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FINDING GREATEST COMMON FACTOR AND LEAST COMMON MULTIPLE USING ALTERNATIVE METHOD

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ABSTRACT

This study was conducted mainly to discover a new procedure of finding GCF and LCM. Descriptive case-investigatory and deductive process was employed in this study. The study showed that prime numbers of any given two or more numbers served as factors in finding the Greatest Common Factor and Least Common Multiple In the existing method the prime numbers, which are not common to the given numbers are disregarded while the common prime numbers were used as factors in finding the GCF and LCM. With this fact, instead of using common factors, the non-common factors were used as determinants in finding the GCF and LCM, thus creating a new method. The method used only the product of non-common factors of each number as a divisor for itself. Likewise, in finding the LCM, the product of the non-common factors of the numbers was used as multiplier to the other number which is not the source of the prime numbers. The derived procedure is applicable to any whole number.

KEYWORDS: *Prime factor and number, greatest common factor, least common multiple*

1. INTRODUCTION

Integers are considered as the basic numbers, and all other numbers are made through them. But there is another use of integers; it is used as prime numbers, each number greater than one is a prime or a product of primes. Therefore, prime numbers are considered to be the most fundamental composition of numbers (Yuan, Xiaoming, 2010). The most well-known application of prime numbers is in finding GCF and LCM using Prime Factorization. Early mathematicians have discovered a method on how to find GCF and LCM. It is to break down the given numbers to its prime factors, then use the common factors to solve. It seems that this method focuses only on the common factors and neglected the non-common factors. In fact, this existing method is quite intriguing. The researchers have been intrigued why it only focuses on the common factors. So, through this, the researchers decided to discover an alternative way using the non-common factors.

2. METHODOLOGY

This study used a descriptive case-investigatory method with the application of the Mathematical Adaptation Model of Dr. Konstantin Ivanov in order to discover a new method in finding Greatest Common Factor and Least Common Factor.

3. RESULTS AND DISCUSSIONS

Role of prime numbers in finding the GCF and LCM

Prime factors. A prime factor is a prime number that is a factor of a certain number.

Example 1: Show the prime factors of 80.

Solution:

80 = 2 x 40 (1)
= 2 x 2 x 20 (2)
= 2 x 2 x 2 x 10 (3)
= 2 x 2 x 2 x 2 x 5
(note that 2 and 5 are primes) (4)

Prime factors can also be used in finding the greatest common factor (GCF) and the least common multiple (LCM) of two or more numbers.

EXISTING METHOD IN FINDING THE GCF AND LCM

Greatest Common Factor - is the highest positive integer that can divide a number without a remainder.

Example 2: Find the GCF of 150 and 230.

Solution: **find all prime factors of the given numbers**

150 = 2 x 3 x 5 x 5 230 = 2 x 5 x 23

Arrange the above result and underline the prime factors that are common to both numbers. The GCF is the product of common prime factors.

150 = 2 x 5 x 5 x 3
230 = 2 x 5 x 23
GCF = 10

Since 150 = 15 x 10 and
230 = 23 x 10

Least Common Multiple - is the lowest quantity that is a multiple of two or more given quantities.

Example 3: Find the LCM of 150 and 230.

Solution:

150 = 2 x 5 x 5 x 3
230 = 2 x 5 x 23

To find the LCM, multiply the combined underlined factors and the not underlined factors

LCM = 2 x 5 x 5 x 3 x 23= 3,450
3,450 = multiple of 150 as 23 x 150 and
3,450 = multiple of 230 as 15 x 230.
LCM = 3,450 of 150 and 230.

THE ALTERNATIVE METHOD OF FINDING GCF AND LCM

1. The Mathematical Model of Adaptation through Adaptive Hypermedia Systems of Konstantin Ivanov, Ph.D., Institute of Mechanics and Machine Science of Kazakhstan was employed, the following procedures were instituted so as to arrived to the desired objective.

A. FINDING THE GREATEST COMMON FACTORS

Procedures:

Step 1: Plot the prime factors of the given two numbers into a table.

Step 2: Arrange the information above and cancel all the common prime factors.

Step 3: Divide each number by their remaining prime factor.

Example 1: Find the GCF of 300 and 375

Step 1: Plot the prime factors of the given two numbers into a table.

Illustration 1:

300 = 2 x 2 x 3 x 5 x 5
375 = 3 x 5 x 5 x 5

Step 2: Arrange the information above and cancel all the common prime factors.

Illustration 2:

300 = 3 x 5 x 5 x 2 x 2
375 = 3 x 5 x 5 x 5

Step 3: Divide each number by their remaining prime factor.

Illustration 3:

300/4 = 75 375/5 = 75
Since they have same answer so, their GCF is 75.

B. FINDING THE LEAST COMMON MULTIPLE

Procedures:

Step 1: Plot the prime factors of the given two numbers into a table.

Step 2: Arrange the information above and cancel all the common prime factors.

Step 3: Multiply each given number to the product of the remaining prime factors of the other given numbers which are not common to the given.

Illustration 4:

300 x 5 = 1500 375 x 4 = 1500
Since they have same answer so, their LCM is 1500.

(If there are more than two numbers given, each number should be multiplied by the product of the remaining prime factors excluding its own factor.)

Example 2: Find the LCM of 360, 168, 120, 240, 280 and 392.

Illustration 5

Step 1: determine the prime factors of all given numbers

360 = 2 x 2 x 2 x 3 x 3 x 5
168 = 2 x 2 x 2 x 3 x 7
120 = 2 x 2 x 2 x 3 x 5
240 = 2 x 2 x 2 x 2 x 3 x 5
280 = 2 x 2 x 2 x 5 x 7
392 = 2 x 2 x 2 x 7 x 7

Step 2: arrange the prime factors and cancel all common prime numbers

360 = 2 x 2 x 2 x 3 x 3 x 5
168 = 2 x 2 x 2 x 3 x 7
120 = 2 x 2 x 2 x 3 x 5
240 = 2 x 2 x 2 x 2 x 3 x 5
280 = 2 x 2 x 2 x 5 x 7
392 = 2 x 2 x 2 x 7 x 7

Step 3: multiply each given number to the product of the remaining prime factors of the other given numbers which are not common to the given.

360 = 3 x 3 x 5	= 360 x 7 x 2 x 7	= 35,280
168 = 3 x 7	= 168 x 3 x 5 x 2 x 7	= 35,280
120 = 3 x 5	= 120 x 3 x 7 x 2 x 7	= 35,280
240 = 2 x 3 x 5	= 240 x 3 x 7 x 7	= 35,280
280 = 5 x 7	= 280 x 3 x 3 x 2 x 7	= 35,280
392 = 7 x 7	= 392 x 3 x 3 x 5 x 2	= 35,280

LCM

PROCESS ILLUSTRATION ON THE APPLICATION OF THE TWO METHODS

Figure 1:
Existing method of finding GCF

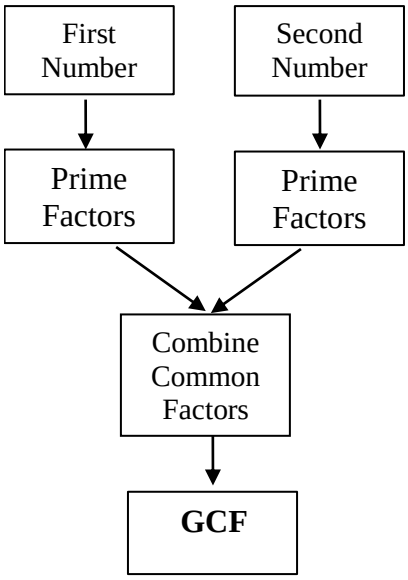


Figure 2:
Alternative method of finding GCF

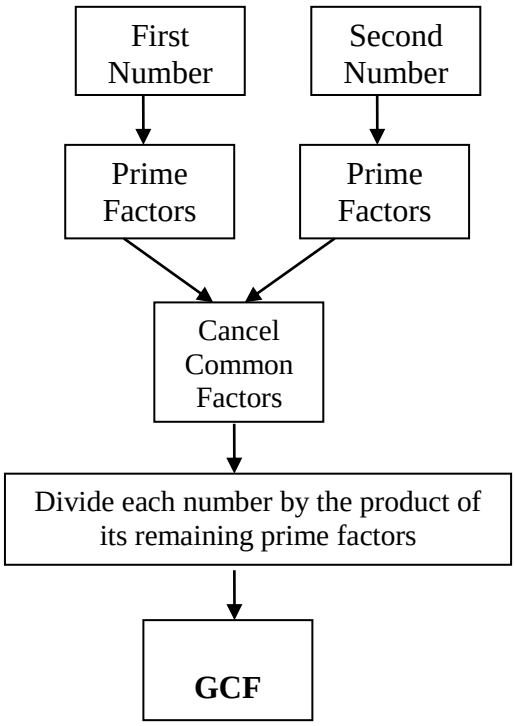


***Figure 3*:**

Existing method of finding LCM

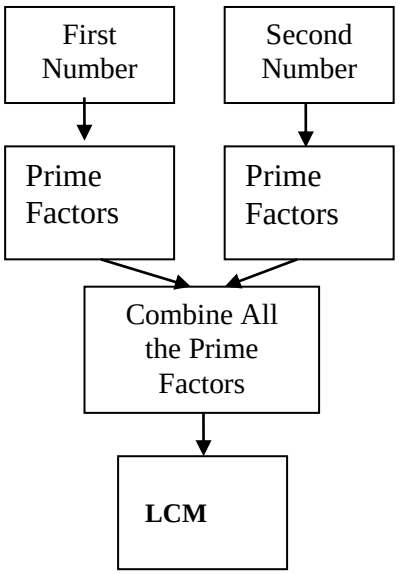
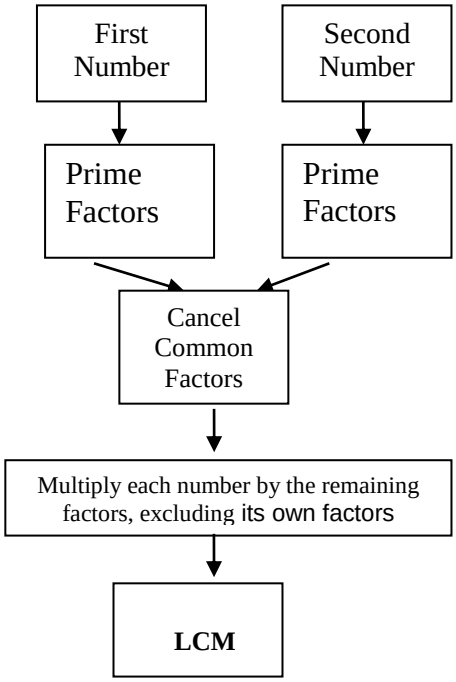


***Figure 4*:**

New method of finding LCM



APPLICATIONS:

Example 1: Find the GCF and LCM of 24 and 40 using the existing and alternative method.

For GCF:

24 = 2 x 2 x 2 x 3
40 = 2 x 2 x 2 x 5

Common Prime Factors

24 = 2 x 2 x 2 x 3
40 = 2 x 2 x 2 x 5

Multiply the common factors

GCF= 2 x 2 x 2 = 8

For LCM:

24 = 2 x 2 x 2 x 3
40 = 2 x 2 x 2 x 5

Common & Not Common Prime Factors

LCM = 2 x 2 x 2 x 3 x 5
=120

ALTERNATIVE METHOD

For GCF:

24 = 2 x 2 x 2 x 3
40 = 2 x 2 x 2 x 5

Not Common Prime Factors

24 = 2 x 2 x 2 x 3
40 = 2 x 2 x 2 x 5

Use as divisor the product of the not common factors to the other given number

24/3 = 8
40/5 = 8 } GCF

For LCM:

24 = 2 x 2 x 2 x 3
40 = 2 x 2 x 2 x 5

24 x 5 = 120
40 x 3 = 120 } LCM

Example 2: Find the GCF and LCM of 3,850 and 5,280

Solution: **EXISTING METHOD**

For GCF:

3,850 = 2 x 5 x 5 x 7 x 11
5,280 = 2 x 2 x 2 x 2 x 2 x 3 x 5 x 11

Determine common Prime Factors

3,850 = 2 x 5 x 11 x 5 x 7
5,280 = 2 x 5 x 11 x 2 x 2 x 2 x 2 x 3

Multiply the common factors

GCF = 2 x 5 x 11 = 110

For LCM:

3,850 = 2 x 5 x 11 x 5 x 7
5,280 = 2 x 5 x 11 x 2 x 2 x 2 x 2 x 3

Multiply all Common (once only) and Not Common Prime Factors

LCM = 2 x 5 x 11 x 5 x 7 x
2 x 2 x 2 x 2 x 3
= 184,800

ALTERNATIVE METHOD

For GCF:

3,850 = 2 x 5 x 5 x 7 x 11
5,280 = 2 x 2 x 2 x 2 x 2 x 3 x 5 x 11

Determine not Common Prime Factors

3,850 = 2 x 5 x 11 x 5 x 7
5,280 = 2 x 5 x 11 x 2 x 2 x 2 x 2 x 3

Use as divisor the product of the not common factors to the other given number

3,850 / 35 = 110
5,280 / 48 = 110 } GCF

For LCM:

3,850 = 2 x 5 x 11 x 5 x 7
5,280 = 2 x 5 x 11 x 2 x 2 x 2 x 2 x 3

Use as divisor the product of the not common factors of every given number to the other given number

3,850 x 48 = 184,800
5,280 x 35 = 184,800 } LCM

Prime numbers of any given two or more numbers served as factors in finding the Greatest Common Factor (GCF) and Least Common Multiple (LCM). In the existing method, the prime numbers, which are not common to the given numbers are disregarded while the common prime numbers were used as factors in finding the GCF and LCM. Likewise, in the New Method using the Adaptive Model, the non-common factors were used as determinants in finding the GCF and LCM. The new method to solve GCF and LCM is applicable to any whole number.

4. REFERENCES CITED

1. *Cooper, Curtis (2008). The largest known primenumber. Warrensburg, Missouri: University of Central Missouri. email:cooper@ucmo.edu. Crandall, Richard (2005). Prime Numbers, A computational perspective (second edition). Berlin, New York: Springer Verlag Inc.*
2. *Curtis, Matthew & Tularam, Gurudeo A. (2011). Department of Mathematics and Statistics, Faculty of Science Environment Engineering and Technology, Centre of Environmental Futures. Griffith University Brisbane, Australia; Science Publications Inc.*
3. *Ivanov, Konstantin. Mathematical Model of Adaptation, Institute of Mechanics and Machine Science of Kazakhstan · Laboratory of Adaptive Mechanisms, https://www.researchgate.net/publication/303013778 [accessed Feb 06 2018].*
4. *Khalid, Ahmed E. (2007). The prime number theorem. Kansas, USA: University of Kansas.*
5. *Zhang, Yitang (1991). Unheralded Mathematician Bridges the Prime Gap. USA: Purdue University*