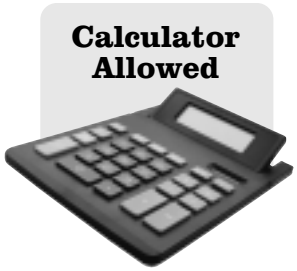
Learning Project 3 Algebra/Using a Variable

Inquiry Activity 3-3: Variables and Measurement

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

1. Identifying the Problem (Item #11, PA) Calculator allowed (Teacher directed)

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



11. The dimensions of the rectangle shown below are 2x and 3x

How many square units are in its area?

1) 12
2) 5x
3) 10x
4) $5x^2$
5) $6x^2$

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

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.

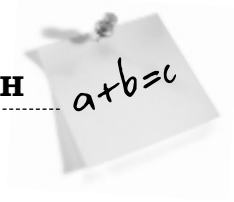
Re-read the question. What is it asking you to find?

What do I know about this? (Finding area of a rectangle? What to do with the 'x'? The meaning of the little 2?)

Sketch a picture of what is going on. (Divide the rectangle into square units and label them.)

3. Planning, Assigning and Performing Tasks

Try to answer the test question any way you can, 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.



Substitute an easy number for x to figure out the relationship. (For example, if x were 5, how would you find the area?)

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

If they drew sketches, dividing the rectangle into squares is separating but the final step is to bring the two rows of squares (the area of each is x^2) together. 2 X 3(x^2)

Find an answer.

Is your answer reasonable? (Check it by using x = 5 again.)

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.*

Discuss the sketches that were made by individuals in your group. How are they alike or different? Did they all logically lead to the same answer?

Agree on the correct answer and the steps you would recommend for solving this problem. Write them as step1, step 2, etc.

Write a mathematical expression that shows what your group did to find the correct answer.

Whole class: *Report to the class the sketches you drew, the steps you decided on to answer this question, and the mathematical expression that summarizes them.*

For those groups who used the area formula, listen for their explanation of why the answer included an x^2. This will likely be a topic for the reflection step.

Take notes on any different ways that others used to find the answer.

For discussion purposes, we hope that some groups reasoned out the answer without just plugging the numbers into the formula. Since the correct answer choice is the only one with a 6, some may have just made the choice based on that alone. (A curse on multiple-choice!)

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.

Refer both to the geometry and the algebra of this item even though you will be repeating the geometry emphasis in the geometry LP on areas and perimeters. Throughout this discussion you should stress the importance of understanding the basis of a formula before using it. The sketches that were drawn will provide the starting point. This is a critical phase. Start with the idea that area is surface and is measured using square units. Visualizing the rows and columns of squares provides a touchstone for understanding what multiplication does and why you multiply the length by the width when finding the area of a rectangle. Choose questions like the ones below that will clarify and amplify what the students have contributed already.

Study the different sketches that students drew. How has the variable x been used? What does x^2 mean in the answer? If x was not used in the sketch, how could it have been used? Show that your answers make sense if x = 5.

We would like the students to conclude that each square unit that they have drawn is x units wide and x units long, and thus has an area of x^2, or x X x, square units.

Compare the procedure that is suggested by your sketches to the formula for the area of a rectangle that is found on the formulas page that will be included in every GED math test. Now use the formula (substituting 3x and 2x for length and width) to find the answer. Explain what x^2 means mathematically. Check your explanation of the notation with what you can find in a textbook. Note any new vocabulary.

A strict mathematical procedure would start with (3)(x)(2)(x), considering each factor separately. Because these are all being multiplied and multiplication is commutative, you can rearrange them into (3)(2)(x)(x). Next you would multiply the numbers to get 6 and the variables to get x^2. Help your students to see that the sketch procedure actually explained what the algebra of multiplying variables means.

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 making new connections to other information.

You could ask and discuss, "What if they had asked for the perimeter of the rectangle?" here or in the geometry Learning Project. If a student brings it up here, go ahead, but we suggest that you save it for later. Focus on the algebra ideas that surface here.

In this item, you learned what x^2 means. What would the value of each of the following expressions be if x = 4?

a) x^2
b) $5x^2$
c) $(5x)^2$
d) $2x^2 + 7$
e) $(2x)^2 + 7$

Answers for instructors:
a) 4 x 4= 16
b) 5 x 16 = 80
c) 20 x 20 = 400
d) 2 x 16+7 = 39
e) 8 x 8+7 = 71

Look in the available mathematics textbooks to find out what x^3 means. Then look up the formula for the volume of a cube on the formulas page provided with the GED test. How would you find the volume of a cube whose edges are 6 inches long?

6x6x6 = 216 cu in

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.

Compare your feelings about algebra now to the way you felt about it before this Learning Project.

What strengths of mine were apparent during this project?

What more would you like to know about equations, math symbols, etc.?

Do you need more practice in any of the math discussed in this Learning Project?