

# Week 2: Weakest Preconditions

"The Virgin"

Postcondition

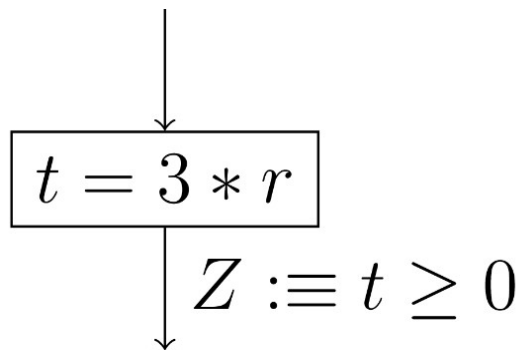
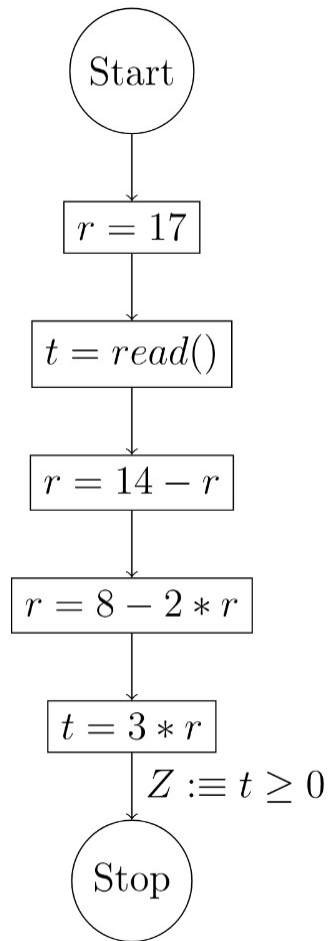


THE CHAD

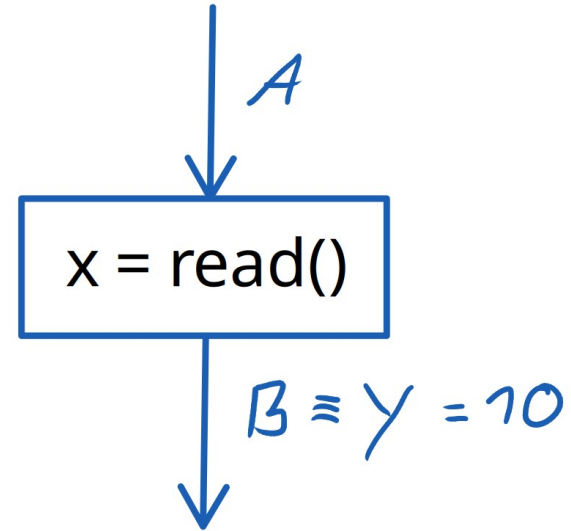
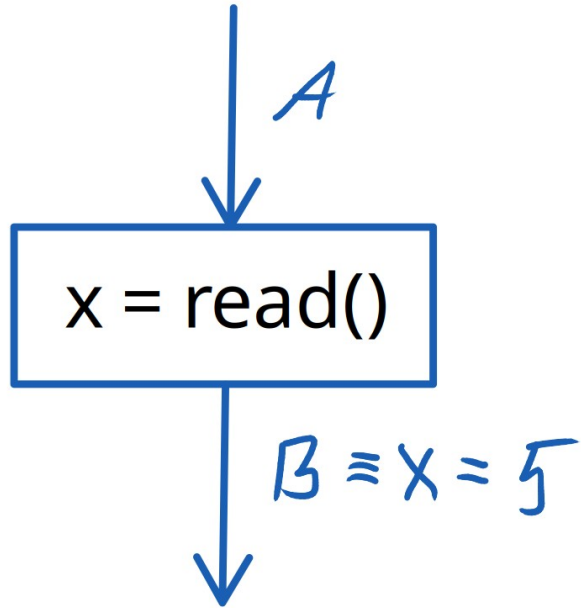
Precondition



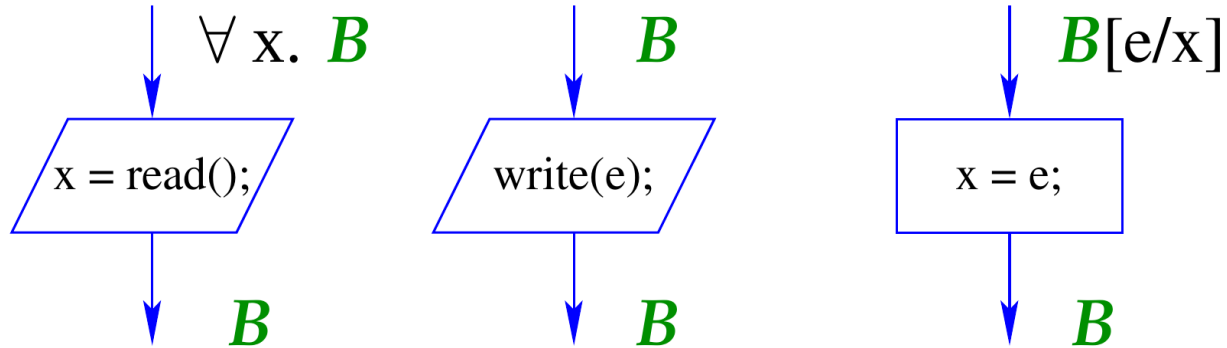
# Strongest Post $\rightarrow$ Weakest Pre



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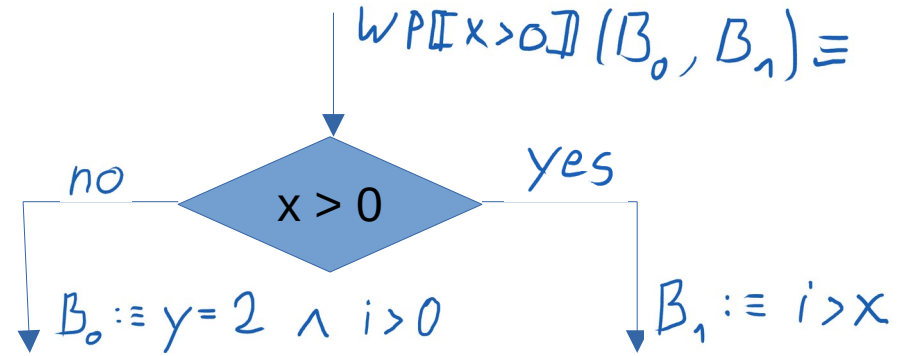
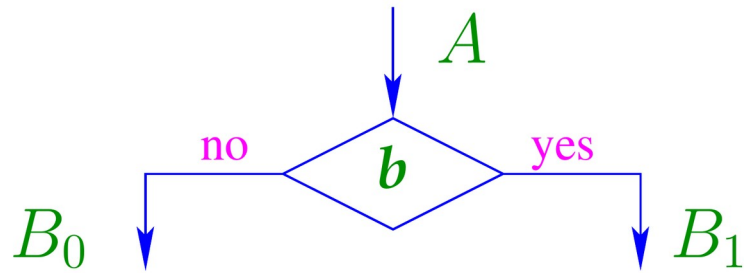


# Strongest Post $\rightarrow$ Weakest Pre

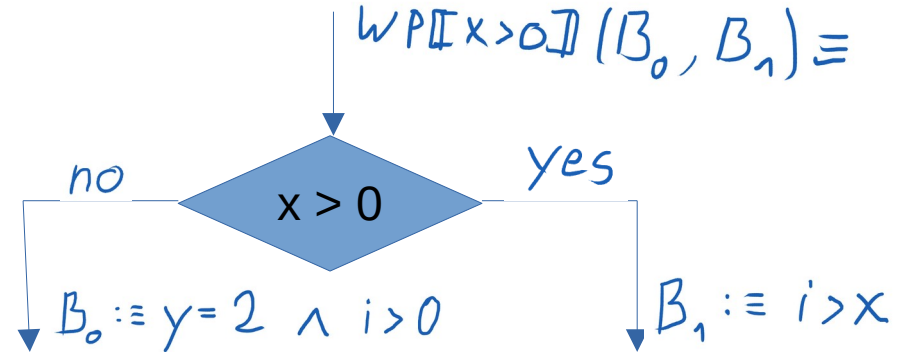
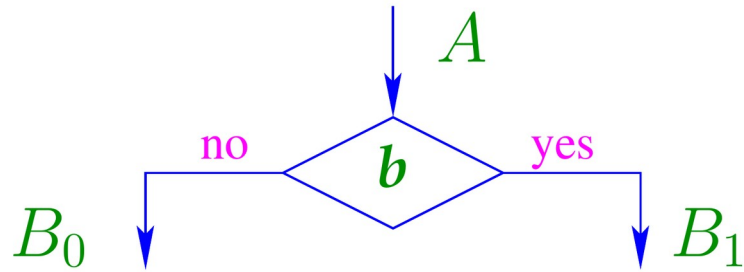


$$\begin{aligned}\mathbf{WP}[\text{;}] (B) &\equiv B \\ \mathbf{WP}[\text{x} = \text{e};] (B) &\equiv B[e/x] \\ \mathbf{WP}[\text{x} = \text{read}();] (B) &\equiv \forall x. B \\ \mathbf{WP}[\text{write}(\text{e});] (B) &\equiv B\end{aligned}$$

# Strongest Post $\rightarrow$ Weakest Pre



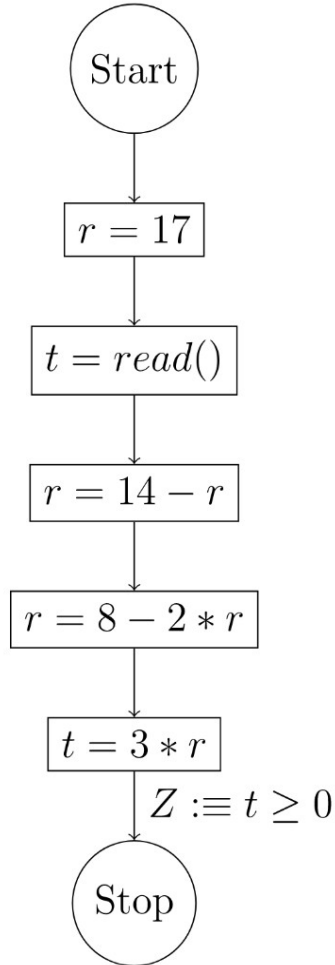
# Strongest Post $\rightarrow$ Weakest Pre



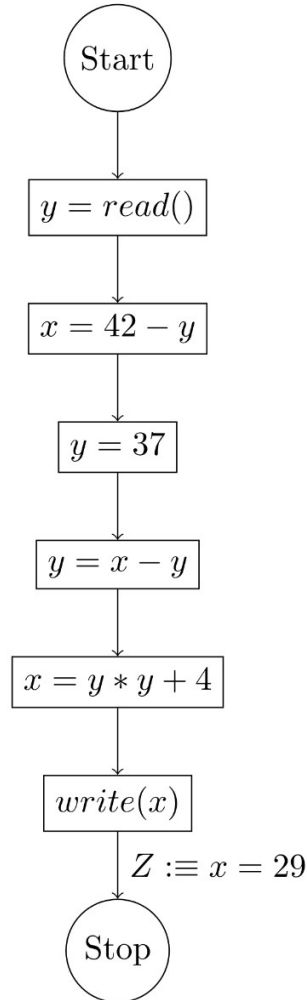
$$\begin{aligned} \mathbf{WP}[b](B_0, B_1) &\equiv ((\neg b) \Rightarrow B_0) \wedge (b \Rightarrow B_1) \\ &\equiv (\neg b \wedge B_0) \vee (b \wedge B_1) \end{aligned}$$

# Week 02 Tutorial 01 — From Post- to Preconditions

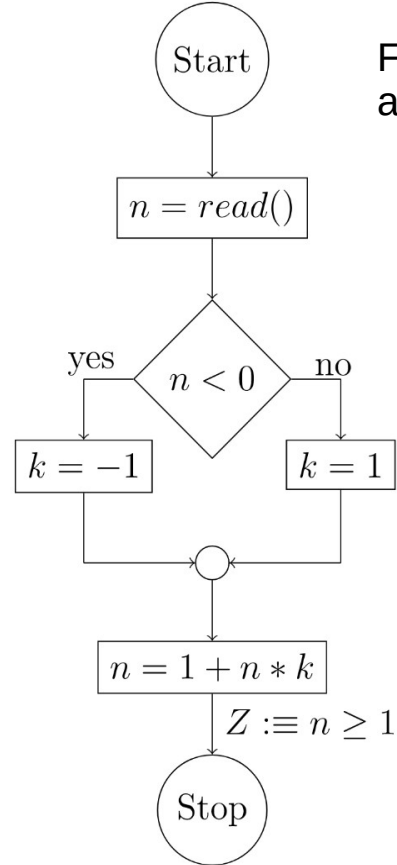
1.



2.



3.



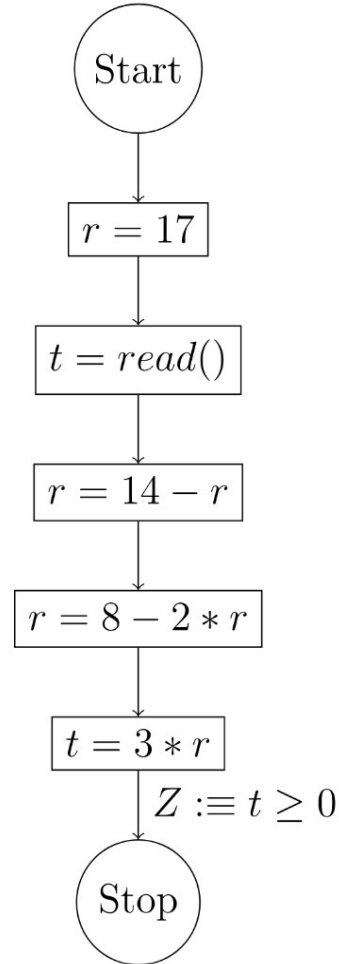
For each of these graphs show whether the assertion  $Z$  holds...

(a) ...using strongest postconditions

(b) ...using weakest preconditions.

# Week 02 Tutorial 01 — From Post- to Preconditions

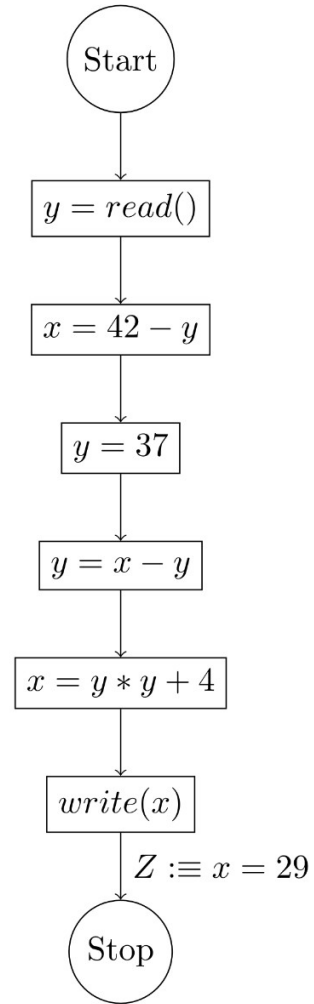
1.





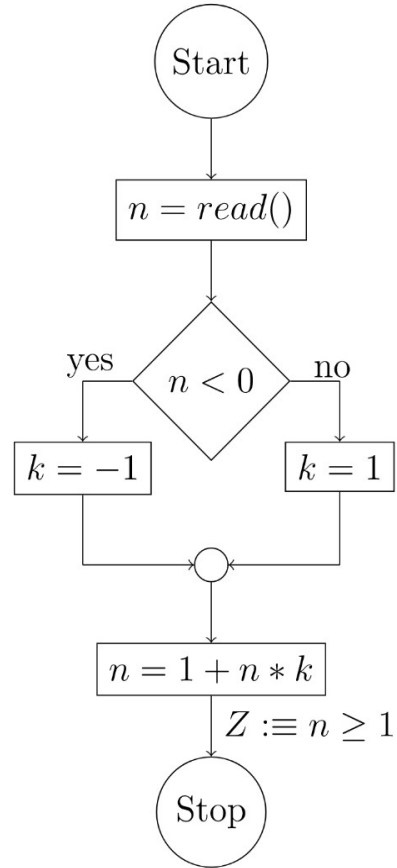
# Week 02 Tutorial 01 — From Post- to Preconditions

2.

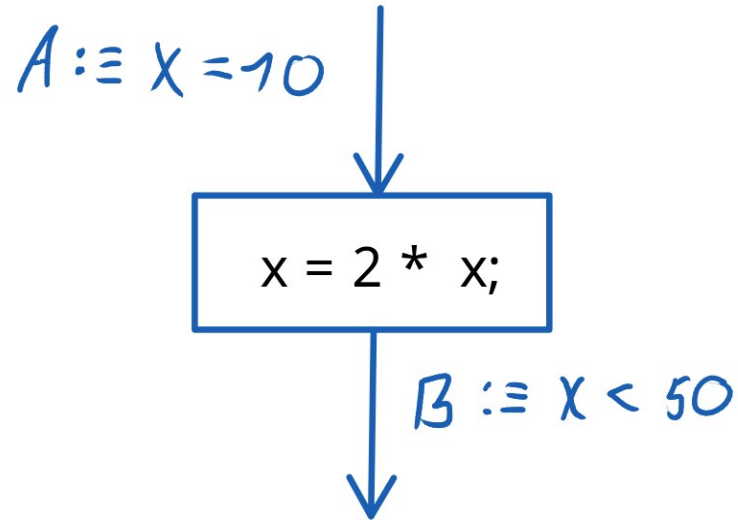


# Week 02 Tutorial 01 — From Post- to Preconditions

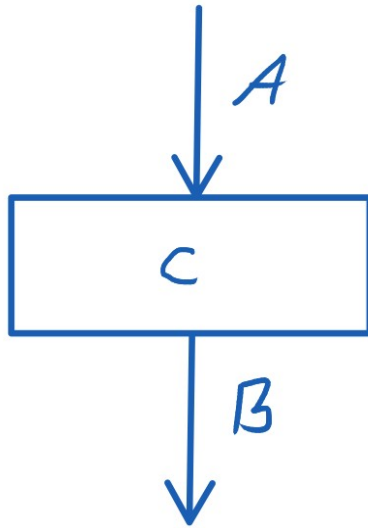
3.



# Local Consistency



# Local Consistency



A, B und c sind Locally Consistent, falls eine der folgenden Aussagen gilt:

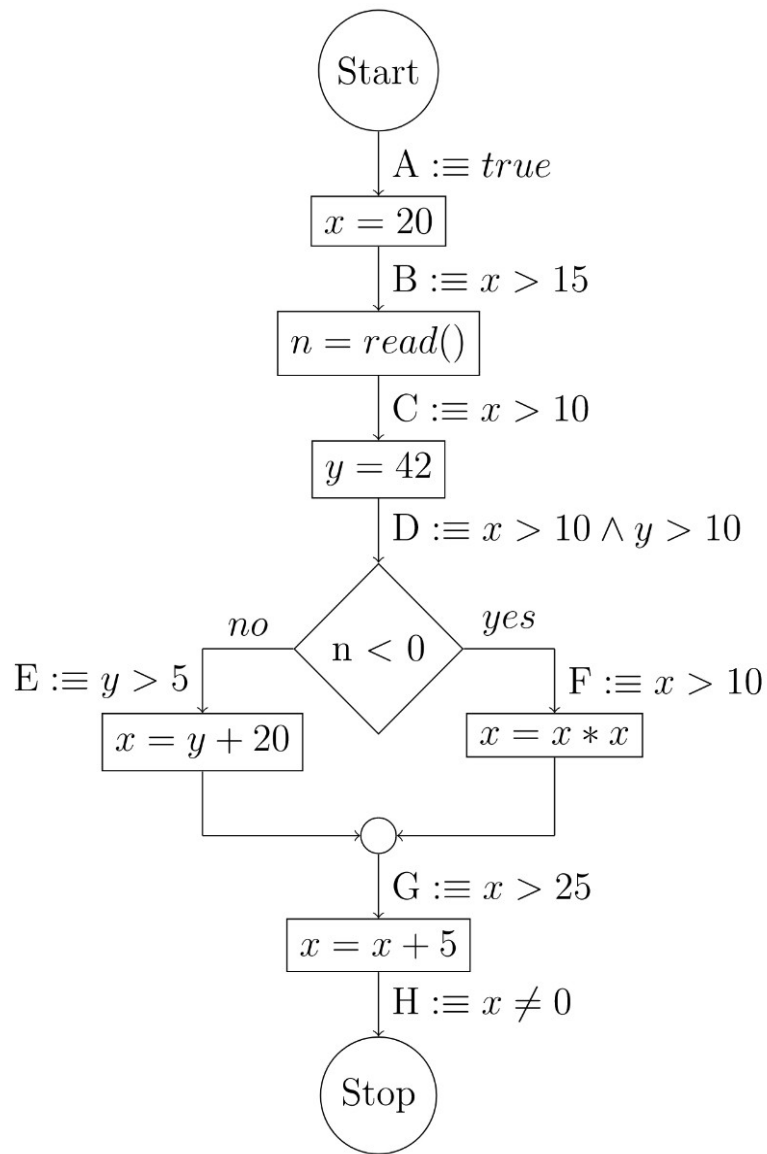
- 1)  $A \Rightarrow WP[C](B)$
- 2)  $SP[C](A) \Rightarrow B$

Beachte: 1) und 2) sind gleichbedeutend

# Week 02 Tutorial 02

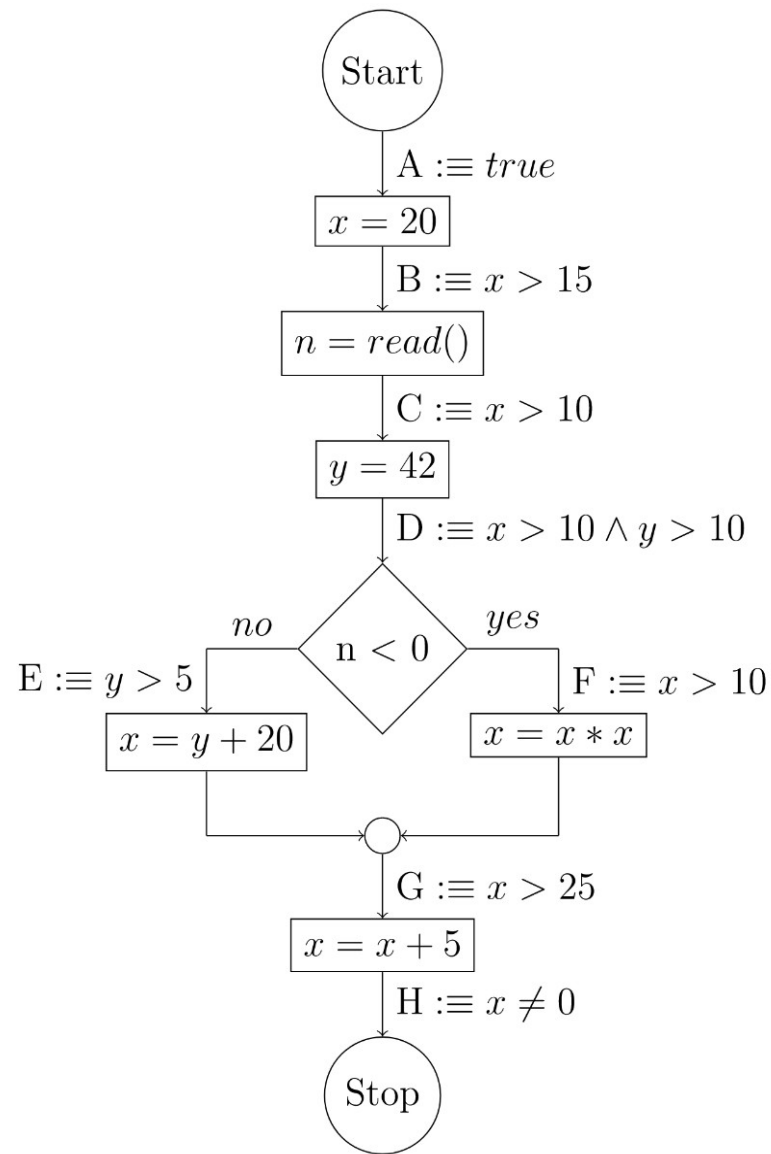
## Local Consistency

Check whether the annotated assertions prove that the program computes an  $x \neq 0$  and discuss why this is the case.

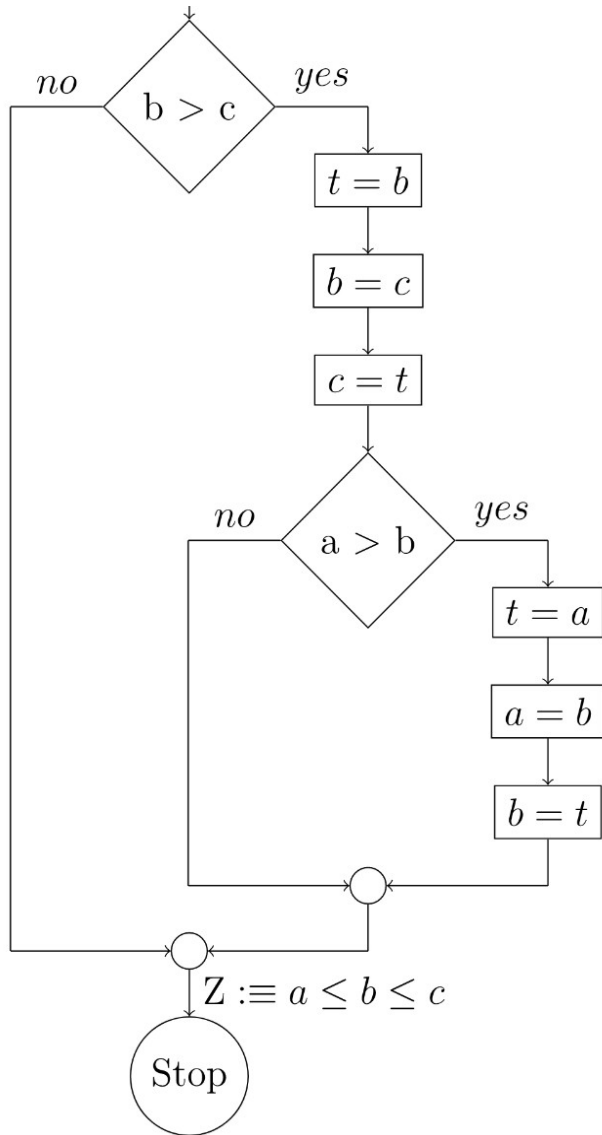


# Week 02 Tutorial 02

## Local Consistency



## Week 02 Tutorial 03 — Trouble Sort



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