Introduction to Computer Science I

Variables, Primitive Data Types, Expressions

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Data Types

- Data stored in memory is a string of bits (0 or 1)
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- Data stored in memory is a string of bits (0 or 1)
- How the computer interprets the string of bits depends on the context.
- In Java, we must make the context explicit by specifying the type of the data.
Data Types

- Java has two categories of data:
  - primitive data (e.g., number, character)
  - object data (programmer created types)
- There are 8 primitive data types: `byte`, `short`, `int`, `long`, `float`, `double`, `char`, `boolean`
- Primitive data are only single values; they have no special capabilities.
Primitive Data Types

- integers: byte, short, int, long
- floating point: float, double
- characters: char
- booleans: boolean
## Common Primitive Data Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Example of Literals</th>
</tr>
</thead>
<tbody>
<tr>
<td>int</td>
<td>integers (whole numbers)</td>
<td>42, 60634, -8</td>
</tr>
<tr>
<td>double</td>
<td>real numbers</td>
<td>0.039, -10.2</td>
</tr>
<tr>
<td>char</td>
<td>single characters</td>
<td>'a', 'B', '&amp;', '6'</td>
</tr>
<tr>
<td>boolean</td>
<td>logical values</td>
<td>true, false</td>
</tr>
</tbody>
</table>
## Range of Values

<table>
<thead>
<tr>
<th>Type</th>
<th>Storage</th>
<th>Range of Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>int</td>
<td>32 bits</td>
<td>-2,147,483,648 to 2,147,483,647</td>
</tr>
<tr>
<td>double</td>
<td>64 bits</td>
<td>$\pm 10^{-45}$ to $\pm 10^{38}$</td>
</tr>
<tr>
<td>char</td>
<td>16 bits = 2 bytes</td>
<td>0 to $2^{16}$ or £u0000 to £uFFFF</td>
</tr>
<tr>
<td>boolean</td>
<td>1 bit</td>
<td>NA</td>
</tr>
</tbody>
</table>
Expression is a combination of one or more operators (+, −, %, ...) and operands (literals, constants, variables, ...).
Order of Precedence

- Operators are evaluated in an expression according to the rules of precedence.
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- Operators are evaluated in an expression according to the rules of precedence.
- Operators within ( ) are evaluated first.
- *, /, % evaluated next (L to R).
- +, - evaluated last (L to R).
The `Scanner` class in the `java.util` package is a simple text scanner which can parse primitive types and strings.

We can use the `Scanner` class to get the input from the terminal.

We must create an instance of the `Scanner` as:

```java
Scanner name = new Scanner (System.in)
```

where `name` is the name you choose for your instance of the `Scanner`.
Scanner Methods

- next() : get the next word (token) as a String
- nextLine() : get a line of input as a String
- nextInt() : get an integer
- nextDouble() : get a double value