

Powers

- Powers are a shorter way of writing products of the same numbers or letters.

- The power of a number is called the **index or exponent**.

- The plural of index is **indices**.

Example: Write the following in power form.

i) $2 \times 2 \times 2 \times 2$
 $= 2^4$

ii) $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$
 $= 2^4 \times 3^3$

Activity 3

Write the following in power form.

a. $5 \times 5 \times 5 \times 5 \times 5 \times 5$

b. $8 \times 8 \times 8 \times 8$

c. 17×17

d. $90 \times 90 \times 90 \times 90 \times 90 \times 90$

e. $2 \times 2 \times 2 \times 5 \times 5 \times 5$

f. $4 \times 4 \times 5 \times 5 \times 5 \times 5 \times 5$

Multiples and Lowest Common Multiples (LCM)

- The multiples of a number obtained by **multiplying** that number by 1, 2, 3, ... in turn.

Example: Find the first five multiples of 6

- Multiply the number 6 by 1, 2, 3, 4, 5 in turn.

$6 \times 1 = 6$

$6 \times 2 = 12$

$6 \times 3 = 18$

$6 \times 4 = 24$

$6 \times 5 = 30$

So the first five multiples of 6 are **6, 12, 18, 24, 30**

Lowest Common Multiples (LCM)

- The LCM of two or more numbers is found by listing the multiples of each number and picking out the lowest multiple in common (tatau).

Example: Find the LCM of 6 and 8

Multiples of 6 = 6, 12, 18, **24**, 30, 36,

Multiples of 8 = 8, 16, **24**, 32, 40, 48,

- Now the lowest number that **common** in both set is 24

So the LCM of 6 and 8 is **24**

Activity 4

1. List down the next five multiples of the following numbers

a) 7

b) 11

c) 14

d) 21

2. Find the LCM of the following.

a) 4 and 6
21

b) 12 and 18
d) 9 and 12

c) 14 and 21

Factors

- Factors are numbers which **divide** into a given number with no remainder.

Example: i) Find all the factors of 24.

- First thing to do is list down the factor pairs of 24

$1 \times 24 = 24$

$2 \times 12 = 24$

$3 \times 8 = 24$

$4 \times 6 = 24$

Therefore the factors of 24 are {1, 2, 3, 4, 6, 8, 12, 24}

ii) Find all the factors of 12

- First thing to do is list down the factor pairs of 12

$1 \times 12 = 12$

$2 \times 6 = 12$

$3 \times 4 = 12$

Therefore the factors of 12 are {1, 2, 3, 4, 6, 12}

Common Factors and Highest Common Factors

- **Common factor** of two numbers are factors that appear ('asi) in both lists of factors.

- The **highest common factor (HCF)** is the greatest number (mata'ifika lahi taha) that occurs in the list of common factors.

Example: List the common factors of 18 and 24 and hence find the HCF of 18 and 24.

Step 1- Find the factors of 18 and 24

$1 \times 18 = 18$

$2 \times 9 = 18$

$3 \times 6 = 18$

Therefore the factors of 18 are {1, 2, 3, 6, 9, 18}

$1 \times 24 = 24$

$2 \times 12 = 24$

$3 \times 8 = 24$

$4 \times 6 = 24$

Therefore the factors of 24 are {1, 2, 3, 4, 6, 8, 12, 24}

Step 2- Pull out numbers that are common (tatau) in both list

Common factors- {1, 2, 3, 6}

Step 3- Greatest number is the Highest Common Factor

Therefore, HCF is **6**

Activity 5

- List the factor pairs of the following numbers.
a. 10 b. 20 c. 42 d. 60
e. 12 f. 36
- List all the factors of the following numbers.
a. 15 b. 32 c. 55 d. 16
e. 80
- Find the common factors of the following numbers.
a. 4 and 10 b. 15 and 20 c. 8 and 12
- Find the highest common factor (HCF) of each set of numbers.
a. 12, 24 b. 36, 48 c. 48, 72 d. 24, 30
d. 36, 48 and 60

Activity 6

- Which of the following numbers are prime numbers?
2, 3, 4, 7, 9, 21, 23, 27
- List all the prime numbers between 20 and 40.
- Express as products of prime factors.
a. 8 b. 30 c. 45 d. 72 e. 20 f. 32
- Write as a product of prime factors in power form.
a. 12 b. 24 c. 36 d. 64 e. 16 f. 27

Prime numbers

- A prime number has **only two factors, 1 and itself**.
- There is an infinite number of prime numbers. The first ten prime numbers are {2, 3, 5, 7, 11, 13, 17, 19, 23, 29, ...}
- Every non-prime number can be expressed as a product of prime factor

Example:

i) Write 42 as a product of prime factors.

- The number 42 is not a prime number as it has more than two factors

$$1 \times 42 = 42, 2 \times 21 = 42, 3 \times 14 = 42, 6 \times 7 = 42$$

- Now, take one of the factor pairs of 42.

$$42 = 2 \times 21 \quad [2 \text{ is a prime number but } 21 \text{ is not}]$$

$$42 = 3 \times 14 \quad [3 \text{ is a prime number but } 14 \text{ is not}]$$

$$42 = 6 \times 7 \quad [7 \text{ is a prime number but } 6 \text{ is not}]$$

So **42 = 3 x 2 x 7** which is a product of prime factors.

ii) Write the number 54 as a product of prime factors

$$1 \times 54 = 54, 2 \times 27 = 54, 3 \times 18 = 54, 6 \times 9 = 54$$

Take one of the factor pairs of 54.

$$54 = 2 \times 27 \quad [2 \text{ is a prime number but } 27 \text{ is not}]$$

$$54 = 3 \times 18; 18 = 6 \times 3 \quad [18 \text{ can be replaced by } 3 \times 6]$$

$$54 = 3 \times 3 \times 6 \quad [the 3s \text{ are prime numbers but } 6 \text{ is not}]$$

$$6 = 2 \times 3 \quad [6 \text{ can be replaced by } 2 \times 3, \text{ both are prime numbers}]$$

So **54 = 3 x 3 x 2 x 3 or 3² x 2** which is a product of prime factors