HIGHEST COMMON FACTOR (H.C.F.)

NIGENIUS
Digital Assistant For Teachers

Subject

Mathematics

Prepared By

[Instructor Name]

Grade Level

3

Overview

This lesson plan covers teaching content for;

1. Understanding the concepts of prime factors of numbers
2. Calculating the Highest Common Factor (HCF) using factor-pairs method
3. Calculating the Highest Common Factor (HCF) using Prime Factorization method
4. Word problems involving Highest Common Factors.

Objectives

Students should be able to;

1. Understand factors and prime factors.
2. List the prime factors of numbers
3. Identify common factors of 2 or more numbers
4. Identify the Highest common factor of 2 or more numbers
5. Use different methods to solve for HCF (Listing method, Prime factorization method, division method)

Activity Starter/Instruction

1. Before beginning, teacher writes the HCF on the board and ask students to break down each word and share out the meaning of each word.
2. After receiving student response, the teacher explains that <u>Greatest</u> means biggest, <u>common</u> means the same, and <u>factor</u> is the numbers that are multiplied together to get the product.
3. The teacher combines all ideas and tells students that the highest common factor of two or more given numbers is the greatest which divides each of given numbers exactly.
4. The teacher goes on to ask some questions like:
   Does every number have factors?
   Can you think of a number that has… exactly 2 factors? … exactly 3 factors? … exactly 4 factors?
5. Every number has at least 1 factor, because 1 is a factor of every number. The only number with exactly 1 factor is 1.
6. All prime numbers have exactly 2 factors, which learners might realize.

Teacher Guide

Day 1/ Lesson 1: 15 Mins

1. Write 2 numbers 12 and 18 on the board.
2. Ask students to shout out factors (i.e., "What numbers go into 12 and 18?").
3. Write the factors around the number and prompt students as needed to get all factors ((1, 2, 3, 4, 6 and 12) and (1, 2, 3, 6, 9 and 18)).
4. Explain, "These are all factors of 12 and 18. Factors are numbers we can multiply together to get another number. For example, 3 x 6 is 18, so 3 and 6 are both factors of 18."
5. The teacher says that when we list factors, we have to be sure we don't forget any. It can be easy to miss a factor if we just list them from memory."
6. Since we have the factors below
   12: 1, 2, 3, 4, 6, 12
   18: 1, 2, 3, 6, 9, 18
7. Explain that the HCF is the highest factor which is common to both 12 and 18 which is 6.
   Therefore, the HCF is 6.

Materials Required

- White Board and Marker
- Notebooks
- Index cards / Blank sheets
- Pencils

Additional Resources

- https://www.education.com/lesson-plan/factors-over-the-rainbow/
- https://aminghori.blogspot.com/2017/01/lesson-plan-of-h-cf-up-to-2-digits.html
- https://www.teachsecondary.com/maths-and-science/view/lesson-plan-ks4-mathematics-highest-common-factor-lowest-common-multiple

Additional Notes

Guided Practice

Day 2/ Lesson 2: 25 Mins

1. The teacher explains that the method of listing out all the factors of each number might not be the best. Students may forget a particular factor and end up giving the wrong number as the HCF.
2. Explain, "One way to ensure that we have listed all the factors of a number is by finding factor pairs: a set of two numbers that, when multiplied together, result in a given product."
3. Tell students that we can use factor arcs as a way to list factor pairs and find all the factors of a number, in order from least to greatest.
4. Write a number, like 15, on the board. Remind students that 1 and the number itself are always factors of every number.
5. Draw a factor arc for 15 starting with 1. Draw a big arch from 1 to 15, leaving room for other factors inside the first arch.
6. Ask students, "Is 2 a factor? Is 3 a factor? What times 3 is 15?" Draw an arch from 3 to 5 to continue the arc

Guided Practice

Day 3/ Lesson 3: 25 Mins

1. The teacher tells students that when making a factor arc, they should keep counting up from 1 and adding factors until reaching a factor that is already listed. When they reach a factor that is already listed, the factor arc is complete.
2. Guide students through an example of a square number, like 16, and demonstrate how to make a rainbow when a factor is used twice (i.e., write the factor once as the center number in the rainbow without an arch drawn above it).
3. The teacher displays factor arcs for 12 and 16 side by side. Circle the common factors (1, 2, and 4) and explain, "When two numbers have factors in common, we call these common factors. The term greatest common factor refers to the largest, or greatest, common factor between two or more numbers. In this case, 4 is the greatest common factor."

12

1 2 3   4   6   12

16

1 2   4   8 16
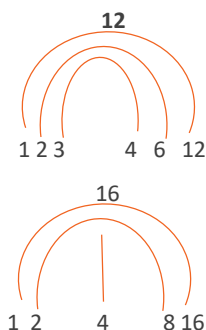
Therefore, the common factors are: 1, 2, and 4.

The highest Common factor is 4.

Guided Practice

Day 4/ Lesson 4: 20 Mins

Prime factorization means to express a number as the product of its prime factors.

E.g. 12 = 2x 2 x 3

Factors shared by two or more numbers are called common factors.

The product of two or more common prime factors is the Greatest Common Divisor (GCD) or highest Common Factor (H CF).

Method of prime factorization for finding H CF of two or more numbers.

Step 1: Express each one of the given number as the product of prime factors.

Step 2: Identify the prime factors which are common in all factorization.

Step 3: Now multiply all these prime factors which are common.

Thus a number/factor obtained is called (GCD) or highest Common factor (H CF).

E.g. Find the HCF of 28 and 32

2	28
2	14
7	7
	1

2	32
2	16
2	8
2	4
2	2
	1

24 = 2 * 2 * 7

32 = 2 * 2 * 2* 2*2

Therefore, the HCF = 2 * 2 = 4.

Assessment Activity

Assessment Activity

1. Ask students to work in pairs.
2. Ask students to find prime factors of 24 and write them as product.
3. Now ask students to find prime factors of 48 and write them as product.
4. Now ask them to find H CF.
5. Let the students think themselves.
6. Collect answers from different students.

Assessment Activity

As students work the following problems the teacher should move around the room checking student progress.

1. Find the GCF of 36 and 63 (Answer: GCF = 9)
2. Cameron is pasting pieces of square colored paper of equal size onto a board measuring 72 cm by 90 cm. If only whole square pieces are used, and the board is to be completely covered with no overlapping, find the largest possible length of the side of each square colored paper.

(Answer: This involves finding GCF(72, 90) = 18. The largest possible squares has a side of 18cm.)

Summary

1.

Review and Closing

1. Ask and discuss, "Why are factors important? How can we use what we've learned about factors to help us in math?"
2. Teacher answers that: One situation that learners might think of is when cancelling down fractions. If you want to simplify 12/20, you could divide the numerator and denominator by any common factor (e.g., 2), but dividing by the highest common factor (HCF) of 4 simplifies the fraction as much as possible in one go, giving 3/5.
3. Ask students to write any three two-digit numbers and find H CF through prime factorization