Factors, Prime Factorization, Multiples

Summary

Find Prime Factorization of a number. Use Prime Factorization to find GCF and LCM for two numbers. Apply factors and multiples in problem solving.

Main Core Tie

Mathematics Grade 6

Strand: THE NUMBER SYSTEM (6.NS) Standard 6.NS.4

Materials

- A small white board, dry erase marker and wipe-off rag for each team
- About 100 Color Tiles for each team
- About 200 centimeter or rainbow cubes for each team
- Frayer Model journal page for each student
- graph paper for each student
- Worksheet: " Prime Factorization For Finding GCF and LCM"
- A cardstock copy of the "Prime Factorization For Finding GCF and LCM" worksheet for each team
- 8-10 copies of " Applying Prime Factorization, GCF, and LCM"

Background for Teachers

Enduring Understanding (Big Ideas):
Every number has one unique prime factorization
Essential Questions:

- How can I determine the prime factorization for a number?
- How can I use factors in solving problems?

Skill Focus:
Applying prime factorization, factors and multiples in problem solving
Vocabulary Focus:
Prime Factorization, Greatest Common Factor, multiple, Least Common Multiple
Ways to Gain/Maintain Attention (Primacy):
Games, graphic organizers, technology, manipulatives, journal, cooperative groups

Instructional Procedures

Starter:

- Complete the "Factor" section of the Frayer Model.
- Name two common factors for 12 and 16
- Name two numbers that are relatively prime

Lesson Segment 1: How can I determine the prime factorization for a number.
In our last lesson we reviewed finding factors for a number. The following game will review prime factorization-an objective taught in 5th and 6th grade cores as well as vocabulary such as product, factor and divisible.
Puzzlers Contest
The teams in the rooms will compete in a Puzzler Race. Each team is given a small white board, dry erase marker and wipe-off rag. One person will be the scribe, while two team members coach and the fourth encourages and helps team celebrate. The teacher poses the Puzzler challenge. Teams work together to find a solution to the puzzler. As soon as a team believes they have the solution, they

raise their board. The first three boards raised with correct solutions are given points. First = 3 points. Second = 2 points. Third = 1 point. If a team raises a board with an incorrect solution, one point is deducted from their score.

Puzzlers:

Find a way to get a product of 25 using only prime number factors. You may use a factor more than once if necessary.

Find a way to get a product of 12 using only prime number factors. You may use a factor more than once if necessary.

Find a way to get a product of 36 using only prime number factors. You may use a factor more than once if necessary.

Find a way to get a product of 100 using only prime number factors. You may use a factor more than once if necessary.

Have teams who were able to find the solutions describe to the class how they found the prime factors. When we write a number as the product of only prime factors, we say we have a prime factorization. We can use divisibility rules for 2, 3 and 5 to begin identifying prime factors, since 2, 3 and 5 are the first prime numbers. We can use a graphic organizer such as a factor tree or a table like this to organize:

When the quotient in the box becomes a prime number, use that and all factors outside the box for the prime factorization

The TI-73 can also be used to find prime factorization by selecting and highlighting b/c and Mansimp. On the home screen, type a number in as a numerator. Push , and type the same number for the denominator. Push and . A prime factor and simplified fraction will appear. A down arrow indicates there are more prime factors. Continue pushing and until the down arrow no longer appears. All prime factors are now listed.

Journal: Have students complete the " Prime Factorization" section of the Frayer model (attached).

Practice: Play Tic Tac Toe to practice. Divide class in two. Put a Tic Tac Toe board on the overhead. Give class a practice problem for finding prime factorization. They can work with team members to check. Select one person from Team X to work the problem. If they are correct, that person comes to the overhead to put an X in a slot. If not correct, choose a person from the O Team to answer. If they are correct, they put an O in a slot. The teacher gives another problem, team time, then selects a person from Team O to answer, and the game continues until one team wins. Students record all problems on their assignment paper.

Lesson Segment 2: Access and build background knowledge for finding the GCF and LCM of two given numbers.

Do the following activity to help students activate and broaden their knowledge about greatest common factor and least common multiple. These two vocabulary terms are often confused with each other.

GCF:

Using graph paper and Color Tiles, have students build, sketch and label two rectangles. One using 6 units the other using 9 units so that the rectangles have the same number of rows. Discuss all the options. What is the greatest number of rows these two rectangles could have in common? Build two more rectangles, one using 6 units, the other using 12 units so that they have the greatest number of rows in common. Connect this to greatest common factor. Have students build and sketch two more rectangles, one using 18 units, the other using 21 units so that they have the greatest number of rows in common. Greatest Common Factor can be represented as two rectangles with greatest common width.

LCM:

Have students build one rectangle in which groups of 4 tiles or groups of 6 tiles can be identified and circled. Discuss what their rectangles look like. Q. Could you have built a rectangle using 24 tiles? 36 tiles? 48 tiles? What is the smallest rectangle that would work for 4 and for 6? Have them do the

same for 5 and 3, this time trying to build use the least number of tiles possible in their rectangle. Emphasize that the rectangle must have the least number of tiles possible. Connect this to the LCM for two numbers.
Helps students complete the Frayer Model for the GCF and LCM sections including ideas for examples and non examples.
Lesson Segment 3: How can I use factors in solving problems?
Finding the Prime factors for numbers can help us identify the GCF and the LCM. There are other ways to do this such as listing and circling common factors, or writing lists of multiples and circling the least. But prime factorization can be very useful in working with larger numbers. The attached worksheet guides students in a physical model using the colors of centimeter cubes to identify prime numbers, to find the prime
factorization for a number and to use prime factorization to find the GCF and LCM for two given numbers.
Give each student the attached "Prime Factorization For GCF and LCM" worksheet. Give each team about 200 centimeter cubes and one cardstock copy of the sheet to place centimeter cubes on. Rotating roles to make sure each team member contributes could be: The Builder, The 2 Coaches, and the Encourager. All students will write the factors on their own worksheets to represent cubes. Follow directions on the attached worksheet.
When students discuss the factors, they should say the factor, not the color of the cube. For example, if 3 is a prime factor, the students should say, "a factor of 3" rather than saying, "a red cube".
When building the GCF on the cardstock, only choose centimeter cubes that both numbers have in common. Emphasize using the prime factors that <u>both numbers share</u>. To use a common factor, there must be a "twin" factor in the other number.
When showing LCM on the cardstock, show every prime factor needed for each number to be completed. If the numbers have a common factor, they can share it. They don't both need one of their own--none to spare.
A two-circle Venn Diagram is also great for organizing the factors for GCF and LCM. You may want the students to sketch a Venn on the back of the worksheet for each pair of numbers on the bottom part of the page. Each circle will contain the prime factors for a number that are not factors of the other number. The overlapping area is where any factor that is needed in both numbers goes. This organizer helps the students see the factors in the center that represent the GCF. Since any common factor is only listed once in the overlapping area, the product of the factors in all three areas of the Venn is the LCM.
Music helps students remember information. When using prime factorization to find Greatest Common Factor and Least Common Multiple, the following songs may be helpful in helping students remember.

Greatest Common Factor
Use the tune for Three Blind Mice
(Lyrics by Linda Bolin)

Greatest Common Factor
Greatest Common Factor
We will <u>only</u> use
We will <u>only</u> use
The factors which both the numbers <u>share</u>
Use only those <u>twin</u> common factors there
A common factor <u>must have a pair</u>,

Least Common Multiple
Use the tune for Where Is Thumper?
(Lyrics by Linda Bolin)

Least Common Multiple
Least Common Multiple
We must see
We must see
Both numbers completed
All the factors needed
Must be there
But common factors share.

In the Greatest Common Factor.

TI-73: LCM and GCD (GCF) can be check on the TI-73 by selecting the key and choosing the Number menu. At the " (", type in one of the numbers, , and the other number. Press

Lesson Segment 4: Application

Give each person on a team a different problem from the Applying Prime Factorization, GCF and LCM attachment. These may be used for application practice. Four-Corners is a good cooperative structure to use here. Each person from a team goes to a different corner in the room to work with the others who join them there to work on a problem. After working in their corners to make sure they understand and can answer the questions in the problem, the teams reunite, and each person teaches the team how to work the problem they brought from their corner. Team members decide if they agree with the presenting team member. The students justify and answer every problem on their own assignment paper.

Additional Practice: Homework practice from text may be assigned as appropriate for any segment of this lesson.

Assessment Plan

observation, discussion, performance task

Bibliography

This lesson plan was created by Linda Bolin.

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