FLOW-CHARTS AND STRUCTURED PROGRAMMING

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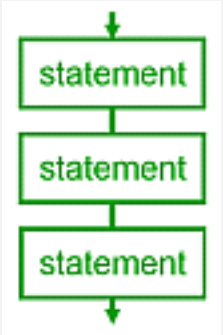
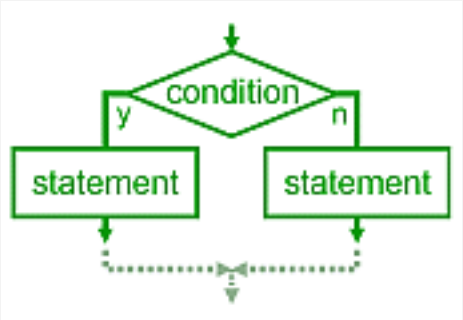
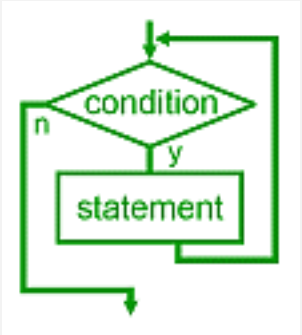
Böhm–Jacopini theorem

A flowchart can compute any computable function if it combines subprograms in only three specific ways (control structures):

1. executing one subprogram, and then another subprogram (sequence);
2. executing one of two subprograms according to the value of a boolean expression (selection); and
3. repeatedly executing a subprogram as long as a boolean expression is true (iteration).

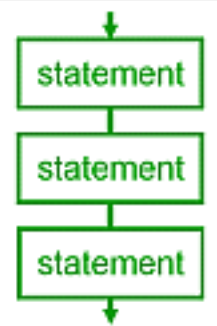


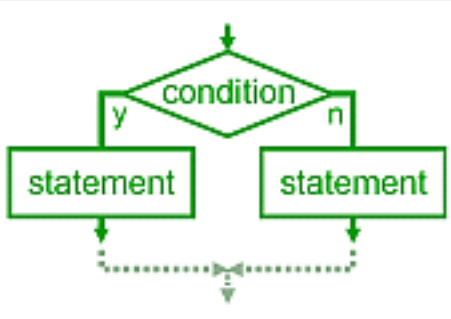


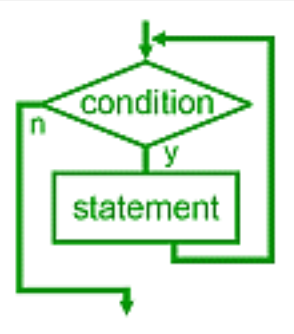


Böhm–Jacopini theorem

Böhm–Jacopini theorem is also known as the structured program theorem; therefore, when a program follows the rules of this theorem, such program is defined as a structured program.

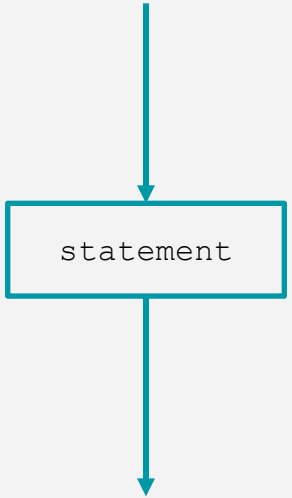






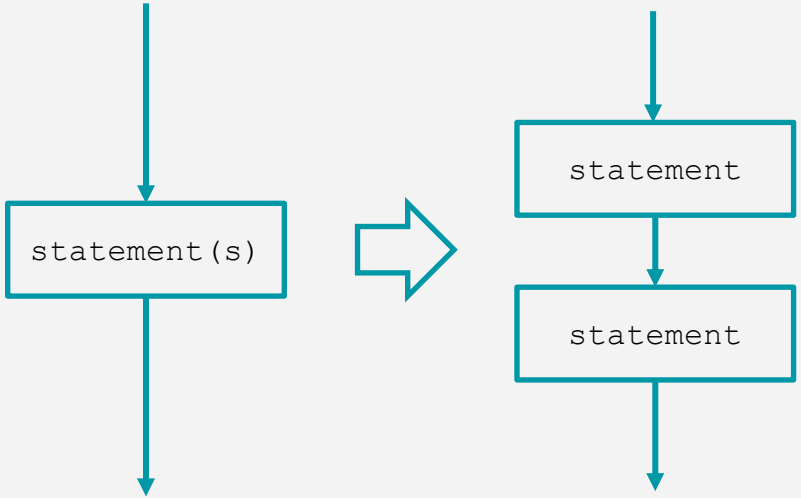
Statement

Flow chart:



Statements

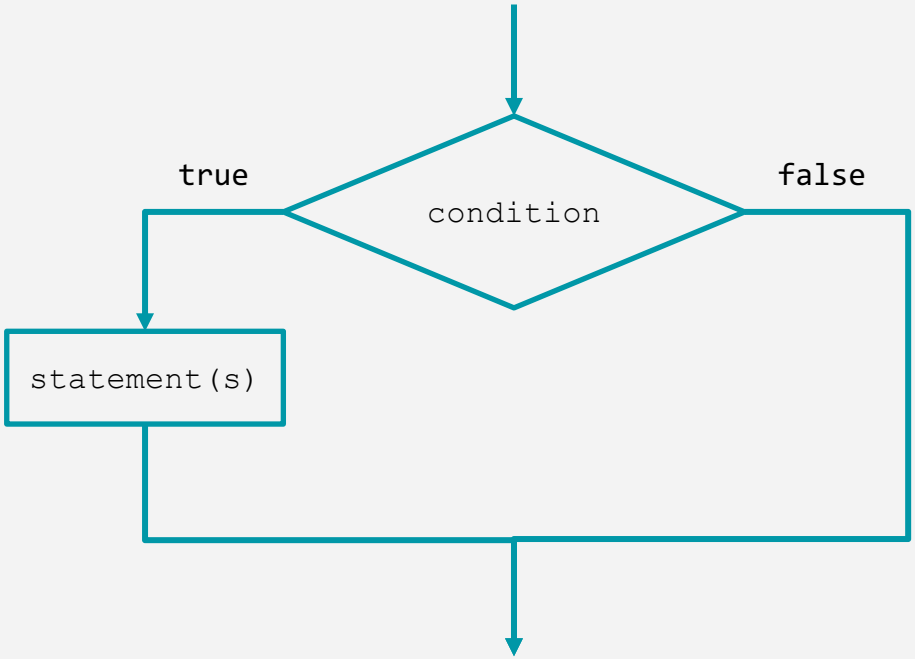
Flow chart:



Can be include more
than one statement…

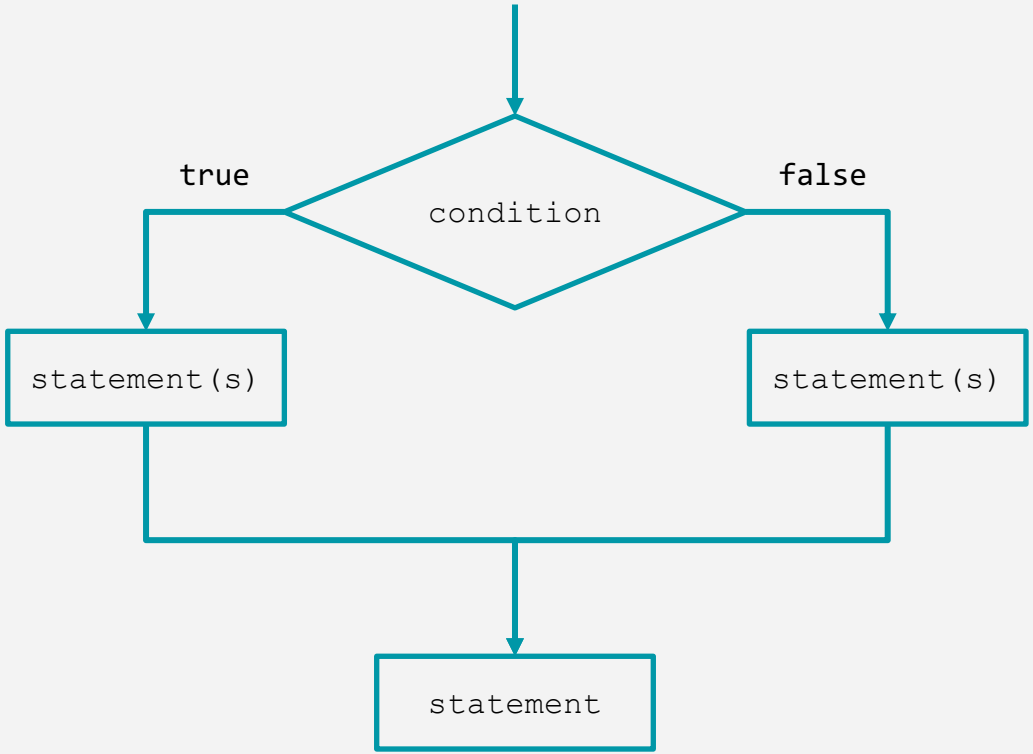
Selection statements: if then

Flow chart:



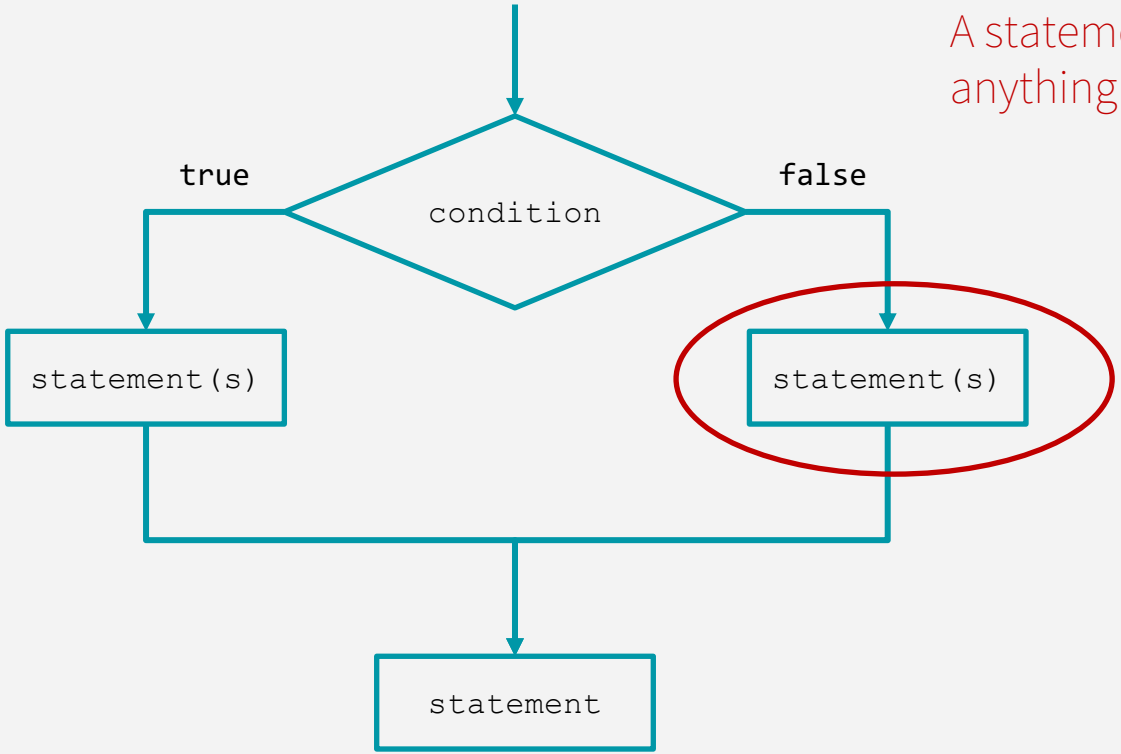
Selection statements: if then else

Flow chart:



Selection statements: if then else

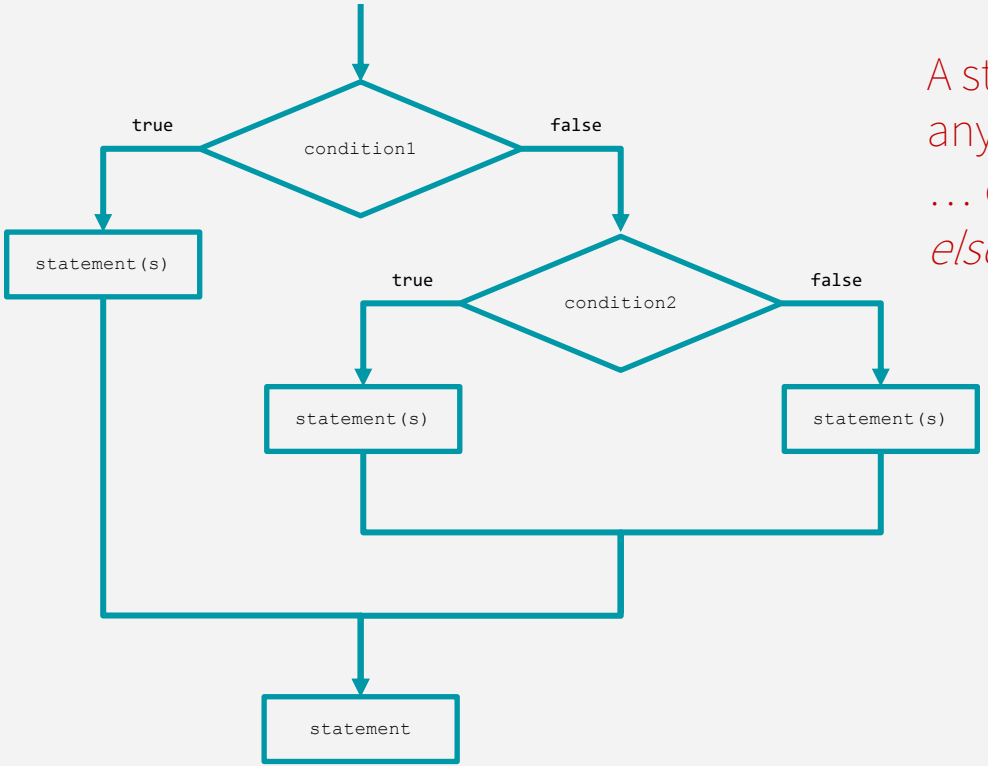
Flow chart:



A statement can be anything…

Selection statements: nested if then else

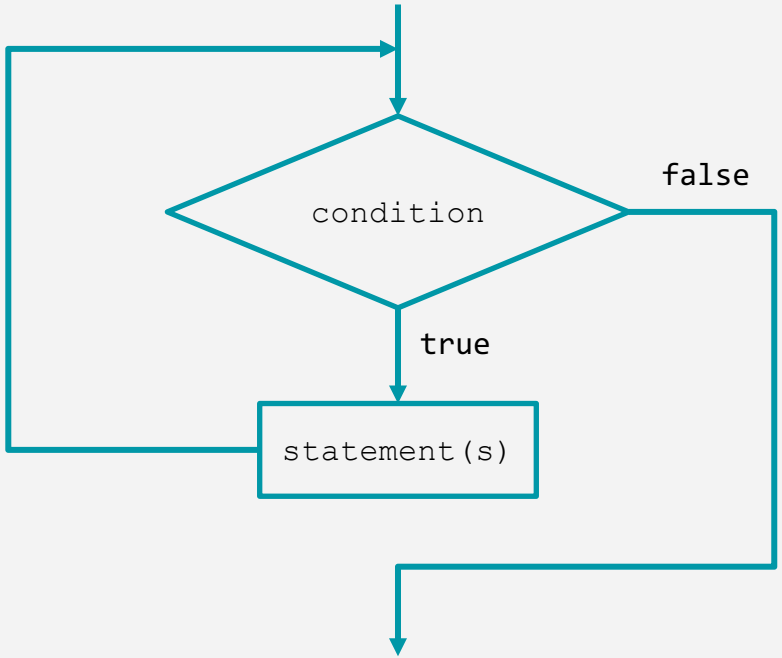
Flow chart:



A statement can be anything…
… even another *if then else* statement!

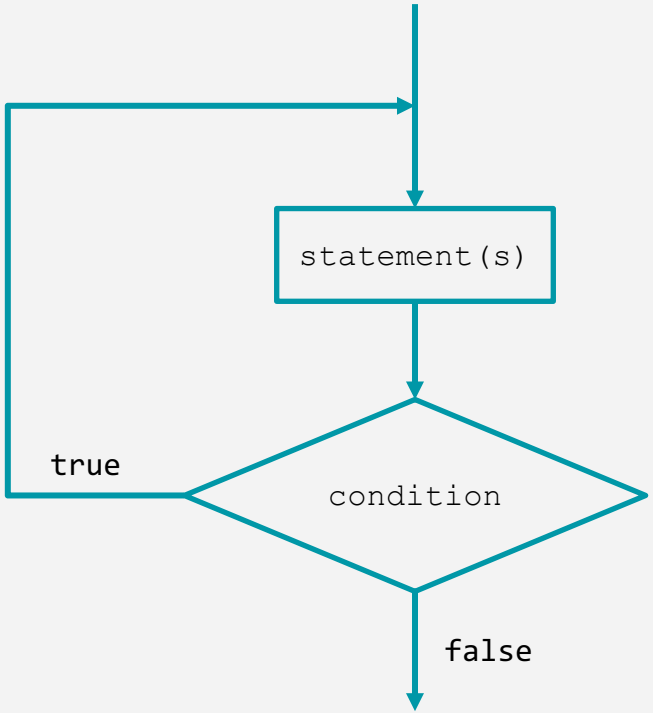
Iteration statement: while loop

Flow chart:



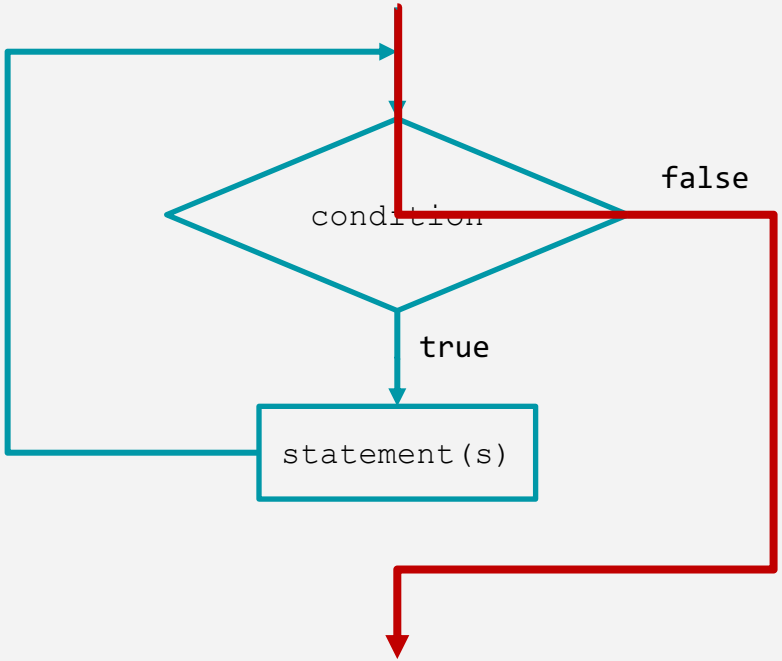
Iteration statement: repeat-until

Flow chart:

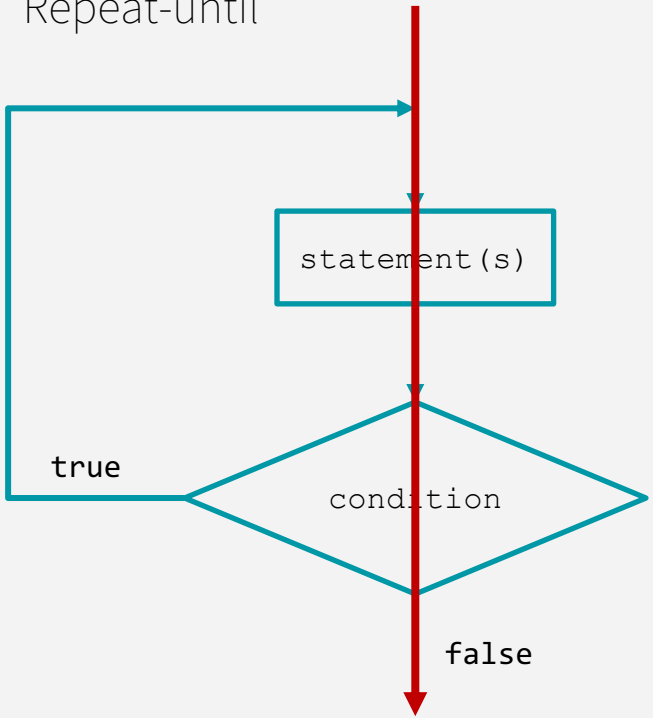


Difference between iteration statements

While



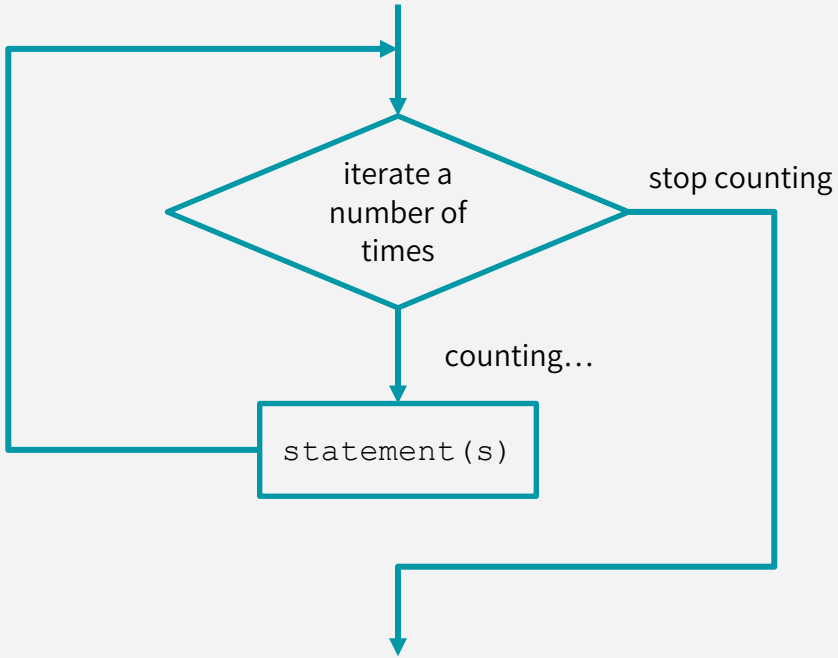
Repeat-until



In case the condition is **`false`**, **`while`** will skip the statements in the loop, whereas **`repeat-until`** will execute them at least once.

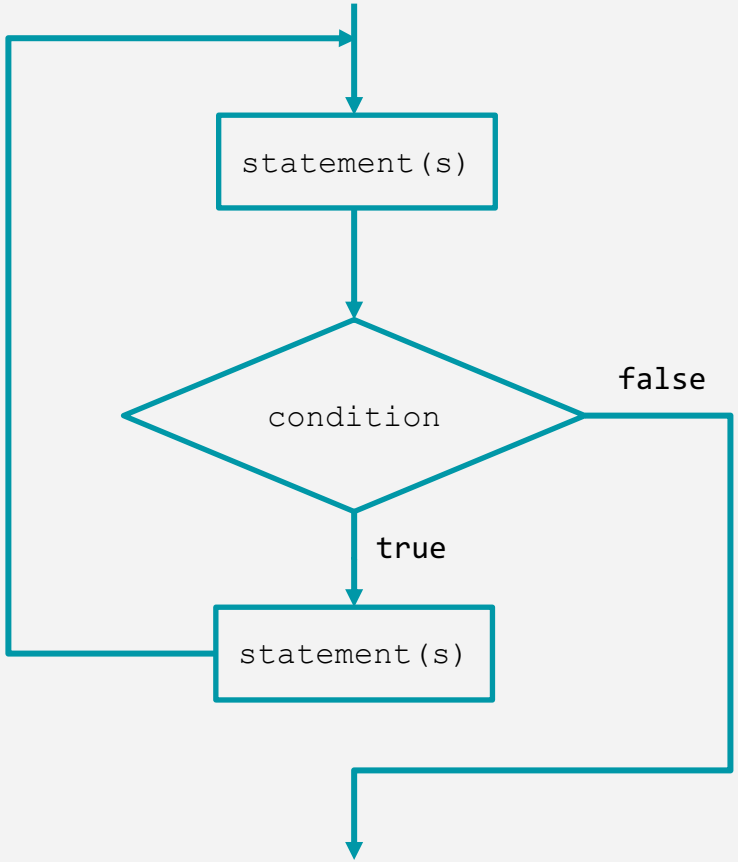
Iteration statement: counting

Flow chart:



Example of a non-structured statement

THIS IS A WRONG FLOW CHART!



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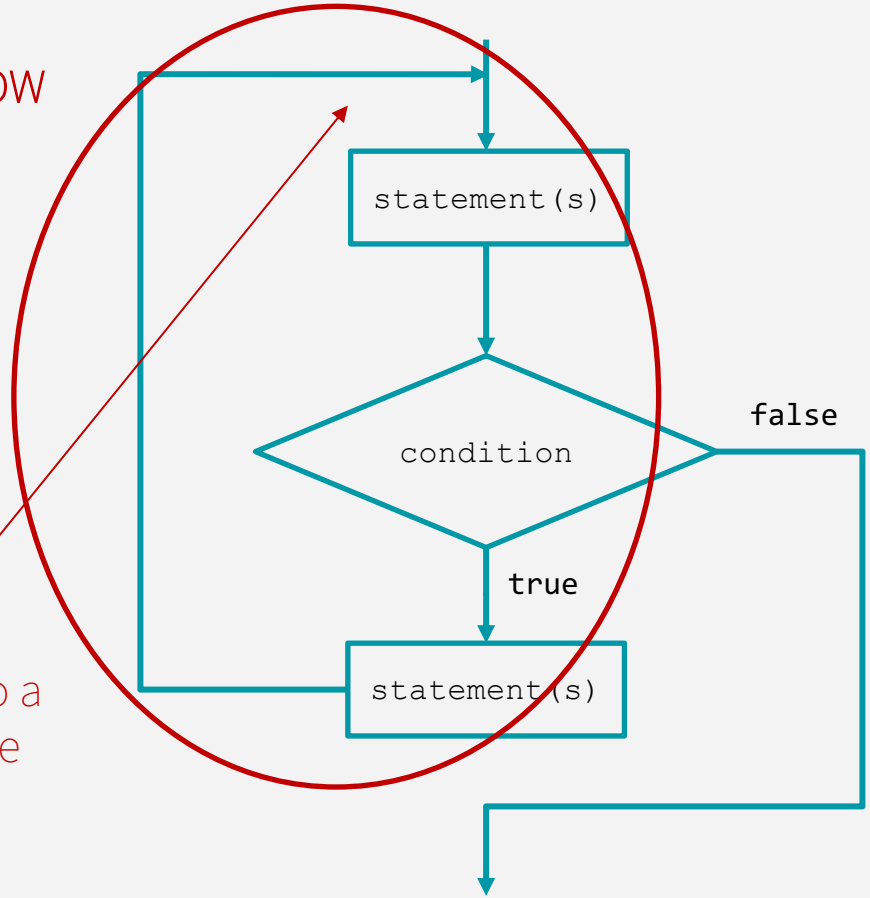
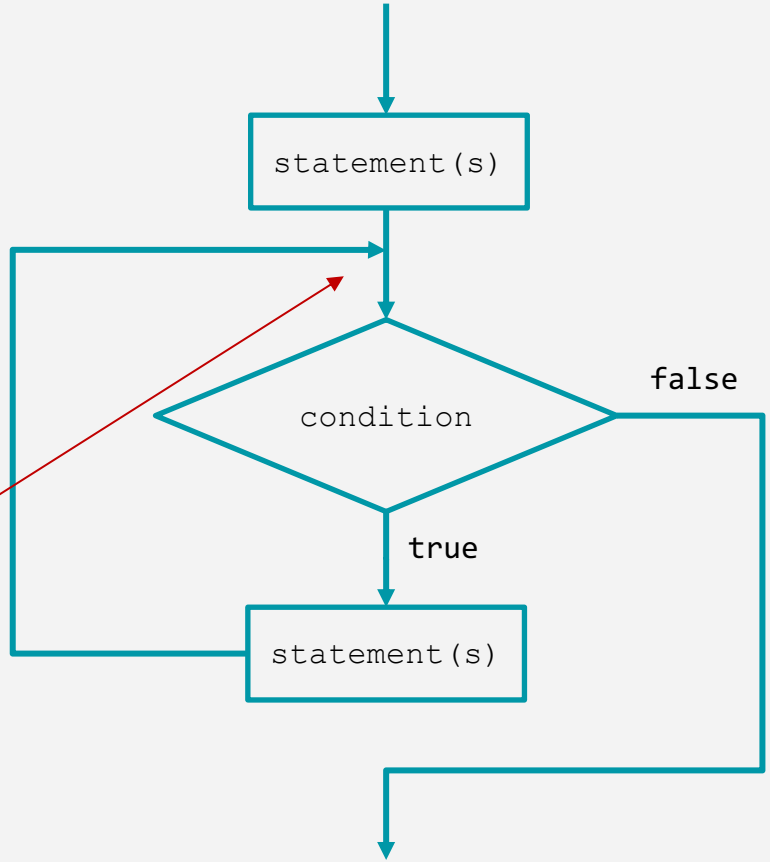


The loop is jumping to a random location of the flow chart…!

Example of a structured statement

THIS IS A CORRECT FLOW CHART



Instead, it should return exactly before the condition, which is a controlled location!