Datatypes in C#

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

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# Value Types

## Numeric

### Signed Integer

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

### Unsigned Integer

| Type | Range | Size |
| --- | --- | --- |
| byte | 0 to 255 | Unsigned 8-bit integer |
| ushort | 0 to 65,535 | Unsigned 16-bit integer |
| uint | 0 to 4,294,967,295 | Unsigned 32-bit integer |
| ulong | 0 to 18,446,744,073,709,551,615 | Unsigned 64-bit integer |

### Floating-point Numbers

| Type | Approximate Range | Precision |
| --- | --- | --- |
| float | ±1.5e−45 to ±3.4e38 | 7 digits |
| double | ±5.0e−324 to ±1.7e308 | 15–16 digits |
| decimal | (-7.9 x 1028 to 7.9 x 1028)/(100 to 1028) | 28–29 significant digits |

## Logical

| Type | Possible Values | Size |
| --- | --- | --- |
| bool | true, false | 8-bit |

## Character

| Type | Range | Size |
| --- | --- | --- |
| char | U+0000 to U+ffff | Unicode 16-bit character |

# Literals

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

# Compatibility

|  | **Integer Literal** | **Float Literal** | **Double Literal** | **Decimal Literal** |
| --- | --- | --- | --- | --- |
| int | $✓$ | ✘ | ✘ | ✘ |
| float | $✓$ | $✓$ | ✘ | ✘ |
| double | $✓$ | $✓$ | $✓$ | ✘ |
| decimal | $✓$ | ✘ | ✘ | $✓$ |

# Result Type of Operations

|  | int | float | double | decimal |
| --- | --- | --- | --- | --- |
| int | int | float | double | decimal |
| float | float | float | double | illegal |
| double | double | double | double | illegal |
| decimal | decimal | illegal | illegal | decimal |

# 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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* <https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/implicit-numeric-conversions-table>
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