To make them unambiguous, you must enclose liberal names in single straight quotes whenever they are used in commands or waveform arithmetic expressions. For example:

```
wave0 = 'miles/hour'
Display 'run 98', 'run 99'
```

NOTE: Writing procedures that work with liberal names requires extra effort and testing on the part of Igor programmers (See **Programming with Liberal Names** on page IV-168). We recommend that you avoid using liberal names until you understand the potential problems and how to solve them.

See **Object Names** on page III-501 for a discussion of object names in general.

Number of Dimensions

Waves can consist of one to four dimensions. You determine this when you make a wave. You can change it using the **Redimension** operation (see page V-788). See Chapter II-6, **Multidimensional Waves** for details.

Wave Data Types

Each wave has data type that determines the kind of data that it stores.You set a wave's data type when you create it. You can change it using the Data Browser, the **Redimension** operation (see page V-788) or the Redimension dialog.

There are three classes of wave data types:

- Numeric data types
- Text
- References (wave referencesand data folder references)

Each numeric data type can be either real or complex. Text and reference data types can not be complex.

Reference data types are used in programming only.

You can programmatically determine the data type of a wave using the **WaveType** function.

Numeric Wave Data Types

This table shows the numeric precisions available in Igor.

Precision	Range	Bytes per Point
Double-precision floating point	10^{-324} to 10^{+307} (~15 decimal digits)	8
Single-precision floating point	10^{-45} to 10^{+38} (~7 decimal digits)	4
Signed 64-bit integer	-2^63 to 2^63 - 1	8
Signed 32-bit integer	-2,147,483,647 to 2,147,483,648	4
Signed 16-bit integer	-32,768 to 32,767	2
Signed 8-bit integer	-128 to 127	1
Unsigned 64-bit integer	0 to 2^64 - 1	8
Unsigned 32-bit integer	0 to 4,294,967,295	4
Unsigned 16-bit integer	0 to 65,535	2
Unsigned 8-bit integer	0 to 255	1

The 64-bit integer types were added in Igor Pro 7.00.