Practice problems with relational expressions.

**Logical operators**

Logical operators take boolean operands. In other words, the logical operators are used to compare two boolean values.

In Java the logical operators are:

|  |  |
| --- | --- |
| **Logical Operator** | **Meaning** |
| && | And (and at the same time) |
| || | Or (one or the other) |
| ! | Not (negation or reversal) |

Truth tables help us evaluate the logical operators. To read the table, look at the table for the && operator. If both operands are true, the result is true. If either operand is false the result is false. NOTE: Memorize the truth tables.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| && | true | false |  | || | true | false |  | ! | true | false |
| true | **true** | **false** |  | true | **true** | **true** |  |  | false | true |
| false | **false** | **false** |  | false | **true** | **false** |  |  |  |  |

Examples: !true is false

true && false is false

3 > 12 || 13 == 12 is true

**1. BOARD: Evaluating logical expressions**. Using the variables, types, and values in the chart below, evaluate each expression and write your result as true or false. You may use a calculator.

|  |  |  |
| --- | --- | --- |
| **Variable** | **Data type** | **value** |
| blue | char | ‘b’ |
| red | char | ‘R’ |
| yes | boolean | true |
| no | boolean | false |
| hiVal | int | 999 |
| loVal | int | -999 |
| code | char | ‘@’ |
| grade | double | 89.5 |
| amount | double | 50.00 |

|  |  |
| --- | --- |
| **Expression** | **Result** |
| a. (blue > red) && yes |  |
| b. (blue <= red) || no |  |
| c. (yes == no) || (code > blue) |  |
| d. yes || no |  |
| e. no && true |  |
| f. !(yes && no) |  |
| g. (yes || (no && (blue > red))) || (grade <= 100) |  |
| h. (amount <= hiVal) && (amount >= loVal) |  |
| i. (amount <= hiVal) || (amount >= loVal) |  |
| j. ((amount + 10000) <= hiVal) || (amount >= loVal) |  |
| k. (code < red) || no |  |