

CSCI 1301 – Datatypes in C#

1 Value Types

1.1 Numeric

1.1.1 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 |

1.1.2 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 |

1.1.3 Floating-point Numbers

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

1.2 Logical

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

1.3 Character

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

2 Literals

| Name | Corresponding datatype | Examples |
|-------------------|------------------------|--|
| Integer Literal | int | 40, -39, 291838, 0, ... |
| Float Litteral | 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', ... |

3 Compatibility

| | Integer Litteral | Float Litteral | Double Litteral | Decimal Litteral |
|----------------|------------------|----------------|-----------------|------------------|
| int | ✓ | | | |
| float | ✓ | ✓ | | |
| double | ✓ | ✓ | ✓ | |
| decimal | ✓ | ✓ | ✓ | ✓ |

You can test this compatibility chart for yourself using the project at <http://spots.augusta.edu/caubert/teaching/2019/fall/csci1301/shared/datatypes/DatatypeTest.zip>.

4 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>
- <https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/floating-point-types-table>
- <https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/value-types-table>
- <https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/implicit-numeric-conversions-table>
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