

# Datatypes in C#

<https://csci-1301.github.io/about#authors>

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## 1 Value Types

### 1.1 Numeric

#### 1.1.1 Signed Integer

| Type         | Range   | Size                  |
|--------------|---|-----------------------|
| <b>sbyte</b> | -128 to 127   | Signed 8-bit integer  |
| <b>short</b> | -32,768 to 32,767                                       | Signed 16-bit integer |
| <b>int</b>   | -2,147,483,648 to 2,147,483,647                         | Signed 32-bit integer |
| <b>long</b>  | -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807 | Signed 64-bit integer |

#### 1.1.2 Unsigned Integer

| Type          | Range              | Size                    |
|---------------|--------------------|-------------------------|
| <b>byte</b>   | 0 to 255           | Unsigned 8-bit integer  |
| <b>ushort</b> | 0 to 65,535        | Unsigned 16-bit integer |
| <b>uint</b>   | 0 to 4,294,967,295 | Unsigned 32-bit integer |

| Type         | Range                           | Size                    |
|--------------|---------------------------------|-------------------------|
| <b>ulong</b> | 0 to 18,446,744,073,709,551,615 | Unsigned 64-bit integer |

### 1.1.3 Floating-point Numbers

| Type           | Approximate Range  | Precision                |
|----------------|--|--------------------------|
| <b>float</b>   | $\pm 1.5e-45$ to $\pm 3.4e38$                                      | 7 digits                 |
| <b>double</b>  | $\pm 5.0e-324$ to $\pm 1.7e308$                                    | 15–16 digits             |
| <b>decimal</b> | $(-7.9 \times 10^{28}$ to $7.9 \times 10^{28})/(100$ to $10^{28})$ | 28–29 significant digits |

## 1.2 Logical

| Type        | Possible Values    | Size  |
|-------------|--------------------|-------|
| <b>bool</b> | <b>true, false</b> | 8-bit |

## 1.3 Character

| Type        | Range            | Size                     |
|-------------|------------------|--------------------------|
| <b>char</b> | U+0000 to U+ffff | Unicode 16-bit character |

## 2 Literals

| Name              | Corresponding datatype | Examples                                     |
|-------------------|------------------------|--|
| Integer Literal   | <b>int</b>             | 40, -39, 291838, 0, ...                      |
| Float Literal     | <b>float</b>           | 3.5F, -43.5f, 309430.70006F, ...             |
| Double Literal    | <b>double</b>          | 28.98, 239.0, -391.089, 0.0, ...             |
| Decimal Literal   | <b>decimal</b>         | 8.95m, 3283.9M, -30m, ...                    |
| Boolean Literal   | <b>bool</b>            | <b>true, false</b>                           |
| Character Literal | <b>char</b>            | 'Y', 'a', '0', '\n', '\x0058', '\u0058', ... |

## 3 Compatibility

|                | Integer Literal | Float Literal | Double Literal | Decimal Literal |
|----------------|-----------------|---------------|----------------|-----------------|
| <b>int</b>     | ✓               | ✗             | ✗              | ✗               |
| <b>float</b>   | ✓               | ✓             | ✗              | ✗               |
| <b>double</b>  | ✓               | ✓             | ✓              | ✗               |
| <b>decimal</b> | ✓               | ✗             | ✗              | ✓               |

## 4 Result Type of Operations

|                      | <code>int</code>     | <code>float</code>  | <code>double</code> | <code>decimal</code> |
|----------------------|----------------------|---------------------|---------------------|----------------------|
| <code>int</code>     | <code>int</code>     | <code>float</code>  | <code>double</code> | <code>decimal</code> |
| <code>float</code>   | <code>float</code>   | <code>float</code>  | <code>double</code> | illegal              |
| <code>double</code>  | <code>double</code>  | <code>double</code> | <code>double</code> | illegal              |
| <code>decimal</code> | <code>decimal</code> | illegal             | illegal             | <code>decimal</code> |

## References

- <https://docs.microsoft.com/en-us/dotnet/csharp/tour-of-csharp/types-and-variables>
- <https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/integral-types-table>
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