

## Factors and Prime Factorization

The whole numbers that are multiplied to find a product are called factors of that product. A number is divisible by its factors

Write 24 as a product of two whole numbers in all possible ways.

$$1 \cdot 24 \quad 2 \cdot 12 \quad 3 \cdot 8 \quad 4 \cdot 6$$

The factors of 24 are 1, 2, 3, 4, 6, 8, 12, and 24.

Use the factors to find all the rectangular displays with no more than 10 photos in any row or column.

3 rows of 8 photos

6 rows of 4 photos

8 rows of 3 photos

4 rows of 6 photos

There are 4 possible displays.

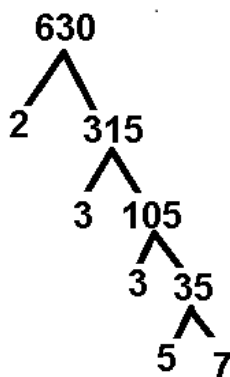
**Prime and Composite Numbers:** A **prime number** is a whole number that is greater than 1 and has exactly two whole number factors, 1 and itself. A **composite number** is a whole number that is greater than 1 and has more than two whole number factors. The number 1 is neither prime nor composite.

Examples of Prime and Composite Numbers		
Number	Factors	Prime or composite
24	1, 2, 3, 4, 6, 8, 12, 24	Composite
41	1, 41	Prime
51	1, 3, 17, 51	Composite
89	1, 89	Prime
121	1, 11, 121	Composite

**Prime Factorization:** When you write a number as a product of prime numbers, you are writing its **prime factorization**.

You can use a diagram called a **factor tree** to write the prime factorization of a number. We start by dividing the given number by the prime numbers 2, 3, 5, 7...

**Example 1:** Write the prime factorization of 630.



$$630 = 2 \cdot 3 \cdot 3 \cdot 5 \cdot 7 = 2 \cdot 3^2 \cdot 5 \cdot 7.$$

**Factors of a Monomial:** A **monomial** is a number, a variable, or the product of a number and one or more variables raised to whole number powers.

Monomials	Not monomials
$7x$	$7 + x$
$25mn^2$	$25m - n^2$
$24y^3z^2$	$24 + y^3 + z^2$

To find the factors a monomial, write the monomial as a product of prime numbers and variables with exponents of 1.

**Example 2:** List all the factors of the monomial of  $28xy^3$ .

$$\begin{aligned} 28xy^3 &= 2 \cdot 2 \cdot 7 \cdot x \cdot y^3 \\ &= 2 \cdot 2 \cdot 7 \cdot x \cdot y \cdot y \cdot y \end{aligned}$$