Week 2: Weakest Preconditions

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Postconition

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Precondition

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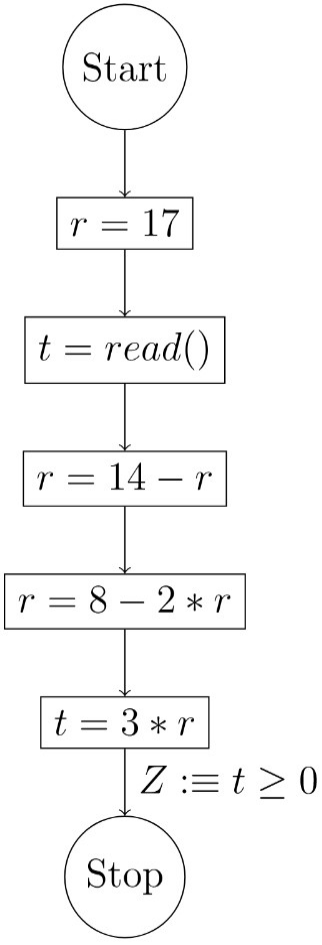
Strongest Post → Weakest Pre

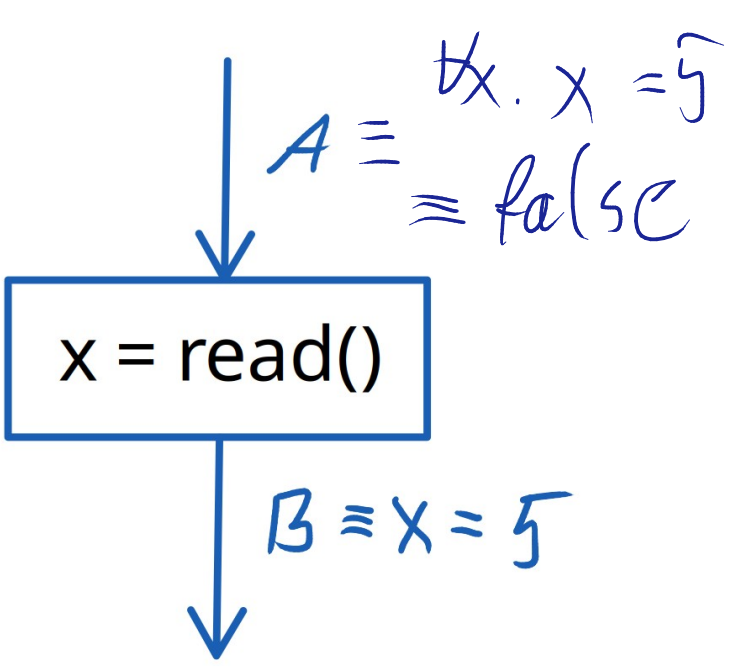


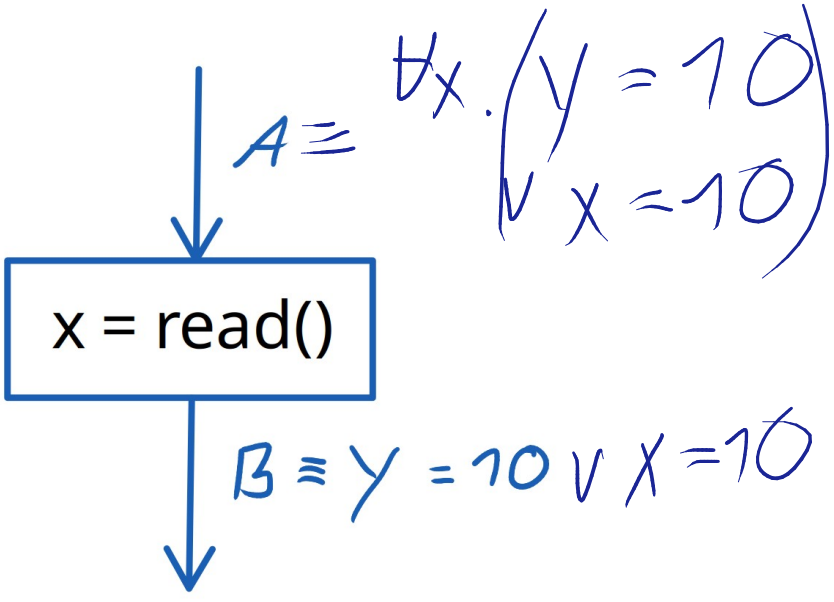
$3 \cdot r \geq 0 \equiv r \geq 0$

$t = 3 * r$

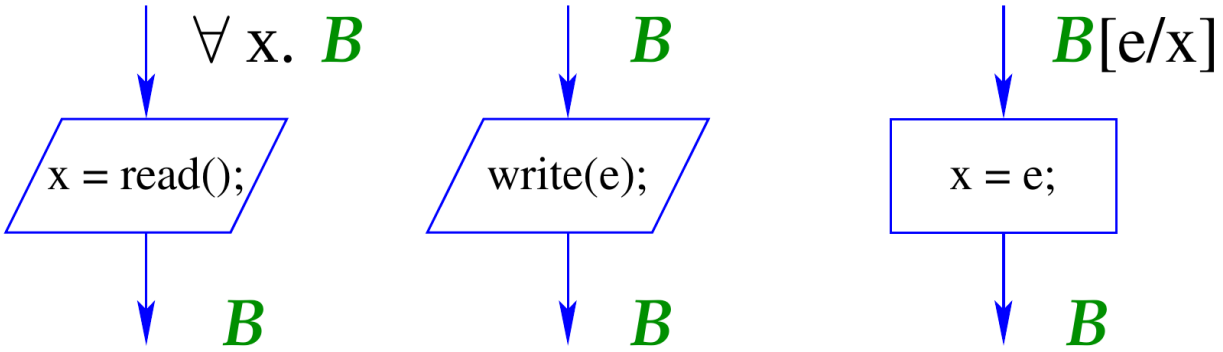
$Z :\equiv t \geq 0$

Strongest Post → Weakest Pre



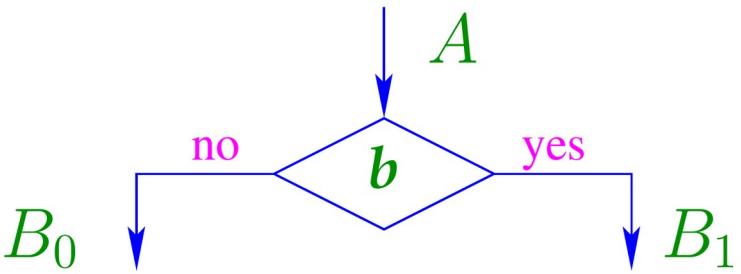


Strongest Post → Weakest Pre

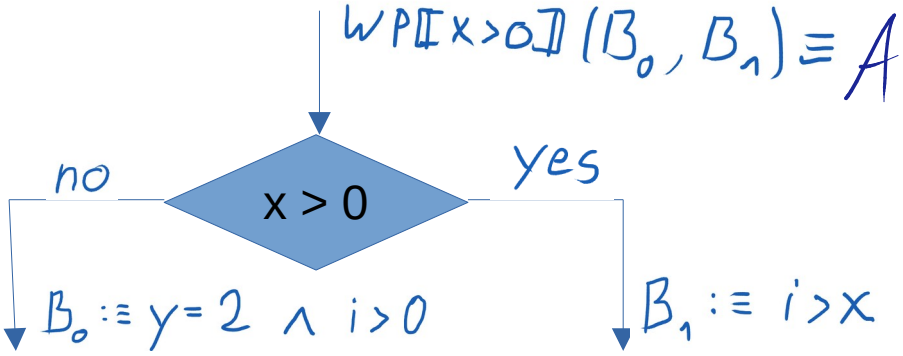


$$
\begin{array}{lcl}
\mathbf{WP}[\![\texttt{;}]\!](B) & \equiv & B \\
\mathbf{WP}[\![\texttt{x = e;}]\!](B) & \equiv & B[e/x] \\
\mathbf{WP}[\![\texttt{x = read();}]\!](B) & \equiv & \forall\, x.\, B \\
\mathbf{WP}[\![\texttt{write(e);}]\!](B) & \equiv & B
\end{array}
$$

Strongest Post → Weakest Pre

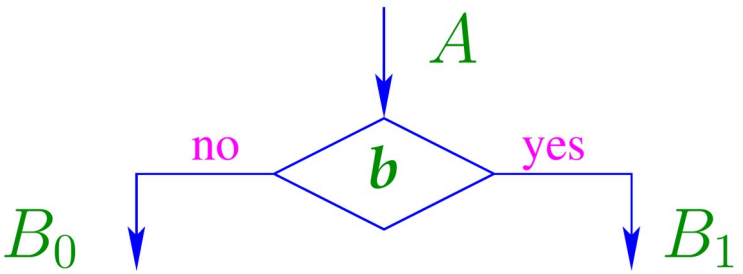


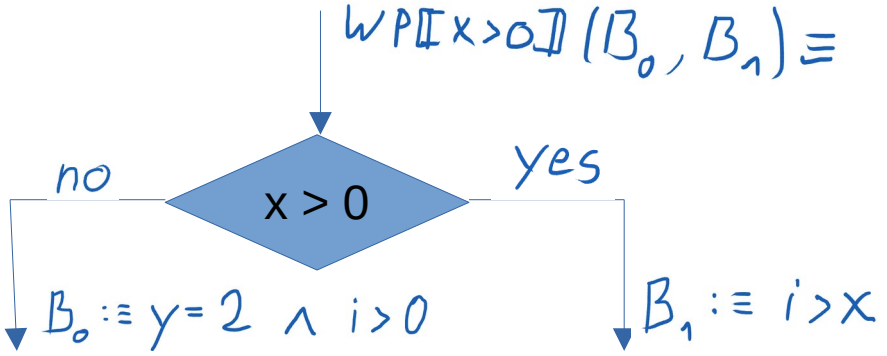
$$A \equiv (B_1 \wedge b) \vee (B_0 \wedge \neg b)$$
$$\equiv (b \Rightarrow B_1) \wedge (\neg b \Rightarrow B_0)$$



$$A \equiv (x > 0 \Rightarrow i > x)$$
$$\wedge (x \leq 0 \Rightarrow (y = 2 \wedge i > 0))$$

Strongest Post → Weakest Pre

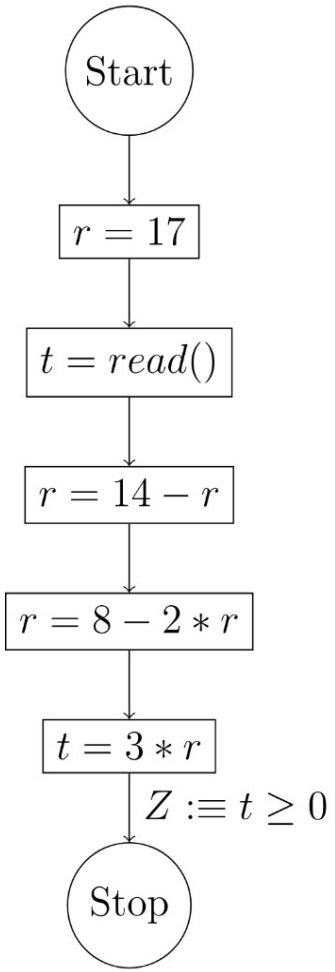




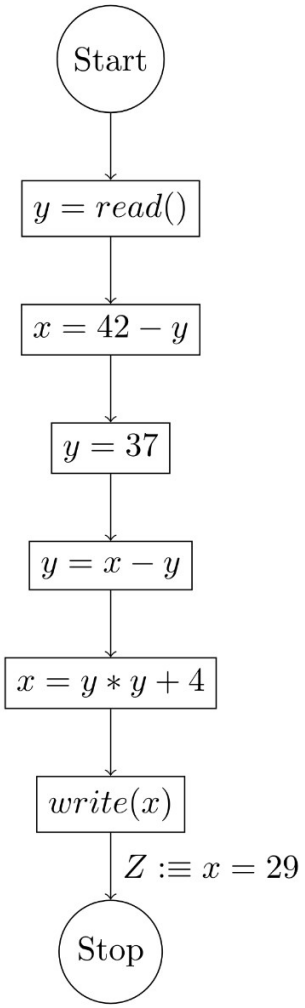
$$\begin{aligned}\mathbf{WP}[\![b]\!]\ (B_0, B_1) &\equiv ((\neg b) \Rightarrow B_0)\ \wedge\ (b \Rightarrow B_1) \\ &\equiv\ (\neg b \wedge B_0) \vee (b \wedge B_1)\end{aligned}$$

Week 02 Tutorial 01 — From Post- to Preconditions

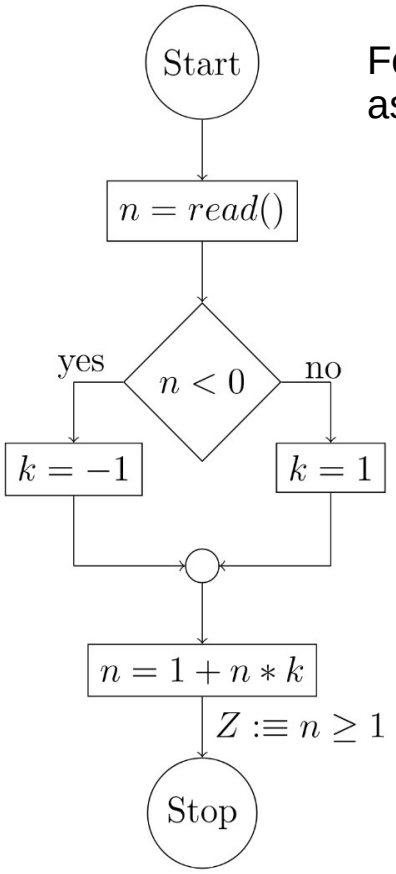
1.



2.



3.



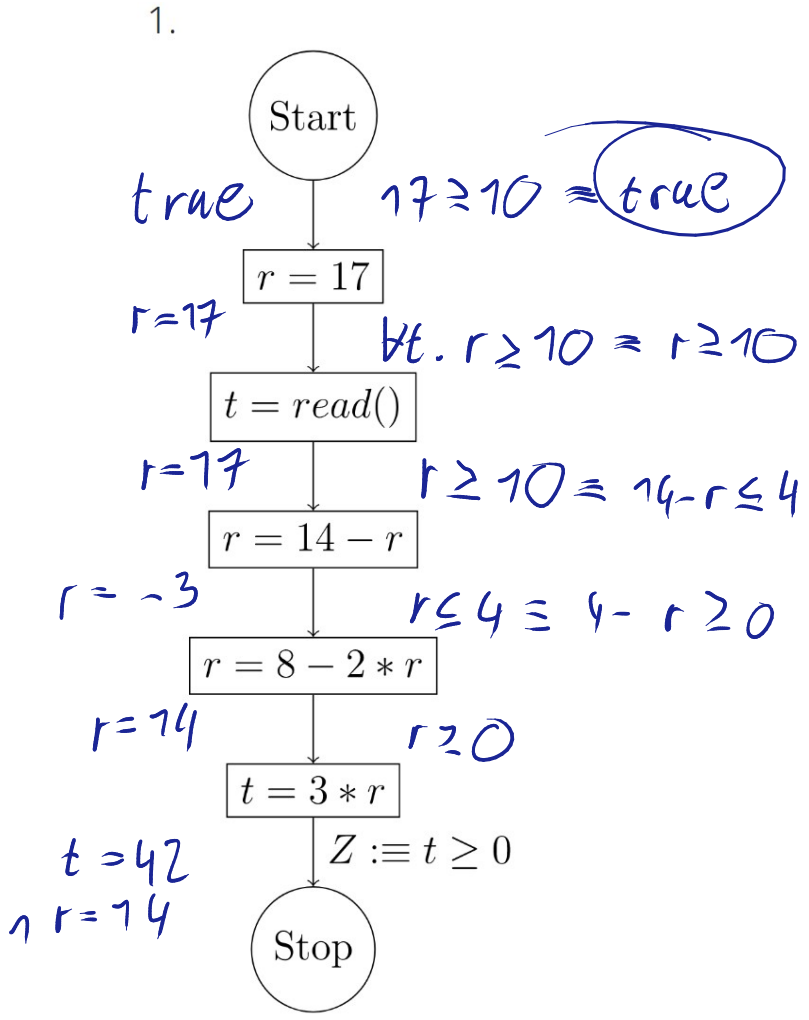
For each of these graphs show whether the assertion Z holds…

(a) …using strongest postconditions

(b) …using weakest preconditions.

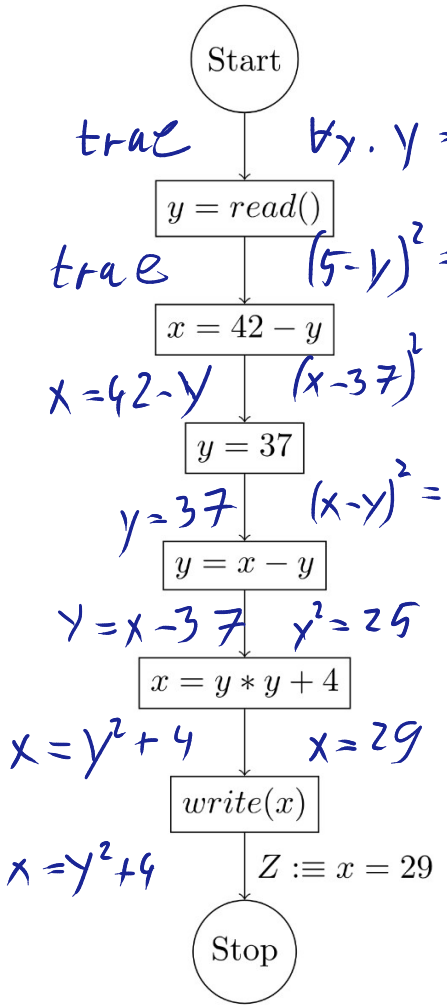
Week 02 Tutorial 01 — From Post- to Preconditions

1.



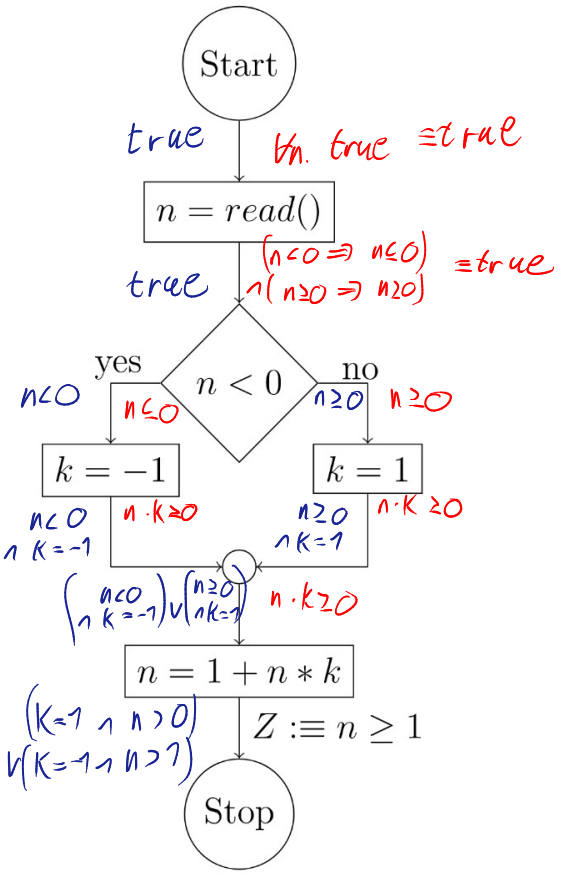
Week 02 Tutorial 01 — From Post- to Preconditions

2.

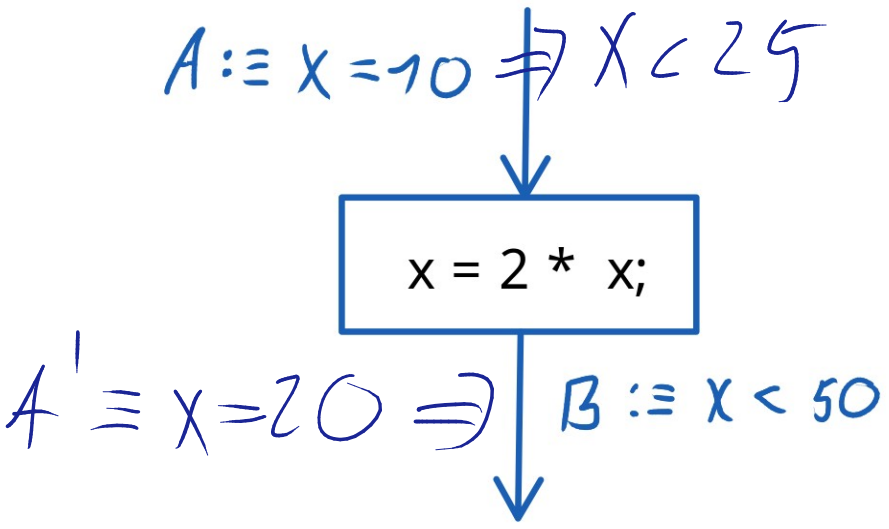


Week 02 Tutorial 01 — From Post- to Preconditions

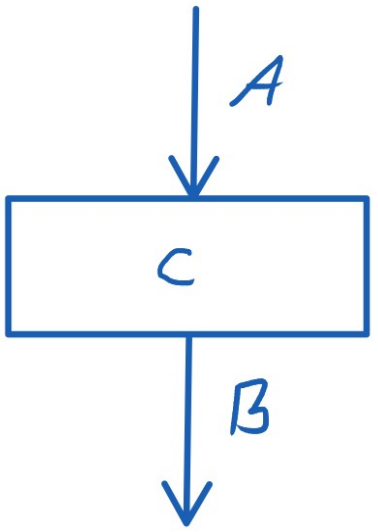
3.



Local Consistency



Local Consistency



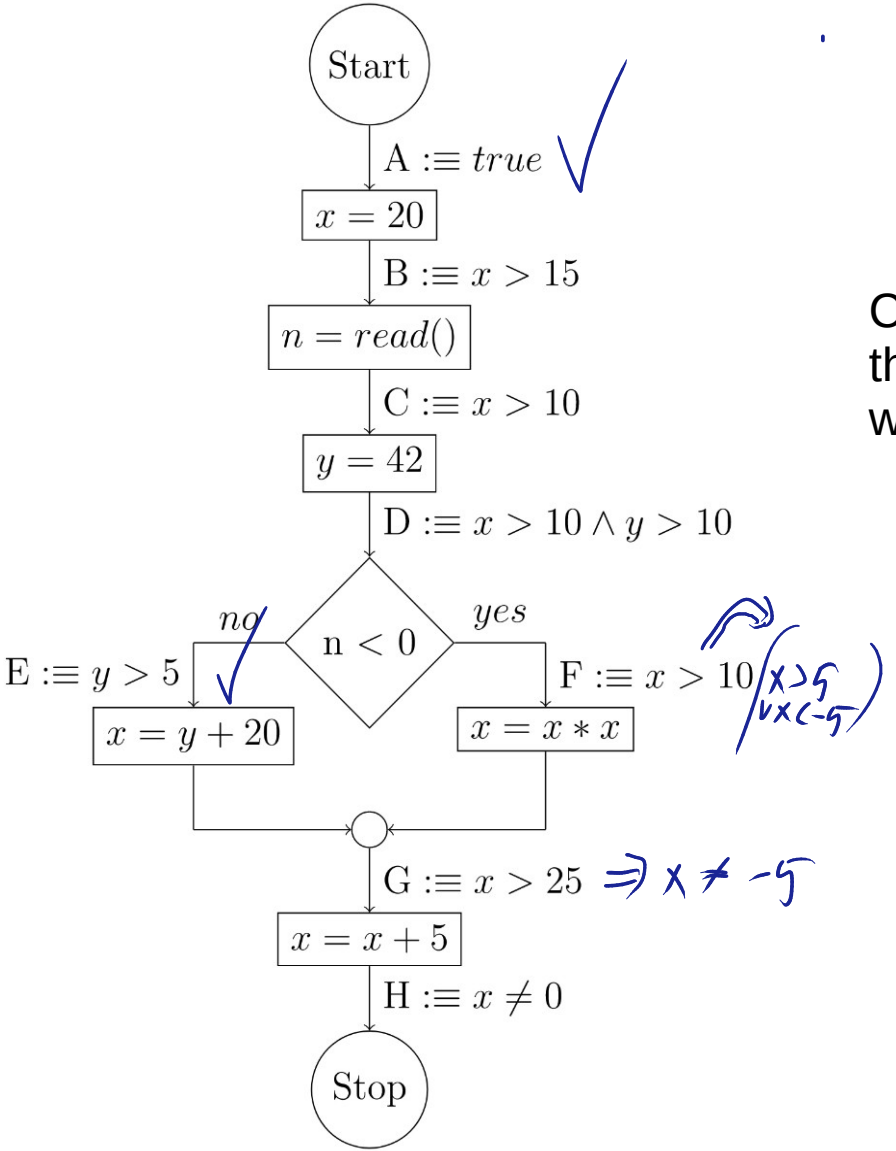
A, B und c sind Locally Consistent, falls eine der folgenden Aussagen gilt:

1) $A \Rightarrow wp[\![c]\!](B)$

2) $sp[\![c]\!](A) \Rightarrow B$

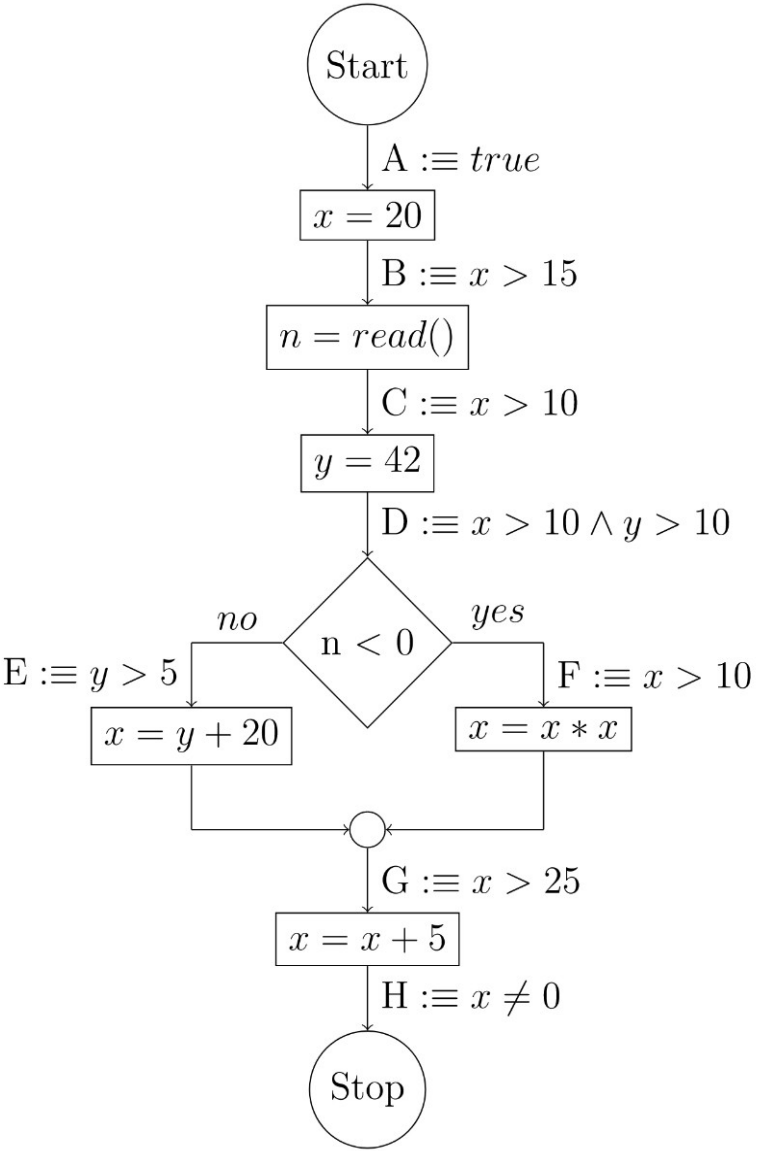
Beachte: 1) und 2) sind gleichbedeutend

Week 02 Tutorial 02
Local Consistency

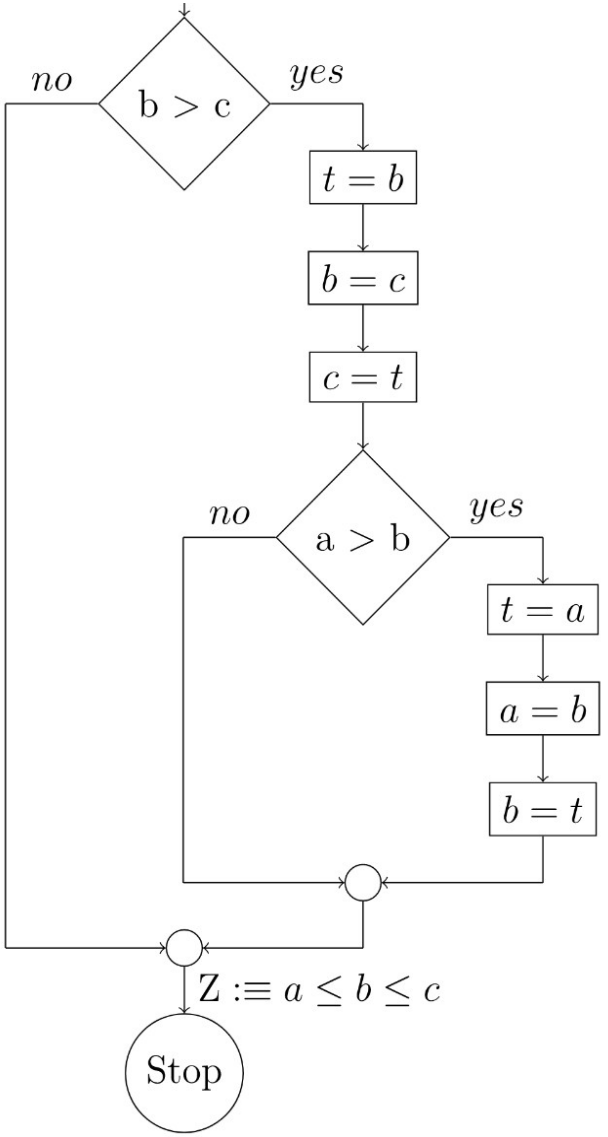


Check whether the annotated assertions prove that the program computes an x != 0 and discuss why this is the case.

Week 02 Tutorial 02
Local Consistency



Week 02 Tutorial 03 — Trouble Sort



Week 02 Tutorial 03 — Trouble Sort