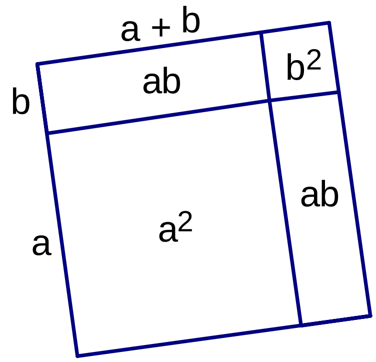
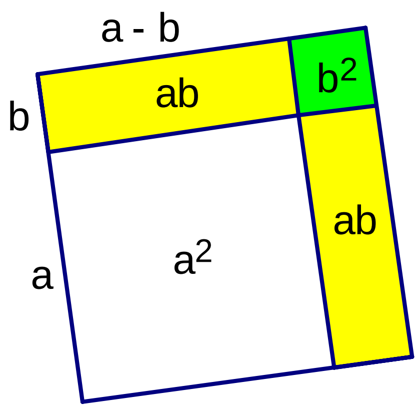
Describe an activity that could be used to show $(a + b)^2 = (a + b)(a + b)$.

Solution: Answers will vary but should look something like:



Describe an activity that could be used to show $(a - b)^2 = (a - b)(a + b)$.

Solution: Answers will vary but should look something like:



Create a paper set of manipulatives including units, xs, and x^2s. Do an example like $5(2x^2 + 3x + 4)$ using the manipulatives. Describe your thoughts and reactions to the manipulation in light of thinking about how this could help students understand the operation.

Solution: Answers will vary. For the product $5(2x^2 + 3x + 4)$, there would be 10 big squares, 15 rectangles that are x by 1, and 20 little squares. There should be no trading rectangles for big squares or little squares for rectangles.

Create a partial product explanation of the product of two binomials.

Solution: Answers will vary, but should look something like:

$x + 3$
$\underline{2x + 4}$
12 from 4×3
$4x$ from $4 \times x$
$6x$ from $2x \times 3$
$\underline{x^2\quad\quad}$ from $x \times x$

$$x^2 + 4x + 6x + 12 \text{ or } x^2 + 10x + 12$$

Find at least one situation where algebra is used in a daily-life application and describe how it could be used to answer the typical student question "When am I ever going to use this?"

Solution: Answers will vary.

In a setting like x^n, x is defined as the base and n is the exponent that "shows how many times x is used as a factor." One question that should be asked eventually about the definition is, "What if the exponent is 0.5? How do we write x as a factor 0.5 times?" Describe how you would explain this to a beginning algebra class.

Solution: Answers will vary. One point in the discussion is that the definition will need to be altered.

Is there a need to discuss implicit multiplication versus non-implicit multiplication in beginning algebra? Why or why not?

Solution: Answers will vary. Implicit multiplication needs to be discussed if technology is being used since most technologies will demand that 4x be expressed by (4)(x) or 4*x.

Is there a need to discuss the idea that x really means (1)(x) in beginning algebra? Why or why not?

Solution: Yes. Furthermore, in initial examples, it would be best to avoid x and use 2x or 3x until the student is comfortable with the idea of a variable having a coefficient. Then it would make sense to us x, which implies a coefficient of 1.

It is proper to say the distributive property (law) of multiplication over addition (subtraction) on the set of integers. Without the set and operation, we don't know much about what works and what does not. Yet we say distributive property and go on. How do we justify precision of language at some times and not at others?

Solution: It is difficult to justify sloppy language use.

Student ability to solve equations involving factoring skills is often weak. Couple that with the idea that students often do not understand the zeros of a function, the role of a graph of the equation, or why they are solving the equation. How should you deal with these problems in a beginning algebra class?

Solution: answers will vary. It seems advisable to begin with graphs and point out the matters involved.

How much geometry should be presented in beginning algebra? Defend your response.

Solution: Answers will vary. Howard Eves and Peter Hilton, both world class mathematicians have said that algebra without geometry would leave a lot of questions unanswered and geometry without algebra would leave a lot of questions unasked.

Should writing skills be covered in algebra? For example: Pretend you are an irrational number. You are about to see an old school friend you have not seen for many years. Write a letter describing yourself so you will be easy to spot.

Solution: Yes. Communication of what is known is critical. Writing skills will help that position. Furthermore, this is an opportunity to integrate curriculum.

The calculator has brought to light that our emphasis has been on teaching rules and mechanics. Now we have tools to do the mechanics. So, the questions are, “Why do we teach algebra?” And, “What should we teach in algebra?” Should we focus on mechanics or concepts and applications? How would you answer those questions?

Solution: Mechanics are important and students do need to know how to do operations by hand. But, there is a point beyond which handwork seems excessive and technology should be permitted. Given that the Advanced Placement examinations assume student familiarity with the graphing calculator, it seems irresponsible to not integrate technology into the curriculum early on. The complexities of a graphing calculator cannot be mastered without extensive exposure. Without familiarity with a graphing calculator, the students will be at a disadvantage.

Resources

Brumbaugh, D. K., Ortiz, E., Gresham, G. (2006). *Teaching Middle School Mathematics*. Mahwah, NJ: Lawrence Erlbaum Associates.

Brumbaugh, D., Rock, D. (2006 (3rd Ed.). *Teaching Secondary Mathematics*. Mahwah, NJ: Lawrence Erlbaum Associates.

Brumbaugh, D., Rock, D. (2001). *Scratch Your Brain C1*. Pacific Grove, CA: Critical Thinking Books and Software.