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Data types in Java

There are majorly two types of languages. First one is **Statically typed language** where each variable and expression type is already known at compile time. Once a variable is declared to be of a certain data type, it cannot hold values of other data types. Example: C, C++, Java. Other, **Dynamically typed languages**: These languages can receive different data types over the time. Ruby, Python

Java is **statically typed and also a strongly typed language** because in Java, each type of data (such as integer, character, hexadecimal, packed decimal, and so forth) is predefined as part of the programming language and all constants or variables defined for a given program must be described with one of the data types.

Java has two categories of data:

- Primitive data (e.g., number, character)
- Object data (programmer created types)

Primitive data

Primitive data are only single values; they have no special capabilities. There are 8 primitive data types

TYPE	DESCRIPTION	DEFAULT	SIZE	EXAMPLE LITERALS
boolean	true or false	false	1 bit	true, false
byte	twos complement integer	0	8 bits	(none)
char	unicode character	\u0000	16 bits	'a', '\u0041', '\101', '\w', '\t', '\n', '\b'
short	twos complement integer	0	16 bits	(none)
int	twos complement integer	0	32 bits	-2, -1, 0, 1, 2
long	twos complement integer	0	64 bits	-2L, -1L, 0L, 1L, 2L
float	IEEE 754 floating point	0.0	32 bits	1.23e100f, -1.23e-100f, .3f, 3.14F
double	IEEE 754 floating point	0.0	64 bits	1.23456e300d, -1.23456e-300d, 1e1d



boolean

boolean data type represents only one bit of information **either true or false** . Values of type boolean are not converted implicitly or explicitly (with casts) to any other type. But the programmer can easily write conversion code.

```
// A Java program to demonstrate boolean data type
class GeeksforGeeks
{
    public static void main(String args[])
    {
        boolean b = true;
        if (b == true)
            System.out.println("Hi Geek");
    }
}
```

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Output:

Hi Geek

byte

The byte data type is an 8-bit signed two's complement integer. The byte data type is useful for saving memory in large arrays.

- Size: 8-bit
- Value: -128 to 127

```
// Java program to demonstrate byte data type in Java
class GeeksforGeeks
{
    public static void main(String args[])
    {
        byte a = 126;

        // byte is 8 bit value
        System.out.println(a);

        a++;
        System.out.println(a);

        // It overflows here because
        // byte can hold values from -128 to 127
        a++;
        System.out.println(a);

        // Looping back within the range
        a++;
        System.out.println(a);
    }
}
```

[Run on IDE](#)

Output:

```
126
127
-128
-127
```

short

The short data type is a 16-bit signed two's complement integer. Similar to byte, use a short to save memory in large arrays, in situations where the memory savings actually matters.

- **Size:** 16 bit
- **Value:** -32,768 to 32,767 (inclusive)

int

It is a 32-bit signed two's complement integer.

- **Size:** 32 bit
- **Value:** -2^{31} to $2^{31}-1$

Note: In Java SE 8 and later, we can use the int data type to represent an unsigned 32-bit integer, which has value in range $[0, 2^{32}-1]$. Use the Integer class to use int data type as an unsigned integer.

long:

The long data type is a 64-bit two's complement integer.

- Size: 64 bit
- Value: -2^{63} to $2^{63}-1$.

Note: In Java SE 8 and later, you can use the long data type to represent an unsigned 64-bit long, which has a minimum value of 0 and a maximum value of $2^{64}-1$. The Long class also contains methods like compareUnsigned, divideUnsigned etc to support arithmetic operations for unsigned long.

Floating point Numbers : float and double

float

The float data type is a single-precision 32-bit IEEE 754 floating point. Use a float (instead of double) if you need to save memory in large arrays of floating point numbers.

- **Size:** 32 bits
- **Suffix :** F/f Example: 9.8f

double:

The double data type is a double-precision 64-bit IEEE 754 floating point. For decimal values, this data type is generally the default choice.

Note: Both float and double data types were designed especially for scientific calculations, where approximation errors are acceptable. If accuracy is the most prior concern then, it is recommended not to use these data types and use **BigDecimal** class instead.

Please see this for details: Rounding off errors in Java

char

The char data type is a single 16-bit Unicode character. A char is a single character.

- Value: '\u0000' (or 0) to '\uffff' 65535

```
// Java program to demonstrate primitive data types in Java
class GeeksforGeeks
{
    public static void main(String args[])
    {
        // declaring character
        char a = 'G';

        // Integer data type is generally
        // used for numeric values
        int i=89;

        // use byte and short if memory is a constraint
        byte b = 4;

        // this will give error as number is
        // larger than byte range
        // byte b1 = 7888888955;

        short s = 56;

        // this will give error as number is
        // larger than short range
        // short s1 = 87878787878;

        // by default fraction value is double in java
        double d = 4.355453532;

        // for float use 'f' as suffix
        float f = 4.7333434f;

        System.out.println("char: " + a);
    }
}
```

```
        System.out.println("integer: " + i);
        System.out.println("byte: " + b);
        System.out.println("short: " + s);
        System.out.println("float: " + f);
        System.out.println("double: " + d);
    }
}
```

[Run on IDE](#)

Output:

```
char: G
integer: 89
byte: 4
short: 56
float: 4.7333436
double: 4.355453532
```

Quiz on Data Type in Java

This article is contributed by **Shubham Agrawal**. If you like GeeksforGeeks and would like to contribute, you can also write an article using contribute.geeksforgeeks.org or mail your article to contribute@geeksforgeeks.org. See your article appearing on the GeeksforGeeks main page and help other Geeks.

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