#9931
FACTORING IS FANTASTIC: PART ONE--COMMON FACTORS

BENCHMARK MEDIA, 2002
Grade Level: 6-12
19 mins.

DESCRIPTION

Demonstrates how to factor algebraic expressions. Uses simple examples and the "factor tree" to show how to find the common factor, or part. Gives five factoring problems and their answers.

ACADEMIC STANDARDS

Subject Area: Mathematics

- Standard: Understands and applies basic and advanced properties of functions and algebra
  - Benchmark: Knows that an expression is a mathematical statement using numbers and symbols to represent relationships and real-world situations (e.g., equations and inequalities with or without variables) (See INSTRUCTIONAL GOALS 1 and 5.)

- Standard: Understands and applies basic and advanced properties of the concepts of numbers
  - Benchmark: Uses number theory concepts (e.g., divisibility and remainders, factors, multiples, prime, relatively prime) to solve problems (See INSTRUCTIONAL GOALS 2, 3, and 4.)

INSTRUCTIONAL GOALS

1. To define the terms *factor* and *expression*.
2. To explain how to factor numbers and use a factor tree model to find prime factors.
3. To show how to find the greatest common factor (GCF).
4. To explain how to factor expressions.
5. To illustrate how to write expressions as factored expressions or in expanded form.

BACKGROUND INFORMATION

The factoring of polynomials is closely connected both with the simplification of expressions and with solving equations. When we want to find the least common denominator of a fraction, we must factor numbers. The same procedure is used for algebraic expressions. At the same time, it is much easier to find the roots of a polynomial when it is written in factored form. That makes factoring one of the most valuable parts of algebra.

VOCABULARY

1. algebra
2. common factor
3. divide
4. expanded form
5. expression
6. factor
7. greatest common factor
8. ingredient
9. multiply
10. negative
11. parentheses
12. reverse
13. sign (+/−)

BEFORE SHOWING

1. Review writing formulas in a variety of ways (e.g., $x^2 − 6x + 5 = 6x + x^2 + 5 = 5 + 6x + x^2$, etc.). Explain that this video will show another important way of representing expressions.
2. Discuss various types of equations. Recall how to solve linear equations. Explain that more challenging equations can appear in economics, in technology, etc.
3. How can we solve equations such as: $x^2 − 3x + 2 = 0$ or $x^3 − 4x = 0$?
4. Factoring as explained in this video will help to answer questions like this.
5. Explain that there will be problems to solve throughout the video, so paper and pencil will be necessary.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause to allow students time to complete the problems shown on the screen. Discuss solutions then check the answers by continuing the video.
3. Additional pauses may be desired to review content after presentation of particular concepts.

AFTER SHOWING

Discussion Items and Questions

1. Define the terms *expression* and *factor*.
2. Discuss how to find the factors of a number.
3. What does the term *greatest common factor* (GCF) mean?
4. Describe a factor tree.
5. What are *prime factors*? How can you use common prime factors to find the GCF?
6. Explain how to factor an expression. Where does the GCF go? What goes inside the parentheses?
7. What is the expanded form of an expression?

Applications and Activities

1. Locate number factoring problems in a text book or on the Internet. Practice factoring numbers and locating the greatest common factor using a factor tree. Examples are:

   a. Is the number 3 a factor of 10, 12, or 13?
   b. Name all the factors of the numbers 12, 13, and 28.
   c. Name all prime numbers among the following: 2, 7, 12, 4, 13, 17, and 62.
   d. Write the numbers 8, 26, and 500 in a completely factored form.
   e. Find the GCF of the numbers 9 and 33. Of 60 and 24.

2. Review the factoring of expressions practice problems from the video. Solve any lingering questions. Practice additional similar problems.
   a. $6x + 12$
   b. $4t + 12$
   c. $25 - 15c$
   d. $2x^2 + 3x$
   e. $-x^2 - 4x$
   f. $4xy - 3x + 2x^2$

3. Check to see whether the following expressions are factored correctly:
   a. $(x^2 + x) = x(1 + x)$
   b. $(6 - 2b) = 3(2 - b)$
   c. $2y^2 - 4y + yp = 2y(y - 2y + p)$

4. Working in pairs, write examples of expressions that can not be factored.

SUMMARY

The factoring of polynomials is the key concept explained in the video. At first, the concept of factoring is demonstrated by labeling as "factors" the separate ingredients in a milkshake and those in a sandwich. Their one common ingredient, a banana, becomes their "common factor." Terms and expressions are defined. The factoring of whole numbers is discussed, the concept of prime numbers–numbers different from 1 and having no other factors except 1 and themselves–is reviewed, and then prime factorization with the help of a factor tree is explained. The process of factoring algebraic terms is demonstrated. Some examples of finding common factors and the greatest common factors of several terms are given. Calculations are shown which change factored expressions back into their original expanded forms. Other kinds of expressions are factored (expressions that are sums or differences of terms with common factors). The video ends by posing the question: how can we factor the polynomial $x^2 - 5x + 6$? That question will be answered in the video which is the sequel to this one, *Factoring is Fantastic: Part Two–Quadratic Trinomials*, CMP #9932.

RELATED RESOURCES

- *Algebra: The Quadratic Formula #9751*
- *Factoring is Fantastic: Part Two–Quadratic Trinomials #9932*
- *Quadratics: Factoring Quadratics #3404*

World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

- **MATH FORUM: ASK DR. MATH**

http://forum.swarthmore.edu/dr.math/

"Ask Dr. Math" allows users to e-mail questions to Dr. Math and access archived material. By choosing "Middle School" and then "Factoring Expressions," you can find choices of materials that relate to the video.

- **FACTOR TREE**

http://matti.usu.edu/nlvm/nav/frames_asid_202_g_3_t_1.html

Practice factoring numbers and finding the common factors with this interactive factor tree Web page.

- **FACTORING EXPRESSIONS**

http://www.marlboro.edu/academics/study/mathematics/courses/factoring.html

Although the format of the work is slightly different, this Web site offers a good explanation of factoring expressions, gives several solved examples, and then provides a number of practice problems.