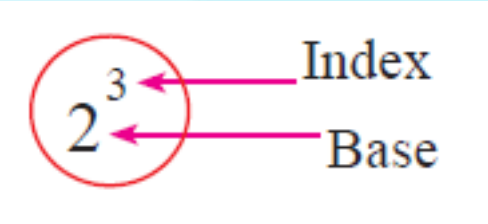
Index notation is used to write a number which is multiplied repeatedly, in a concise way.

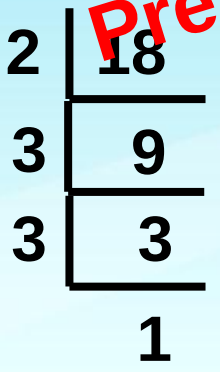


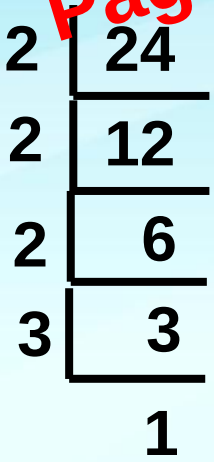
$2 \times 2 \times 2$ is written as 2^3 using indices. That is, $2 \times 2 \times 2 = 2^3$.

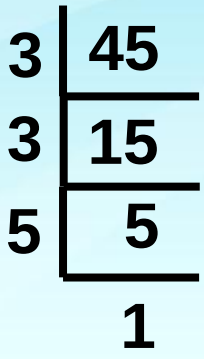
2^3 is read as "two to the power 3".

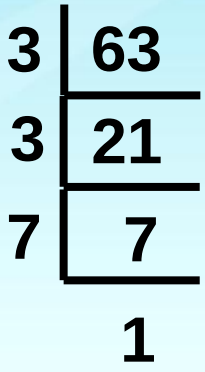
(2) Write each of the following numbers as a product of powers with prime numbers as bases.

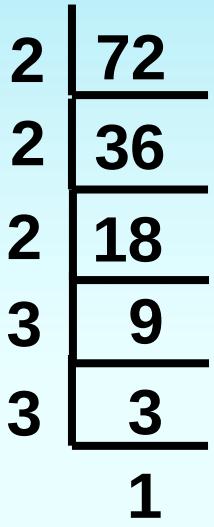
(i) 18 (ii) 24 (iii) 45 (iv) 63 (v) 72











$18 = 2 \times 3 \times 3 = 2^1 \times 3^2$

$24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3^1$

$45 = 3 \times 3 \times 5 = 3^2 \times 5^1$

$63 = 3 \times 3 \times 7 = 3^2 \times 7^1$

$72 = 2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$

Finding the value of a power by substitution

Let us consider expressions in index notation with bases which are unknowns. By substituting values for the unknown bases, the value of an expression in index notation can be found. In this lesson, only positive integers are substituted.

Example 1

Find the value of each of the following expressions when $x = 5$.

(i) x^3

Method I

$x^3 = 5^3$
$= 5 \times 5 \times 5$
$= 125$

Method II

$x^3 = x \times x \times x$
$= 5 \times 5 \times 5$
$= 125$

(ii) $3x$

$3x = 3 \times x$
$= 3 \times 5$
$= 15$

(iii) $7a^2 = 7 \times a \times a$

$= 7 \times 3 \times 3$

$= 63$