



Learning Project 4 Algebra/Using Equations

Inquiry Activity 4-1: Solving an Equation

(Note: *Italicized portions should be directed to students.*)

1. Identifying the Problem (Item #19 - Alternate Question, PA) Calculator not allowed.

(Teacher directed)

Read the question carefully, as you would if taking the actual test.

19. To rent a ball field for a game costs a \$300 basic fee plus a \$2 fee per person.

This cost structure is described by the equation, $2x + 300 = T$, where T represents the total cost and x is the number of people attending the game. If the total cost for renting the field was \$550, how many people attended the game?

Mark your answer in the circles in the grid. (The instructor should be prepared to handout an answer grid for this Inquiry Activity)

**Calculator
NOT Allowed**



Here are some problem clarification questions you may want to consider when reading test questions.

What words and/or symbols might be important to understand to answer this problem and what are they telling you?

What words and/or symbols are unfamiliar and what do you think they mean?

2. Becoming Familiar with the Problem

On your own, ask yourself questions like these about the problem, taking note of the ones that were especially helpful so that you can remember to use them when you take the test.

Re-read the question.

What is it asking you to find in this version?

What information is relevant to what you need to find?

What do you know about this?

3. Planning, Assigning and Performing Tasks

Try to answer the test question any way you can, on your own, even if you have to guess, but try to be aware of the reasoning and operations that you are using. The following questions can be helpful.

What is the problem asking you to do? Bring things together, separate things, or compare things?

Since you already know the total, this problem is asking you to separate.

Find an answer, work out the problem any way you can, but remember the steps that you took.

Is your answer reasonable? (Check it by substituting your answer for x .)

Be ready to defend your answer and the way that you found it.

4. Sharing with Others

Telling other people what you know helps you to understand the material better. So take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare your answer to others in the group and explain why and how you found it and why you think yours is correct.*

Some students may “puzzle it out” by subtracting 300 from 550 and dividing the answer by 2. Tell them to “hold this thought” until we get to the Reflection section, where we will build on this concept. The formal algebraic procedures are not expected.

Agree on the correct answer choice and be ready to explain the step-by-step process that makes the most sense to you.

Most students are likely to talk about two steps:

Step 1 is to subtract 300 from 550 to get 250.

Step 2 is to divide that answer, 250, by 2 to get 125.

Using several answer grids, bubble in the answer in as many ways as you can.

Instructor- hand out blank grids.

Whole groups: *Report your answer choice and the different processes your small group members used to find this answer.*

Ask another member to report on the various ways the answer can be written in the standard grid.

5. Reflecting, Extending and Evaluating

Reflecting: *Think about what you learned. (A group or instructor led.)*

Here are some questions to start you thinking about the experience you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

The aim of the following questions is to lead the students to discover that the steps they took when they puzzled out the answer are the opposite or inverse of the steps that are indicated in the equation that was included.

Remembering what you learned in the previous Learning Project, tell in your own words what the left side of the equation $2x + 300 = 550$ tells you to do mathematically.

Note that 550 has been substituted for T in the equation because it was given in the problem. It says to multiply x (the number of people) by 2 and then add 300.

Look back at the operations you used in the steps you recommended when you found the answer. How do those operations compare to the operations that are indicated in the equation?

Subtraction and division were used, whereas addition and multiplication were indicated in the original equation. Not only are they opposite operations, but they are done in the opposite order.

Now let's look at a simpler example: If you had 100 apples and had to divide them among 50 children, what operation would you use to decide how many apples each child receives?

Division : $100 \div 50$

...and how would you check your answer?

Multiply $2 \times 50 = 100$.



How is this simple example similar to how you have worked this problem?

In this problem, they subtracted and then divided to find the answer. However, when they checked to see if the answer made the equation true ($2(125) + 300$ does equal 550) they multiplied and then added. The property of inverse operations, or “undoing” can be discussed at this point. Addition undoes subtraction, and multiplication “undoes” division, etc. Math is very neat and the pieces fit together perfectly, when you can reason it out. Another point the students may bring up is that difficult problems are often easier to understand when students can substitute very easy numbers and work them as they would in everyday situations.

Extending: *Extend what you learned to new situations.*

In extending, you are being asked to transfer the information presented in the Practice Test question to other information or situations you already know and maybe make new connections to other information.

These exercises reinforce the idea of opposite operations but also use the idea of checking their answers to show that when you solve an equation you find the number that makes it true.

Small groups:

In the problems that follow, x represents an unknown number. Try to solve these problems in your head without using a pencil if you can. Then, discuss how your mental math involved undoing the operations (using its opposite or inverse).

- a) $x - 6 = 2$
- b) $30 - x = 10$
- c) $50 + x = 75$
- d) $x + 20 = 90$
- e) $5x = 15$
- f) $100 \div x = 25$

Now, write the mathematical sentence for how you solved them and then show that the answer you found made the original equation true. Share your reasoning with the whole group.

- a) $x = 8$: by thinking $2 + 6 = 8$ and checked by $8 - 6 = 2$
- b) $x = 20$: by thinking $10 + 20 = 30$ and checked by $30 - 20 = 10$
- c) $x = 25$: by thinking $75 - 50 = 25$ and checked by $50 + 25 = 75$
- d) $x = 70$: by thinking $90 - 20 = 70$ and checked by $70 + 20 = 90$
- e) $x = 3$: by thinking $15 \div 5 = 3$ and checked by $5(3) = 15$
- f) $x = 4$: by thinking $25 \times 4 = 100$ and checked by $100 \div 4 = 25$

Share and compare the answers you came up with, in your small group, or with the whole group.

Evaluating: *Assess what you learned and how you learned it.*

In this last step, you get a chance to review the content of what you learned and the methods used to learn. There are no right or wrong answers to these questions; it is your chance to look more closely at your learning style and the opportunity to state how you benefited or didn't benefit from the content and/or the methods to help you pass the GED test.

How do you think understanding inverse operations could help you in everyday life? On the job? (Think about the apples and children example.)

For most people, adding and multiplying continue to be easier than subtracting and dividing. By using the idea of opposite operations and “fact families,” they can turn difficult problems into easier ones.

If you want it, ask your instructor to recommend some practice algebra equations for you to solve.

Does algebra seem less mysterious now, and more practical or logical? If so, why?

If not, listen to others' answers and discuss as a group.