



Math Journaling: A Way to Make Math Make Sense

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Initiative

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Lesson 1: Identifying Factors

Desired Outcomes

- Students will identify the factors of a variety of whole numbers.
- Students will identify the greatest common factor of pairs of numbers.
- Students will describe factors verbally and in writing.

Teacher Information

Factors and multiples, including the greatest common factors (GCF) and least common multiples (LCM), are investigated in the first few lessons of this module. In Lesson 1, students use their knowledge of divisibility rules to identify factors of numbers. They represent the factors of pairs of numbers in Venn diagrams.

The Student Record Book, Developing Number Concepts: Values and Variables, Module B, is introduced in this lesson. The Student Record Book is intended to provide reflective and connected practice opportunities. An answer key for the Student Record Book pages is located at the end of each lesson.

Reflective Practice provides opportunities for students to solve a variety of problems in such a way that they are encouraged to think about their own learning. Connected Practice ensures that there are opportunities for connections among concepts, facts, and procedures; to other curriculum areas; and to everyday life. This practice provides opportunities for students to make coherent and meaningful connections among mathematical ideas.

Teacher Preparation

- On a sheet of newsprint, prepare a chart with the title “Identifying Factors.” This chart will be used again in Lesson 2.
- Assemble for distribution: Student Record Books and Bright Idea Pens.

Materials

For the class

1 sheet of newsprint
1 black marker w/eraser
Bright Idea Marker w/Eraser

For each student

Student Record Book
Bright Idea Pen



Vocabulary

Composite number:

A positive integer that has more than two factors.

Factor: A number that is multiplied by another number.

Prime number: A positive integer that has exactly two factors, 1 and itself.

Product: The result of multiplication.

Venn diagram: A diagram that uses circles to represent sets and their relationships.

Procedure for the Lesson

Engage



Discussing Numbers

1. Display the chart entitled "Identifying Factors." List the following words on the chart: factor, product, multiple, and divisibility.
2. Arrange the students to work in groups of four. Direct the students in each group to tell each other what they know about the meanings of the words in the list.
3. After the students discuss the words, ask,
What do you remember about factors and products from multiplication?
What do you remember about determining multiples when counting by 3s, or another number?
What do you remember about rules for divisibility, such as whether a number can be divided by 2?
4. Explain that this lesson will be about identifying factors for a variety of numbers.

Investigate

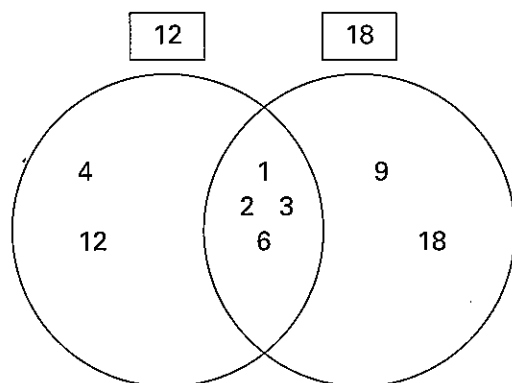


Identifying Factors

1. Draw a Venn diagram on the chart and label the circles "12" and "18." Direct the students to discuss the use of divisibility rules to determine the factors of 12 and 18. Ask,
Which divisibility rules are helpful with determining factors of 12 and 18?
Are there any other factors that can be multiplied together to equal 12 or 18?
2. As the students explain their way of determining factors, summarize the ideas on the chart. Write the factors on the Venn diagram, writing any common factors in the intersection of the circles. Explain that the factors should represent all of the factors including 1 and the number itself, not just the prime factors.



Identifying Factors



Because the numbers are even, they both can be divided by 2. When dividing 12 by 2, the other factor is 6. When dividing 18 by 2, the other factor is 9.

Since the digits of both numbers add up to multiples of 3, they are both divisible by 3. When dividing 12 by 3, the other factor is 4. When dividing 18 by 3, the other factor is 6.

Since both numbers can be divided by 2 and 3, they are both divisible by 6.

Each number is divisible by 1 and itself.

3. Lead a discussion to compare the factors of 12 and 18. Ask,
What can be said about the factors of 12?
What can be said about the factors of 18?
What similarities and differences can be observed in the factors?
Which factors are prime numbers and which are composite?
4. Explain to students that the factors that are in the intersection are called the common factors of 12 and 18. Ask,
What is the greatest common factor of the pair of numbers? How do you know?
5. Distribute a Student Record Book and a Bright Idea Pen to each student. Have the students locate the Reflective Practice for Lesson 1 in their Student Record Books. Explain that the factors for each pair of numbers will be represented on the Venn diagrams with the greatest common factor circled.



6. Direct the students to show the factors for the first two numbers, 30 and 45. After the students have shown the factors in the Venn diagrams, lead a discussion to share the different ways that were used to determine the factors and summarize the ideas on the chart. Ask,

What was your way of determining the factors?

Did anyone have another way?

Does anyone have a question about determining all of the factors of a number?

Strategies for Determining Factors

First, I placed 1 in the intersection and the numbers themselves in their circles. Next, I thought about divisibility. I started by testing each counting number in sequence. Does 2 divide into 30 or 45? Does 3? Does 4? I found that one or both of the numbers are divisible by 2, 3, and 5. The factors exclusive to 30 are 2, 6, 10, and 30. The factors exclusive to 45 are 9 and 45. The common factors are 1, 3, 5, and 15. The greatest common factor (GCF) is 15.

I started from 1 and analyzed whether it was a factor of either or both numbers. I went on and analyzed 2, 3, 4, 5, 6, 7, 8, 9, and 10. As I analyzed, I wrote the factors in the appropriate spaces of the Venn diagram. I kept counting mentally from 11 to 45 to verify that I had not missed any factors for either number.

Teacher as Facilitator

When students work together in small groups, teachers have an opportunity to listen to discussions, guide with questions and feedback, and assess progress. Keeping anecdotal records during this time is a formative assessment tool.

7. Direct the students to complete the remaining Venn diagrams. As the students work, ask questions such as the following: *How are you determining the factors for that number? How can the greatest common factor be identified? In what way does a Venn diagram aid in comparing factors?*
8. After a reasonable amount of time, arrange the students to work in pairs. Direct each pair to compare their findings about the factors and work together to explain a way to determine the greatest common factor of any pair of numbers.



Reflect



Sharing Strategies

1. Have the students name the factors and the greatest common factor for each pair of numbers. Lead a discussion to address any differences in the solutions. Ask,
Is there anyone who has any different factors for that pair of numbers?
Does anyone have a question or comment about any of the factors?
2. Select several pairs of students to share their strategies for determining the greatest common factor of any number. Ask,
Does anyone have another way to determine the greatest common factor of a set of numbers?
Are there any questions or comments about determining the greatest common factors?
What is a description of a greatest common factor of two or more numbers?
3. Give the students an opportunity to make changes in their work with the Bright Idea Pens after hearing the ideas of others.

Bright Idea Marker and Bright Idea Pen

The Bright Idea Marker and the Bright Idea Pen are intended to help students realize that ideas can change throughout the learning cycle. The teacher uses the Bright Idea Marker on class charts to demonstrate continued learning. Students use the Bright Idea Pens to show changes and to add new ideas in their math writing. **Since the Bright Idea Pens will be used throughout the lessons, decide on a management plan for them.**



Apply



Making Connections

The following activities can be used with whole groups, small groups, or individuals, depending on the needs of your students. The activities connect to past and future learning.

Identifying Factors

Have each pair of students prepare a set of 10 numbers written on squares of notebook paper, or other available paper. Examples of numbers to include are as follows: 45, 60, 75, 81, 96, 100, 103, 123, 138, and 192. Direct each student to select a number and list its factors. Next, the factors of the pairs of numbers should be compared and the greatest common factor identified.

Connected Practice

Have the students locate the Connected Practice for Lesson 1 in their Student Record Books. Direct the students to use their knowledge of factors and multiples to answer the questions.

Perfect, Deficient, and Abundant Numbers

Arrange the students to work in groups of four. Explain that mathematicians in ancient Greece classified numbers by their factors. They used proper factors, or the factors of a number other than the number itself. Define and provide examples of perfect, deficient, and abundant numbers. Direct the students to work together in their groups to identify numbers of each type. Give the students an opportunity to share their findings with the group.

The sum of the proper factors of perfect numbers equal the number. For example, $6 = 1 + 2 + 3$. Only a few perfect numbers have been identified. The second perfect number is 28.

The sum of the proper factors of deficient numbers are less than the number. For example, 10 is deficient because $1 + 2 + 5 = 8$, or less than 10.

The sum of the proper factors of abundant numbers are greater than the number. For example, 12 is abundant because $1 + 2 + 3 + 4 + 6 = 16$, or greater than 12.



Assessment

- Are students able to identify the factors of a variety of whole numbers?
- Are students able to identify the greatest common factor of pairs of numbers?
- Are students able to describe factors verbally and in writing?

Information can be gathered from

Class Discussion

Teacher Observation

Individual and Group Questioning

Discussing Numbers

Identifying Factors

Sharing Strategies

Student Record Book

Making Connections

Teacher Reflection

What did I learn about my students as they listed factors and represented them in Venn diagrams?

What did my students learn as they shared strategies for determining greatest common factors?



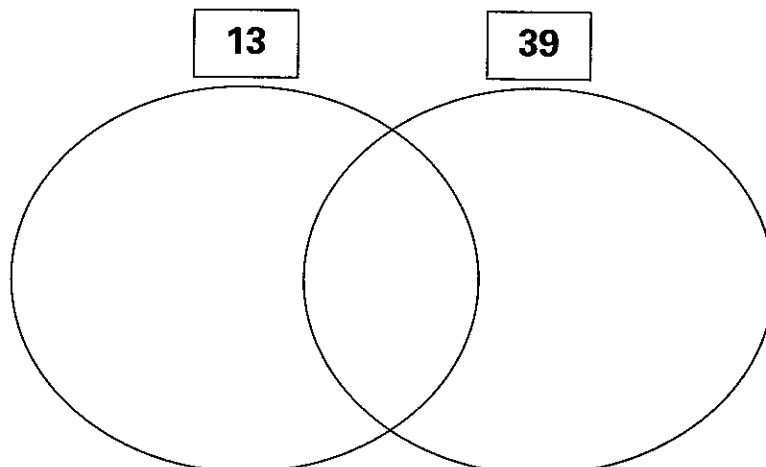
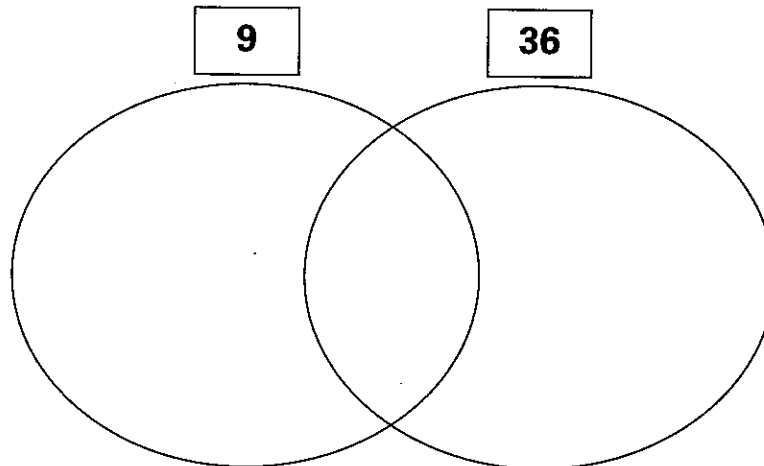
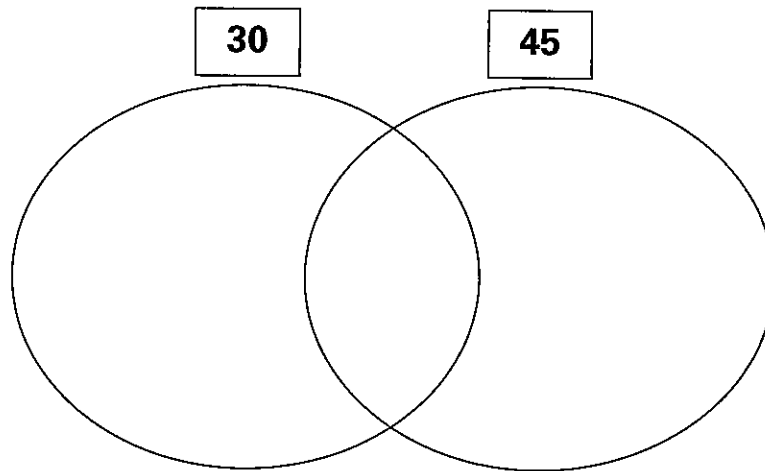
Lesson 1: Identifying Factors

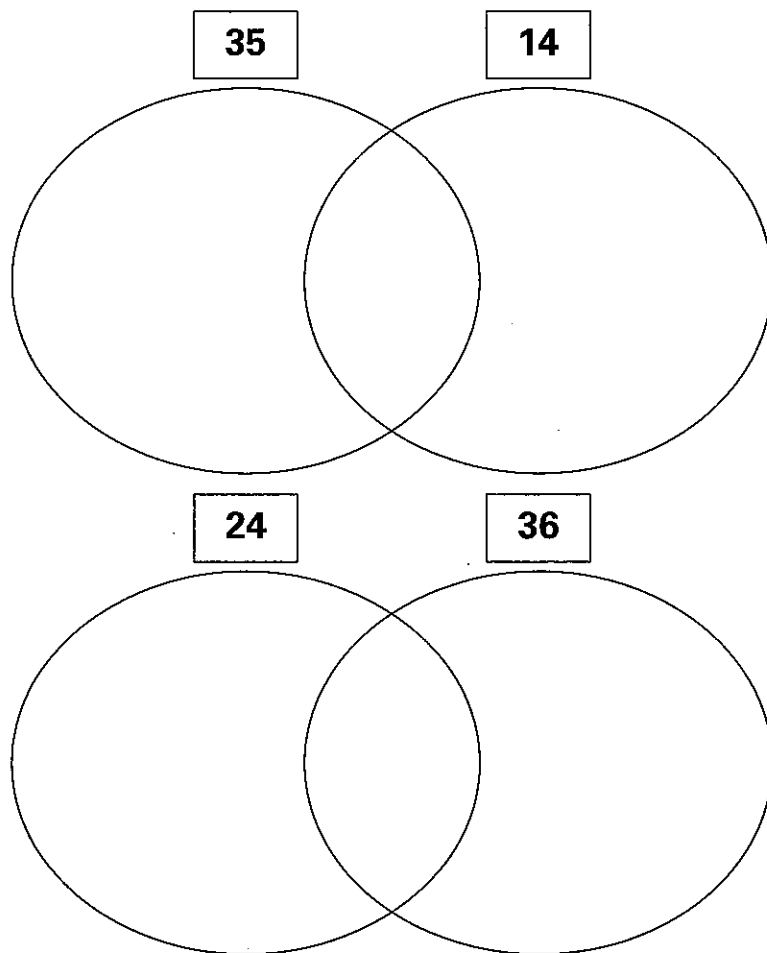
Reflective Practice

Name: _____

Date: _____

1. Identify the factors of the given pairs of numbers and sort the factors in the Venn diagrams. Circle the greatest common factor (GCF) for each pair of numbers.

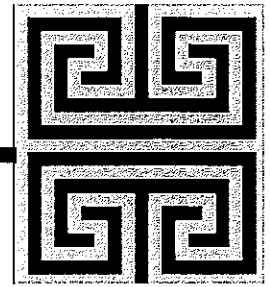
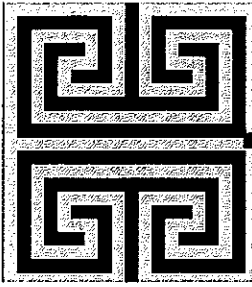




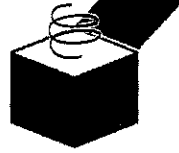
2. Explain a way to determine the greatest common factor of any pair of numbers.



Resources



math



outofthebox

Math Out of the Box is published by Carolina Biological Supply. For more information, go to

<http://www.carolinacurriculum.com/math+out+of+the+box/>



The Alabama Math, Science, and Technology Initiative is the Alabama Department of Education's initiative to improve math and science teaching statewide. Its mission is to provide all students in Grades K-12 with the knowledge and skills needed for success in the workforce and/or postsecondary studies.

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