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Chapter 1 - Variables and datatypes

Just like we have some rules that we follow to speak english (the grammar), we have some rules to follow while writing a Java program. The set of these rules is called syntax.

↳ Vocabulary & Grammar of Java.

Variables

A variable is a container that stores a value. This value can be changed during the execution of the program.

Example:

```
int number = 8;
```

int → Data type; number → variable name; 8 → Value it stores!

Rules for declaring a variable name

We can choose a name while declaring a Java variable if the following rules are followed:

1. Must not begin with a digit → int 1arry; is invalid!
2. Name is case sensitive → harry and Harry are different!
3. Should not be a keyword (like Void)
4. White Space not allowed. → int Code With Harry; is invalid
5. Can contain alphabets, $ character, _ character and digits if the other conditions are met.

Data Types

Data types in Java fall under the following categories

1. Primitive Data Types (Intrinsic)
2. Non-Primitive Data Types (Derived)

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Primitive Data Types

Java is Statically typed. → Variables must be declared before use!

There are 8 primitive data types supported by Java:

1) byte →
   - Value ranges from -128 to 127
   - Takes 1 byte
   - Default value is 0

2) Short →
   - Value ranges from $-(2^{16})/2$ to $(2^{16})/2 - 1$
   - Takes 2 bytes
   - Default value is 0

3) int →
   - Value ranges from $-(2^{32})/2$ to $(2^{32})/2 - 1$
   - Takes 4 bytes
   - Default value is 0

4) float →
   - Value ranges from (See Docs)
   - Takes 4 bytes
   - Default value is 0.0f

5) long →
   - Value ranges from $-(2^{64})/2$ to $(2^{64})/2 - 1$
   - Takes 8 bytes
   - Default value is 0

6) double →
   - Value ranges from (See docs)
   - Takes 8 bytes
   - Default value is 0.0d

7) char →
   - Value ranges from 0 to 65535 ($2^{16}-1$)
   - Takes 2 bytes → because it supports unicode
   - Default value is '\u0000'

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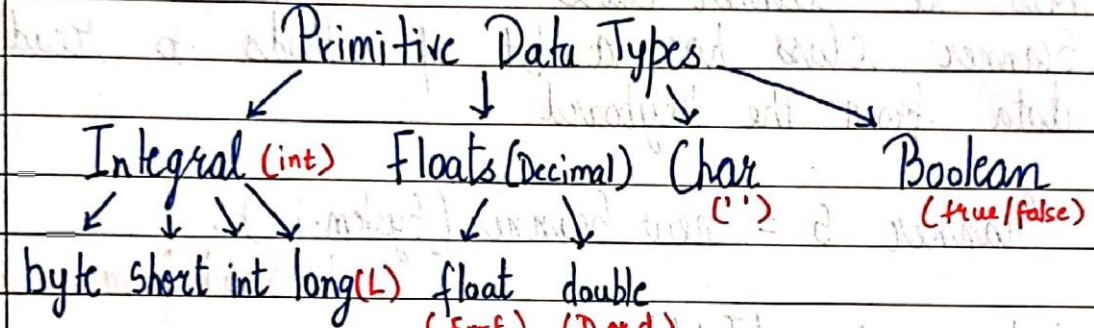
8. boolean →
- Value can be true or false
- Size depends on JVM
- Default value is false

Quick Quiz : Write a Java program to add three numbers.

How to choose data types for our Variables



In order to choose the data type we first need to find the type of data we want to store. After that we need to analyze the Min & Max value we might use

Literals

A constant value which can be assigned to the variable is called as a literal

101 → Integer literal
10.1f → Float literal
10.1 → double Literal (default type for decimals)
'A' → character literal
true → boolean Literal
"Harry" → String Literal

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Keywords

Words which are reserved and used by the Java Compiler. They cannot be used as an Identifier.

↓

Go to docs.oracle.com for a comprehensive list!

Reading data from the Keyboard

In order to read data from the keyboard, Java has a Scanner class.

Scanner class has a lot of methods to read the data from the keyboard

```
Scanner s = new Scanner(System.in);
```

↳ Read from the Keyboard

```
int a = s.nextInt();
```

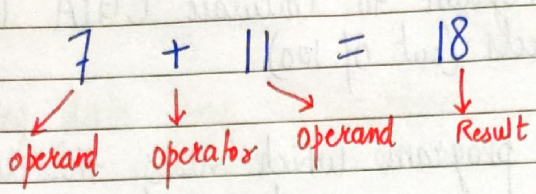
↳ Method to read from the keyboard (Integer in this case)

Exercise 1.1

Write a Program to calculate percentage of a given student in CBSE board exam. His marks from 5 subjects must be taken as input from the keyboard. (Marks are out of 100).

Chapter 2 - operators and Expressions

Operators are used to perform operations on variables and values.



Types of operators

- → Arithmetic operators → +, -, *, /, %, ++, --
- → Assignment operators → =, +=
- → Comparison operators → ==, >=, <=
- → Logical operators → &&, ||, !
- → Bitwise Operators → &, | (operates bitwise)

Arithmetic operators cannot work with booleans
% operator can work on floats & doubles

Precedence of operators

The operators are applied and evaluated based on precedence. For example (+, -) has less precedence compared to (*, /). Hence * & / are evaluated first.
In case we like to change this order, we use parenthesis

Associativity

Associativity tells the direction of execution of operators
It can either be Left to Right or Right to left

- * / → L to R
- + - → L to R
- ++, = → R to L

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Quick Quiz: How will you write the following expressions in Java?

$\frac{x-y}{2}$, $\frac{b^2-4ac}{2a}$, v^2-u^2, $a*b-d$

Resulting data type after arithmetic operation
following table summarizes the resulting data types after arithmetic operation on them

```
R = b + 5 → int
R = 5 + i → int
R = l + f → float
R = i + f → float
R = c + i → int
R = c + 5 → int
R = l + d → double
R = f + d → double
```

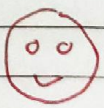
b → byte f → float
s → short d → double
i → integer c → character
l → long

Increment and Decrement operators
a++ , ++a → Increment operators → Data type
a-- , --a → Decrement operators → remains same

These will operate on all data types except booleans

Quick Quiz: Try increment and decrement operators on a Java variable

a++ → first use the value and then increment
++a → first increment the value then use it



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Quick Quiz: What will be the value of the following expression (x).

```
int y = 7;
int x = ++y * 8;
```

Value of x?

```
Char a = 'B';
a++;
```

→ a is now 'C'