MATHEMATICS

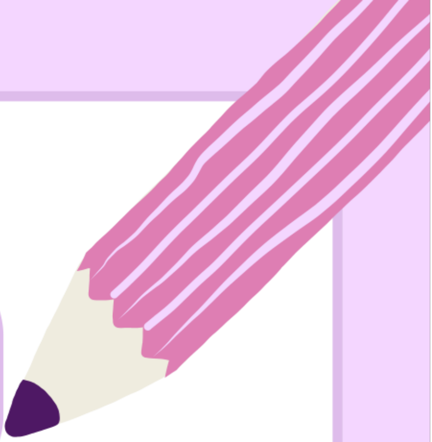
Grade: 8

Prime Factorisation

To find all the factors of a number you can write the number as the product of prime factors, first by writing it as the product of two convenient (composite) factors and then by splitting these factors into smaller factors until all factors are prime. Then you take all the possible combinations of the products of the prime factors.

Example: Find the factors of 84. Write 84 as the product of prime factors by starting with different known factors: $84 = 4 \times 21$ or $84 = 7 \times 12$ or $84 = 2 \times 42 = 2 \times 2 \times 3 \times 7 = 7 \times 3 \times 4 = 2 \times 6 \times 7 = 7 \times 3 \times 2 \times 2 = 2 \times 2 \times 3 \times 7$

Prime Factorisation



A more systematic way of finding the prime factors of a number would be to start with the prime numbers and try the consecutive prime numbers 2; 3; 5; 7; ... as possible factors. The work may be set out as shown below.

2	1 430
5	715
11	143
13	13
	1

$1\,430 = 2 \times 5 \times 11 \times 13$

3	2 457
3	819
3	273
7	91
13	13
	1

$2\,457 = 3 \times 3 \times 3 \times 7 \times 13$

We can use exponents to write the products of prime factors more compactly as products of powers of prime factors.

Integers

The numbers 1; 2; 3; 4 etc. are called the natural numbers. The natural numbers, 0 and the negative whole numbers together are called the integers.

Here is a summary of the properties of integers that make it possible to do calculations with integers:

• When a number is added to its additive inverse, the result is 0, for example (+12) + (−12) = 0.

• Adding an integer has the same effect as subtracting its additive inverse. For example, 3 + (−10) can be calculated by doing 3 − 10, and the answer is −7.

Integers

- Subtracting an integer has the same effect as adding its additive inverse. For example, $3 - (-10)$ can be calculated by doing $3 + 10$, and the answer is 13.

- The product of a positive and a negative integer is negative, for example $(-15) \times 6 = -90$.

- The product of a negative and a negative integer is positive, for example $(-15) \times (-6) = 90$.

Multiplication of whole numbers is associative. This means that in a product with several factors, the factors can be placed in any sequence, and the calculations can be performed in any sequence.

Exponents

Very large numbers are written in scientific notation. Scientific notation is a convenient way of writing very large numbers as a product of a number between 1 and 10 and a power of 10.

Instead of writing $3 \times 3 \times 3 \times 3 \times 3 \times 3$ we can write 3^6.
We read this as "3 to the power of 6". The number 3 is the **base**, and 6 is the **exponent**.
When we write $3 \times 3 \times 3 \times 3 \times 3 \times 3$ as 3^6, we are using **exponential notation**.

Exponents

To square a number is to multiply it by itself. The square of 8 is 64 because 8 × 8 equals 64.

We write 8 × 8 as 8^2 in exponential form.

We read 8^2 as **eight squared**.

To cube a number is to multiply it by itself and then by itself again. The cube of 3 is 27 because 3 × 3 × 3 equals 27.

We write 3 × 3 × 3 as 3^3 in exponential form.

We read 3^3 as **three cubed**.

The square root of 16 is 4 because 4 × 4 = 16.

The question: **Which number was multiplied by itself to get 16?** is written mathematically as $\sqrt{16}$.

The answer to this question is written as $\sqrt{16} = 4$.

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