# 1. Exponents and logarithms

## 1.1 Integer Exponents

### Exponent is a simple way of writing repeated multiplication

### In an expression like , the 2 is called the **base** and the 5 is the **exponent** or **power**

### When we multiply two expressions with the same base, we add their exponents, and when we divide two expressions with the same base we subtract exponents:

### A negative exponent means the extra numbers are in the denominator:

### Any nonzero number raised to the zero power equals 1

### Zero raised to any negative power or null is undefined

### When an exponential expression is raised to a power, we multiply the exponent of the expression by the power to which the expression is raised:

## 1.2 Fractional Exponents

### Since , we then have

### The exponent 1/2 has a special name, the square root, and it also has a special symbol associated with it, . (This symbol is called a **radical**.) Thus we write:

### When asked for the fifth root of 100000, we want the number which, when raised to the fifth power, equals 100000. Since , we have

### When dealing with other powers which are reciprocals of integers, like 1/3,1/4,1/5, and so on,

### we proceed just as with square roots. We can adapt the radical sign to use with other roots by writing for the nth root. For example, is . (When no number is written where the 7 is, then the symbol is assumed to be the square root.)

### As with square roots, numbers raised to the 1/3 power have a special name, **cube roots**.

### When working with fractional powers in which the numerator is not 1, we use our rule for raising exponential expressions to powers backwards: