The values of primitive type boolean are true and false. The operators are:

- ! (meaning negation, of complement. !true is false and !false is true)
- && (and, or conjunction. b && c is true iff both b and c are true; otherwise it is false)
- || (or, or disjunction. b || c is true if b or c (or both) is true; otherwise it is false)

**Operator precedences**

Operator ! has highest precedence, then &&, and finally ||. There is no universal tradition for the relative precedences of && and ||, and we recommend always using parentheses when they appear next to each other in an expression, as in

\[(x < 5 \quad \&\& \quad y == 5) \quad || \quad z == 2\]

**Short circuit evaluation**

Operations b && c and b || c are evaluated left-to-right using short-circuit evaluation. That means that as soon as the answer is known, evaluation stops. There are two cases to explain:

- false && c evaluation does not evaluate c; it simply yields the value false
- true || c evaluation does not evaluate c; it simply yields the value true

Short-circuit evaluation helps to shorten and simplify code. For example, the following expression is true iff j is not 0 and k / j is most 50; division by 0 does not occur if j is 0:

\[j \neq 0 \quad \&\& \quad k / j \leq 50\]

**Expressions with boolean values**

Relational expressions d == e, d != e, d < e, d <= e, d > e, and d >= e all evaluate to a boolean value — either true or false — and can thus be used in boolean expressions.

**Operators & and |**

Operators & and | can also be used but we recommend against their use as boolean operations. They are bitwise operations, and we do not discuss them. Short-circuit evaluation is not used for them.

**Comparison with other languages**

Some languages, e.g. C, use integers as booleans; 0 represents false and any other integer represents true. This does not work in Java.

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