

WORKING WITH NUMBERS

Natural numbers (counting numbers).

These are numbers used in counting.

Thus, (Natural numbers) = (Counting numbers) = (1, 2, 3, 4, 5, ...)

Whole numbers.

These are counting numbers including zero. i.e.

(Whole numbers) = (0, 1, 2, 3, 4, 5, ...)

Integers:

This is a set of whole numbers together with negative whole numbers.

We can write: (..., -4, -3, -2, -1, 0, 1, 2, 3, 4, ...)

Factors and Multiples.

A whole number which divides exactly into another is said to be a factor of that number. Thus, if one number goes exactly into another number, the first number is called a factor of the second and the second number is called a multiple of the first.

Thus, $3 \times 4 = 12$, 3 and 4 are factors of 12. Again, $2 \times 6 = 12$, 2 and 6 are also factors of 12. Also 12 is a multiple of any of the numbers 2, 3, 4, or 6, since each of these numbers goes exactly into 12.

A prime number is a number which has only two factors, itself and 1.

Thus (2, 3, 5, 7, 11, 13, 17, 19, 23, ...) are all prime numbers. A factor which is a prime number is called a **prime factor**.

Thus 3 is a prime factor of 12 and so is 2.

Note:

(a) Every number is a factor of itself.

(b) 1 has only itself as a factor and therefore it is not a prime number.

(c) Numbers that have more than two factors are called **composite numbers**. **Composite numbers** can be expressed as products of their prime factors. We obtain prime factors of a number by successive division of the number starting with the least possible prime factor.

Example 1:

Express 36 in terms of its prime factors.

Solution:

2 36

$$2 \overline{) 18}$$

$$3 \overline{) 9}$$

$$3 \overline{) 3}$$

$$1$$

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

Example 2.

Express 4312 in prime factors.

Solution:

$$2 \overline{) 4312}$$

$$2 \overline{) 2156}$$

$$2 \overline{) 1078}$$

$$7 \overline{) 539}$$

$$7 \overline{) 77}$$

$$11 \overline{) 11}$$

$$1$$

$$\text{Hence, } 4312 = 2^3 \times 7 \times 11$$

Note: The above process of writing numbers in terms of their prime factors is called **prime decomposition** or **prime factorization**

Exercise

1. List all the factors of each of the following numbers:

(a) 8 (b) 12. (c) 20

(d) 11. (e) 45 (f) 32

2. Express the following numbers as products of their prime factors.

(a) 8 (b) 42 (c) 90

(d) 240. (e) 72 (f) 1024

(g) 360. (h) 800 (i) 625

(j) 280. (k) 102. (l) 3465

(m) 1000 (n) 1764. (o) 39693