# Relational and Logical Operators

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## Relational Operators

- Relational operators are used to represent conditions (such as “space ≤ 0” in the water tank example)
- Result of the condition is either true or false
- In MATLAB:
  - false is represented by 0
  - true is represented by 1 (non-zero)



## Relational Operators

| Operation | Result |
|---|---|
| 3 < 4 | 1 |
| 3 <= 4 | 1 |
| 3 == 4 | 0 |
| 3 ~= 4 | 1 |
| 3 > 4 | 0 |
| 4 >= 4 | 1 |
| ‘A’ < ‘B’ | 1 |



## Relational Operators

- Don’t confuse equivalance (==) with assignment (=)
- Be careful about roundoff errors during numeric comparisons (you can represent “x == y” as “abs(x-y) < eps”)
- Relational operations have lower priority than arithmetic operations (use parentheses to be safe, though)



## Logical Operators

- More complex conditions can be represented by combining relational operations using logic operators
- Logical operators:

| | |
|---|---|
| & | AND |
| \| | OR |
| xor | Exclusive OR |
| ~ | NOT |



## Logical Operators

| input a | input b | and a & b | or a \| b | xor xor(a,b) | not ~a |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 1 | 0 | 0 |

# Operator Hierarchy

- Processing order of operations:
  - parenthesis (starting from the innermost)
  - exponentials (left to right)
  - multiplications and divisions (left to right)
  - additions and subtractions (left to right)
  - relational operators (left to right)
  - ~ operators
  - & operators (left to right)
  - | operators (left to right)