

Prime Numbers

A prime number is a positive integer (whole number) which is divisible only by 1 and itself.

Prime numbers less than 20:

2, 3, 5, 7, 11, 13, 17, 19

Factors

A is a factor of B if A divides exactly into B

Example

Factors of 6 are: 1, 2, 3, 6

Multiples

A is a multiple of B if B divides exactly into A

Example

Some multiples of 6 are: 6, 12, 18, 24,

All whole numbers greater than 1 can be written as the product of prime factors.

This means they can be written as prime numbers multiplied together.

Examples

$$10 = 2 \times 5$$

$$7 = 7$$

$$12 = 2 \times 2 \times 3$$

$$30 = 2 \times 3 \times 5$$

PRIME FACTORS, HCF AND LCMTRANSCRIPT

Writing numbers as a product of prime factors

Example 1 36

$$\begin{array}{r} 2 \overline{) 36} \\ 2 \overline{) 18} \\ 3 \overline{) 9} \\ 3 \overline{) 3} \\ 1 \end{array}$$

$$36 = 2 \times 2 \times 3 \times 3$$

$$\text{or } 36 = 2^2 \times 3^2$$

Example 2 50

$$\begin{array}{r} 2 \overline{) 50} \\ 5 \overline{) 25} \\ 5 \overline{) 5} \\ 1 \end{array}$$

$$50 = 2 \times 5 \times 5$$

$$\text{or } 50 = 2 \times 5^2$$

Example 3 120

$$\begin{array}{r} 2 \overline{) 120} \\ 2 \overline{) 60} \\ 2 \overline{) 30} \\ 3 \overline{) 15} \\ 5 \overline{) 5} \\ 1 \end{array}$$

$$120 = 2 \times 2 \times 2 \times 3 \times 5$$

$$\text{or } 120 = 2^3 \times 3 \times 5$$

Example 4 38

$$\begin{array}{r} 2 \overline{) 38} \\ 19 \overline{) 19} \\ 1 \end{array}$$

$$38 = 2 \times 19$$

In each of the examples we repeatedly divided by the smallest prime factors of the numbers until we got an answer of 1. The number was then expressed as the product of the factors we had divided by.

Highest Common Factor (HCF)

If A and B are two whole numbers then the HCF of A and B is the largest number which divides exactly into both A and B .

Lowest Common Multiple (LCM)

If A and B are two whole numbers then the LCM of A and B is the smallest number which both A and B will divide into exactly.

Finding the HCF and LCMExample 5

Find the HCF and LCM of 24 and 40

First write each number as a product of its prime factors:

$$\begin{array}{r|l} 2 & 24 \\ \hline 2 & 12 \\ \hline 2 & 6 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$$\begin{array}{r|l} 2 & 40 \\ \hline 2 & 20 \\ \hline 2 & 10 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$24 = \textcircled{2} \times \textcircled{2} \times \textcircled{2} \times 3$$

$$40 = \textcircled{2} \times \textcircled{2} \times \textcircled{2} \times 5$$

The HCF is given by the product of the factors these numbers have in common

$$\text{HCF} = 2 \times 2 \times 2 = 8$$

The LCM must have all the factors of both numbers

$$\text{LCM} = 2 \times 2 \times 2 \times 3 \times 5 = 120$$

We just write down the factors of 24 then multiply by any factors of 40 which are not already included.

An alternative method of finding the LCM is to write down parts of the 24 and 40 times tables to find the first number that occurs in both lists.

$$24, 48, 72, 96, \textcircled{120}$$

$$40, 80, \textcircled{120}$$

$$\text{LCM} = 120$$

Example 6

Find the HCF and LCM of 36 and 48

$$\begin{array}{r|l}
 2 & 36 \\
 \hline
 2 & 18 \\
 \hline
 3 & 9 \\
 \hline
 3 & 3 \\
 \hline
 & 1
 \end{array}$$

$$\begin{array}{r|l}
 2 & 48 \\
 \hline
 2 & 24 \\
 \hline
 2 & 12 \\
 \hline
 2 & 6 \\
 \hline
 3 & 3 \\
 \hline
 & 1
 \end{array}$$

$$36 = (2) \times (2) \times (3) \times 3$$

$$48 = (2) \times (2) \times 2 \times 2 \times (3)$$

$$\text{HCF} = 2 \times 2 \times 3 = 12$$

$$\text{LCM} = 2 \times 2 \times 3 \times 3 \times 2 \times 2 = 144$$

Alternative method for finding LCM

$$36 \quad 72 \quad 108 \quad (144)$$

$$48 \quad 96 \quad (144)$$

$$\text{LCM} = 144$$

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