

The scope of precision math for exact-value operations includes the exact-value data types (integer and [DECIMAL](#) types) and exact-value numeric literals. Approximate-value data types and numeric literals are handled as floating-point numbers.

Exact-value numeric literals have an integer part or fractional part, or both. They may be signed. Examples: [1](#), [.2](#), [3.4](#), [-5](#), [-6.78](#), [+9.10](#).

Approximate-value numeric literals are represented in scientific notation with a mantissa and exponent. Either or both parts may be signed. Examples: [1.2E3](#), [1.2E-3](#), [-1.2E3](#), [-1.2E-3](#).

Two numbers that look similar may be treated differently. For example, [2.34](#) is an exact-value (fixed-point) number, whereas [2.34E0](#) is an approximate-value (floating-point) number.

The [DECIMAL](#) data type is a fixed-point type and calculations are exact. In MySQL, the [DECIMAL](#) type has several synonyms: [NUMERIC](#), [DEC](#), [FIXED](#). The integer types also are exact-value types.

The [FLOAT](#) and [DOUBLE](#) data types are floating-point types and calculations are approximate. In MySQL, types that are synonymous with [FLOAT](#) or [DOUBLE](#) are [DOUBLE PRECISION](#) and [REAL](#).

12.25.2 DECIMAL Data Type Characteristics

This section discusses the characteristics of the [DECIMAL](#) data type (and its synonyms), with particular regard to the following topics:

- Maximum number of digits
- Storage format
- Storage requirements
- The nonstandard MySQL extension to the upper range of [DECIMAL](#) columns

The declaration syntax for a [DECIMAL](#) column is [DECIMAL\(M,D\)](#). The ranges of values for the arguments are as follows:

- [M](#) is the maximum number of digits (the precision). It has a range of 1 to 65.
- [D](#) is the number of digits to the right of the decimal point (the scale). It has a range of 0 to 30 and must be no larger than [M](#).

If [D](#) is omitted, the default is 0. If [M](#) is omitted, the default is 10.

The maximum value of 65 for [M](#) means that calculations on [DECIMAL](#) values are accurate up to 65 digits. This limit of 65 digits of precision also applies to exact-value numeric literals, so the maximum range of such literals differs from before. (There is also a limit on how long the text of [DECIMAL](#) literals can be; see [Section 12.25.3, “Expression Handling”](#).)

Values for [DECIMAL](#) columns are stored using a binary format that packs nine decimal digits into 4 bytes. The storage requirements for the integer and fractional parts of each value are determined separately. Each multiple of nine digits requires 4 bytes, and any remaining digits left over require some fraction of 4 bytes. The storage required for remaining digits is given by the following table.

Leftover Digits	Number of Bytes
0	0
1–2	1
3–4	2