The comparison of two numbers is an operation that determines whether one number is greater than, less than, or equal to the other number.

A magnitude comparator is a combinational circuit that compares two numbers A and B and determines their relative magnitudes.

The outcome of the comparison is specified by three binary variables that indicate whether \( A > B \), \( A = B \), or \( A < B \).
The circuit for comparing two n-bit numbers has $2^{(2n)}$ entries in the truth table and becomes too cumbersome, even with $n = 3$.

A comparator circuit possesses a certain amount of regularity.

Digital functions that possess an inherent well-defined regularity can usually be designed by means of an algorithm—a procedure which specifies a finite set of steps that, if followed, give the solution to a problem.
The XNOR gate (sometimes spelled "exnor" or "enor" and rarely written NXOR) is a digital logic gate whose function is the inverse of the exclusive OR (XOR) gate.

The two-input version implements logical equality.
The two numbers are equal if all pairs of significant digits are equal:

\[ A_3 = B_3, A_2 = B_2, A_1 = B_1, \quad A_0 = B_0. \]

When the numbers are binary, the digits are either 1 or 0, and the equality of each pair of bits can be expressed logically with an exclusive-NOR function as

\[ x_i = A_i B_i + A'_i B'_i \quad \text{for} \ i = 0, 1, 2, 3 \]
To determine whether $A$ is greater or less than $B$, we inspect the relative magnitudes of pairs of significant digits, starting from the most significant position.

If the two digits of a pair are equal, we compare the next lower significant pair of digits.

The comparison continues until a pair of unequal digits is reached.
Four-bit magnitude comparator