

## Logical expressions

There are three logical operators in Java that can be applied to `boolean` expressions:

`&&`    logical AND

`||`    logical OR

`!`    logical NOT (unary operator)

AND has higher priority than OR, so that

`a || b && c`  $\equiv$  `a || ( b && c )`

but again, it is always better to put parentheses to explicitly define the order of operations.

The logical operations in Java exhibit so-called *short-circuiting behavior*, which means that the second operand is evaluated only if needed.

This feature is very useful when a part of an expression cannot be evaluated (will cause error) if another part is not true. For example, let `destinations` be a collection of places an agent in the model must visit. To test if the first place to visit is London, you can write:

|   |   |  |
|---|---|--|
| <code>destinations != null &amp;&amp; destinations.size() &gt; 0 &amp;&amp; destinations.get(0).equals( "London" )</code> |   |  |
| <div></div>   | <div></div>                                   | <div></div>  |
| 1. Evaluated first  | 2. Evaluated after 1<br>and only if 1 is true | 3. Evaluated after 1 and 2 only<br>if they both are true |

*Short-circuiting behavior of logical operations*

Here we first test if the list of destinations exists at all (does not equal `null`), then, if it exists, we test if it has at least one element (its size is greater than 0), and if yes, we compare that element with the string `"London"`.