GCSE
Maths

N4 Factors Multiples and Primes

Structure and Calculation

Number

Contents

Definitions:

Multiple:

A multiple of a number is a number that can be divided exactly by that number (i.e. it is a number in that number's times table).

Example

The multiples of 4 are 4, 8, 12, 16, 20 …

The multiples of 6 are 6, 12, 18, 24 …

Factor:

A factor of a number is an integer that can divide into that number exactly.

Example

Factors of 16 are 1, 2, 4, 8, & 16.

Factors of 25 are 1, 5, & 25.

Factor Pairs:

Two factors of a number whose product is that number are called a factor pair.

Example

Factor pairs of 24 are 2 & 12, 3 & 8, 4 & 6.

Common Multiple:

Common multiples of two or more numbers are numbers that are multiples of each number.

Example

Common multiples of 3 and 4 are 12, 24, 36 …

Common multiples of 2 and 7 are 14, 28, 42 …

Common Factor:

Factors that two or more numbers share other than 1 are called common factors.

Example

Common factors of 24 and 16 are 2, 4, and 8.

Common factors of 9 and 27 are 3 and 9.

Highest Common Factor:

The highest common factor is the largest common factor that two or more numbers share.

Example

The highest common factor of 24 and 16 is 8.

The highest common factor of 36 and 24 is 12.

Lowest Common Multiple:

The lowest common multiple is the smallest multiple that two or more numbers share.

Example

The lowest common multiple of 3 and 4 is 12.

Prime Number:

A prime number is a number with only two factors

(1 and the number itself).

Example

The following are prime numbers.

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

Exercise

1. What is the highest common factor of 12, 18 and 24? _____

2. What is the lowest common multiple of 13 and 5? _____

3. Sakina makes up packed lunches. She needs the same number of drinks and crisps.
   What is the smallest number of eack pack she can buy?

   _____ packs of drinks

   _____ packs of crisps

Prime Factors:

Any whole number > 2 can be written as a product of two or more prime numbers. These prime numbers are the prime factors of that number.

This product of prime numbers is unique for every integer > 2, and this is called the **Unique Prime Factorisation Theorem.**

Example

The prime factors of 24 are 2 x 2 x 2 x 3 or 2^3 x 3.

Product:

The product of two or more numbers is the answer obtained when those numbers are multiplied together.

Example

The product of 3, 5, 6 is 90.

Exercise

1. Circle all the factors of 4

1	2	3	4	5	6	7	8	9	10

2. Circle all the factors of 15

1	2	3	4	5	10	12	15	20	30

3. Circle all the numbers that are NOT factors of 24

1	2	3	4	5	6	8	12	18	24

4. Circle all the factors of 38

1	2	3	4	5	6	8	14	19	38

5. Circle the number that is **NOT** a factor of 100

1	2	3	4	5	10	20	25	50	100

6. From the following list:

1, 2, 5, 6, 9, 11, 14, 15, 17, 24, 28, 31

a. find all the multiples of 3 ……

b. find all the multiples of 7 ……

c. find all the prime numbers ……

d. find a factor pair of 84 ……

7. Ann has 48 recycled toner cartridges and wants to share them equally between the printers around the organization.

   Could she divide them equally if there are 16 printers?

Yes

No

8. Two of the printers are now obsolete models and are being removed.

   Could she divide them equally between the printers that are left?

Yes

No

Information

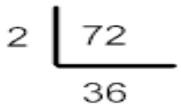
Prime Factor Decomposition:
(Unique Prime Factorisation Theorem)

To find the prime factors of a number, we use a technique called prime factor decomposition.

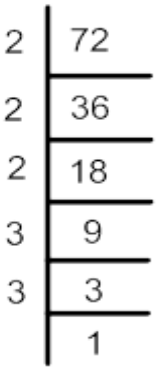
Method 1:

Find the prime factors of 72.

Start with dividing 72 by the smallest prime number that will divide into it . 2 is the smallest and only even prime number.



If the answer is not 1, continue dividing by the smallest prime number until the answer is 1.



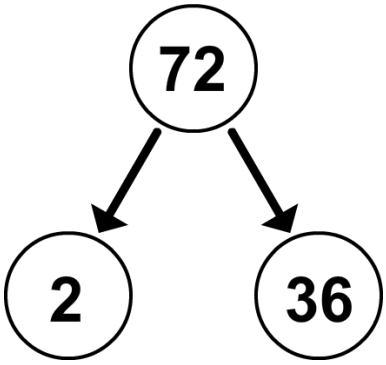
The prime numbers that we have divided by are the prime factors we require. List these with multiplication signs between and then simplify using index notation.

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

Method 2:

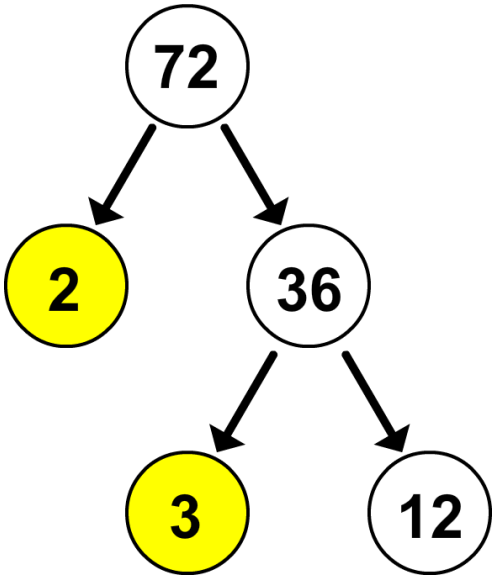
A factor tree can also be used to find the prime factors of a number. A factor tree is a diagram used to break down a number by dividing it by its factors until all the numbers left are prime.

To find the prime factors of 72, start by dividing 72 by a prime number.

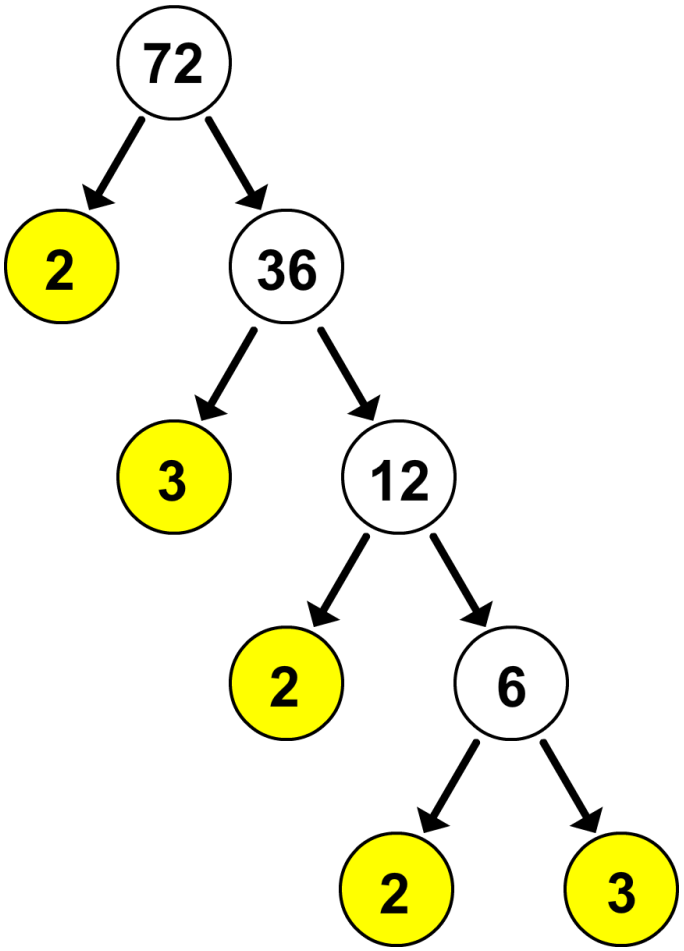


Now we have a factor tree with one level of branches. 36 is not a prime factor so we have to continue the tree branches until we have all the prime factors. So we divide 36 by 3 to get 12 and continue the process until all the factors in the bottom branch of the factor tree are prime.

Highlight any of these factors that are prime.



This is then repeated for all factors:

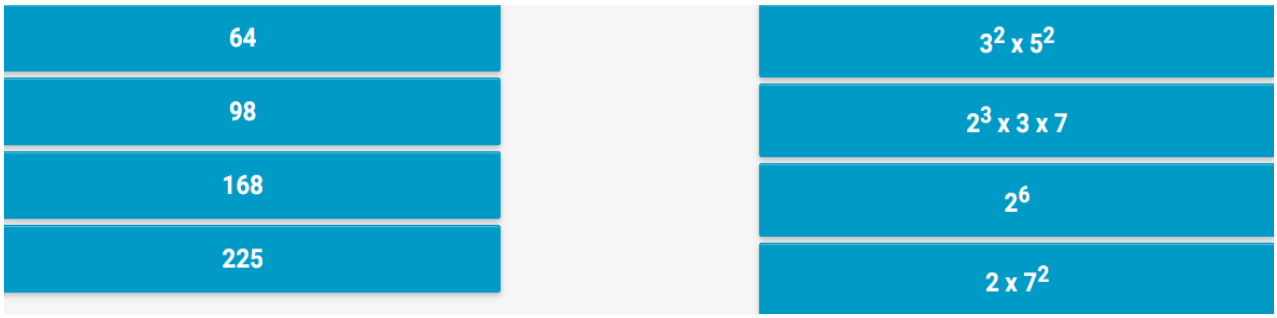


List all the highlighted factors in ascending order with multiplication signs and use index notation to simplify:

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

Exercise

1. Match each number to its prime factors:



2. Write 400 as a product of prime factors.

Circle your answer.