</i>] | |
| Your name | |
| Address | |
| City, State, Zip | |

Model:

| | |
|--|-----------------|
| | August 31, 2018 |
| Mustafa | |
| c/o The Change Agent | |
| 44 Farnsworth St. | |
| Boston, MA 02210 | |
| Dear Mustafa, | |
| I am the editor of <i>The Change Agent</i> , and it was a pleasure to include your very interesting article in our Math issue. I am writing now to give you some advice. Granted, I know almost nothing about poultry farming, but I have some advice for you anyway: look for another career! | |
| Being a poultry farmer seems like very hard work, and after reading your article, I can't tell if you even get paid for your labor. I did some research, and I found out that predators are a real problem. I know you and your friend built a fence, but I bet you still have to worry about hawks and foxes and snakes getting into your chicken coop. Also, you might get attached to some of the chickens, but then you have to send them to a slaughterhouse! Yuck! | |
| I know there is probably a good side to it, too. For example, you get to be your own boss. You seem like a smart and thoughtful person. But after reading your article and doing some research, I would advise you to sell the farm and find another kind of work! | |
| Sincerely, | |
| <i>Cynthia</i> | |
| Cynthia Peters | |
| 44 Farnsworth St. | |
| Boston, MA 02210 | |

Letter Writing Rubric

This rubric will be used to grade your letter. Study the rubric to see what the teacher will be looking for when he or she grades your letter. After you get your grade, re-write your letter and see where you can increase your points.

| | 4 points | 3 points | 2 points | 1 point | TOTAL |
|--------------|---|--|---|---|--------------|
| Letter parts | Includes: 1) date, 2) recipient’s address, 3) salutation, 4) three body paragraphs, 5) your signature, 6) your address | Has four out of the six letter parts | Has three of the seven letter parts. | Has two or fewer letter parts. | |
| Presentation | Margins are present. Neatly written or typed. | Margins are not consistent. Neatly written or typed. | Margins are not consistent. Unevenly written or typed. | Margins are not present. Handwriting or typing interferes with readability. | |
| Conventions | Excellent punctuation, spelling, and grammar with fewer than three errors. | Very good punctuation, spelling, and grammar with fewer than five errors. | Punctuation, spelling, and grammar slightly distract the reader and interfere with meaning. There are ten errors or less. | Punctuation, spelling, and grammar significantly distract the reader. There are more than ten errors. | |
| Content | Your message is clear and precise. Your letter is three or more paragraphs and includes details. Your letter encourages a response from the reader. | Your message is clear and demonstrates understanding. Your letter contains only two paragraphs. Your letter does not encourage a response from the reader. | Your message is mostly clear. Your letter is only one paragraph in length. | Your message is unclear or disorganized. | |
| Voice | Your voice is strong, clear, and passionate. You show that you care about the issue. | Your voice is strong but not very passionate. | Your voice is not very passionate | Your voice is weak. | |
| TOTAL | | | | | |