Class 10 (NCERT) - Lecture 2

Chapter 1 - Real Numbers

Theorem 1.2 **(Fundamental Theorem of Arithmetic) :** *Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.*

14

7	14
2	2
	1

7×2

2	14
7	7
	1

2×7

2	36
2	18
3	9
3	3
	1

$2 \times 2 \times 3 \times 3$

$(2)^2(3)^2$

3	36
2	12
3	6
2	2
	1

$3 \times 2 \times 3 \times 2$

$3^2 2^2$

2	36
3	18
3	6
2	2
	1

$2 \times 3 \times 3 \times 2$

$3^2 2^2$

The prime factorisation of a natural number is unique, except for the order of its factors.

2	24
2	12
2	6
3	3
	1

3	24
2	8
2	4
2	2
	1

$2 \times 2 \times 2 \times 3.$

$3 \times 2 \times 2 \times 2$

1. Express each number as a product of its prime factors:

(i) 140 (ii) 156 (iii) 3825 (iv) 5005 (v) 7429

$$\begin{array}{r|l} 2 & 140 \\ \hline 2 & 70 \\ \hline 7 & 35 \\ \hline 5 & 5 \\ \hline & 1 \end{array} \qquad \begin{array}{r|l} 2 & 156 \\ \hline 2 & 78 \\ \hline 3 & 39 \\ \hline 13 & 13 \\ \hline & 1 \end{array}$$

$2 \times 2 \times 7 \times 5$ $\qquad$ $2 \times 2 \times 3 \times 13$

Example 5 : Consider the numbers 4^n, where n is a natural number. Check whether there is any value of n for which 4^n ends with the digit zero.

Sol. Let 4^n ends with 0 for any no. n.

$4^n = \_\_\_\_0$

$\Rightarrow$ Prime factor of 4^n is 5 — ①

Now $4^n = (2 \times 2)^n$

But By fundamental theoram Prime factors are unique.

Which is contradiction of ①

$\Rightarrow$ there is no natural no for which 4^n ends with 0.

5. Check whether 6^n can end with the digit 0 for any natural number n.

Let 6^n ends with 0 for any natural no.

$$6^n = \underline{\qquad\quad 0}$$

$\Rightarrow$ 6^n has one prime factor 5 — ①

$$6^n = (2 \times 3)^n$$

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

By fundamental theoram prime factors of a No. is unique.

which is contradiction of ①

$\Rightarrow$ there is no natural number n for which 6^n ends with 0.