Week 2: Weakest Preconditions

86803889

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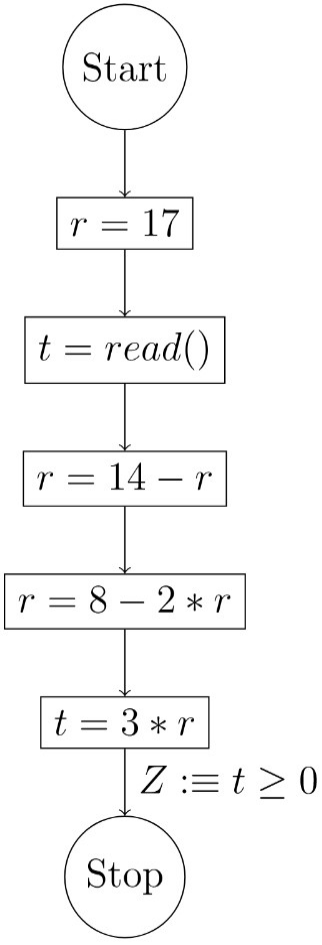
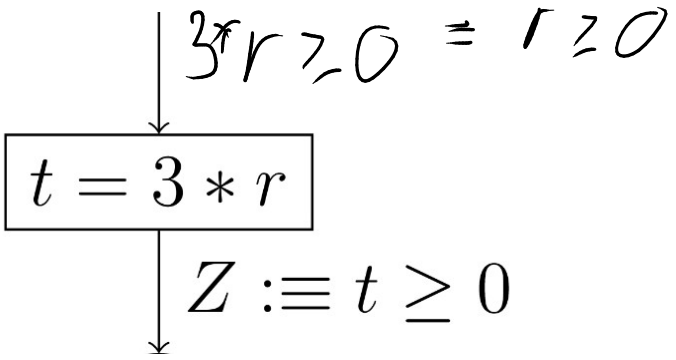
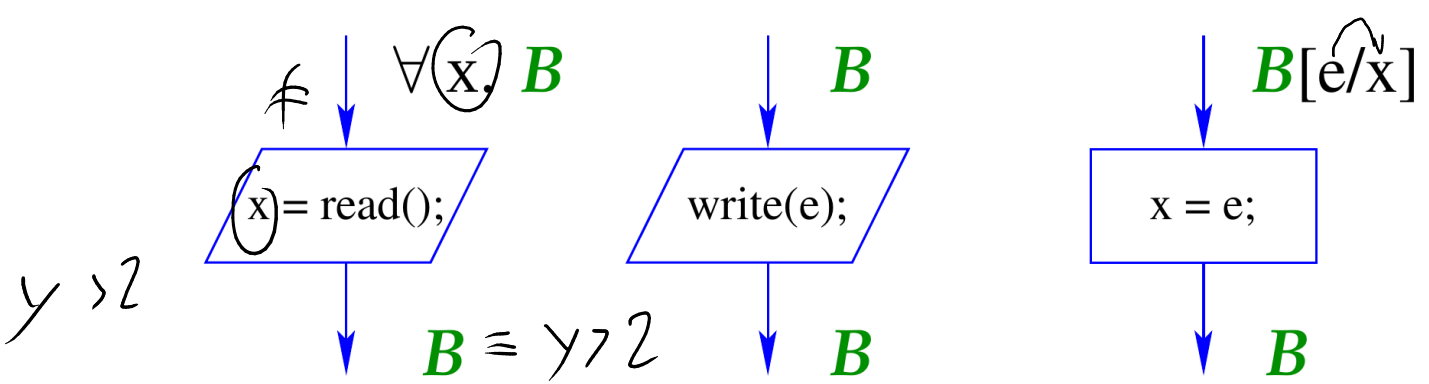
Quiz

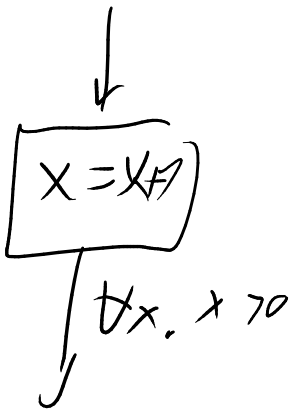
Strongest Post → Weakest Pre



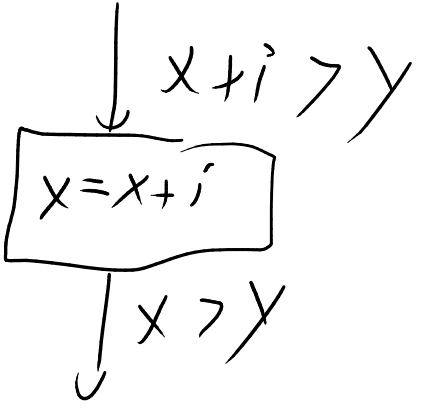


Strongest Post → Weakest Pre

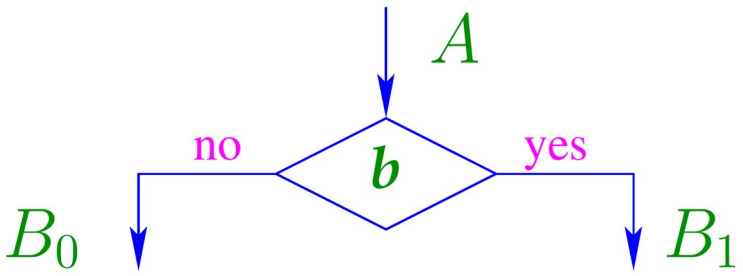




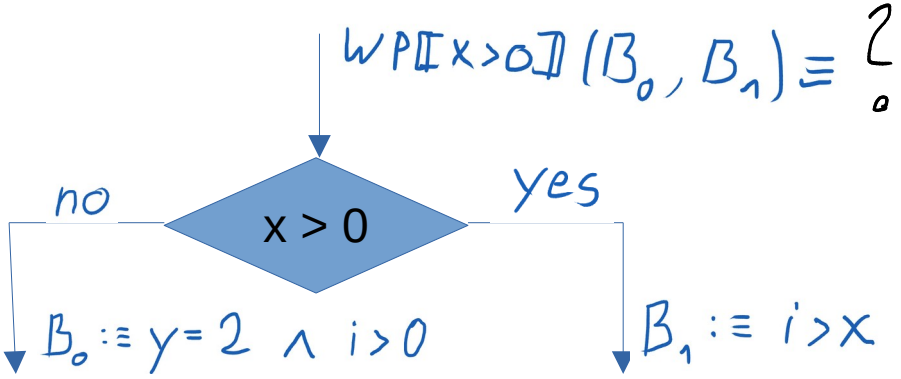
$$
\begin{aligned}
\mathbf{WP}[\![\texttt{;}]\!](B) &\equiv B \\
\mathbf{WP}[\![\texttt{x = e;}]\!](B) &\equiv B[e/x] \\
\mathbf{WP}[\![\texttt{x = read();}]\!](B) &\equiv \forall x.\, B \\
\mathbf{WP}[\![\texttt{write(e);}]\!](B) &\equiv B
\end{aligned}
$$



Strongest Post → Weakest Pre

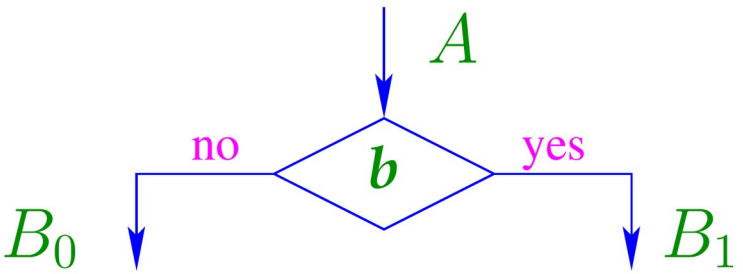


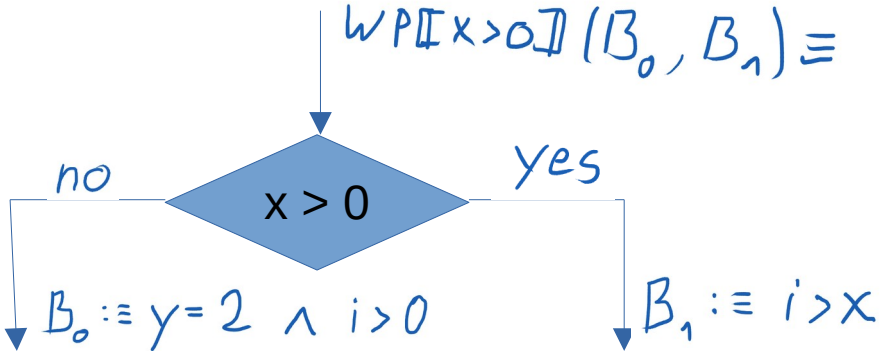
$$\neg\,(x \le 0 \Rightarrow B_0) \quad \equiv \quad (x > 0 \Rightarrow B_1)$$



$$(x > 0 \wedge B_1) \vee (x \le 0 \wedge B_0)$$

Strongest Post → Weakest Pre

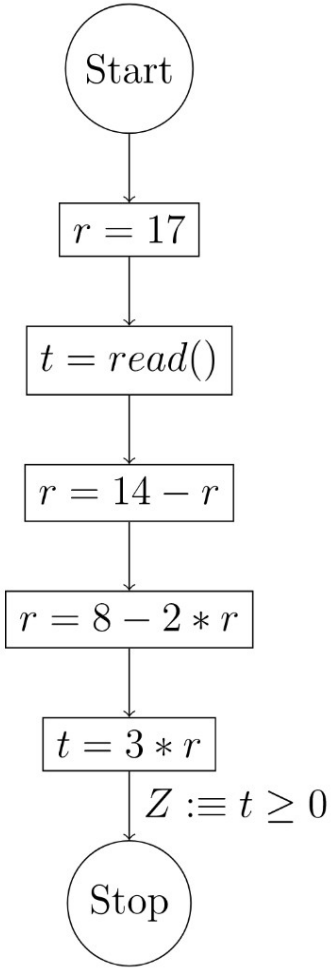




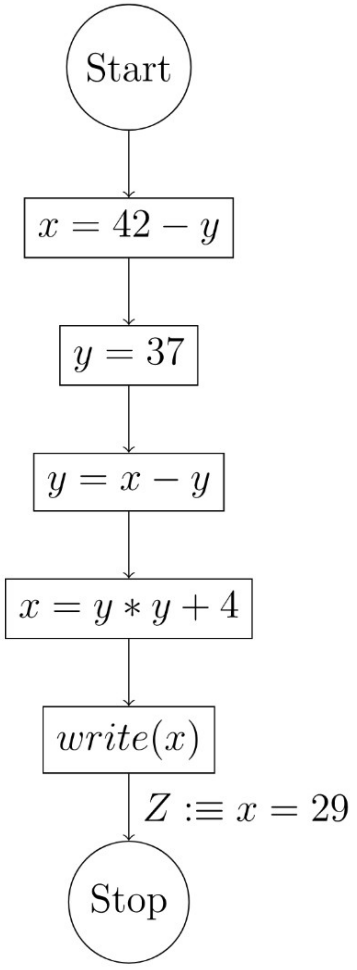
$$\begin{aligned} \mathbf{WP}[\![b]\!]\ (B_0, B_1) &\equiv ((\neg b) \Rightarrow B_0)\ \wedge\ (b \Rightarrow B_1) \\ &\equiv\ (\neg b \wedge B_0) \vee (b \wedge B_1) \end{aligned}$$

Week 02 Tutorial 01 — From Post- to Preconditions

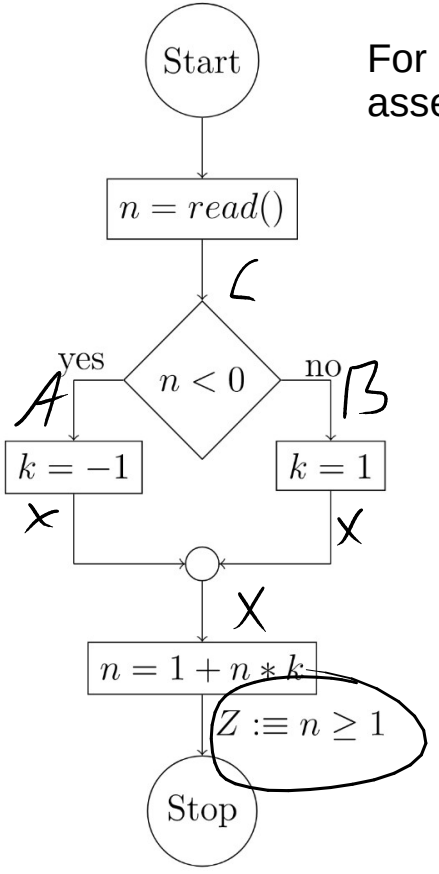
1.



2.



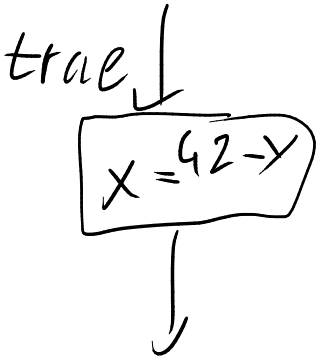
3.



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

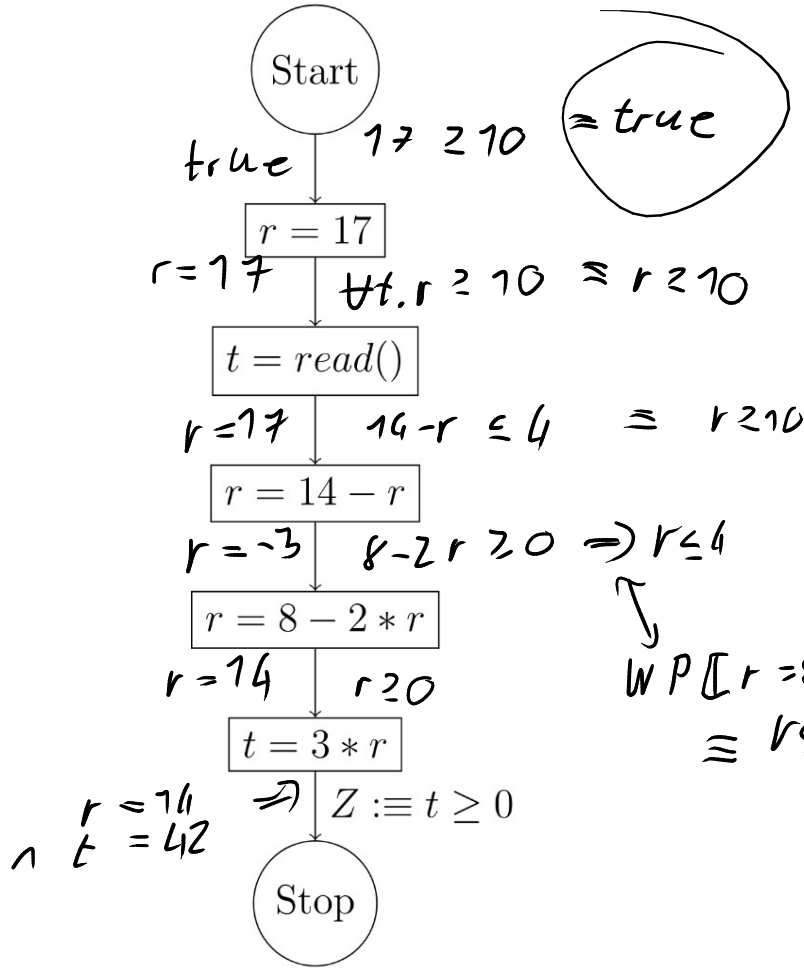
(a) …using strongest postconditions

(b) …using weakest preconditions.



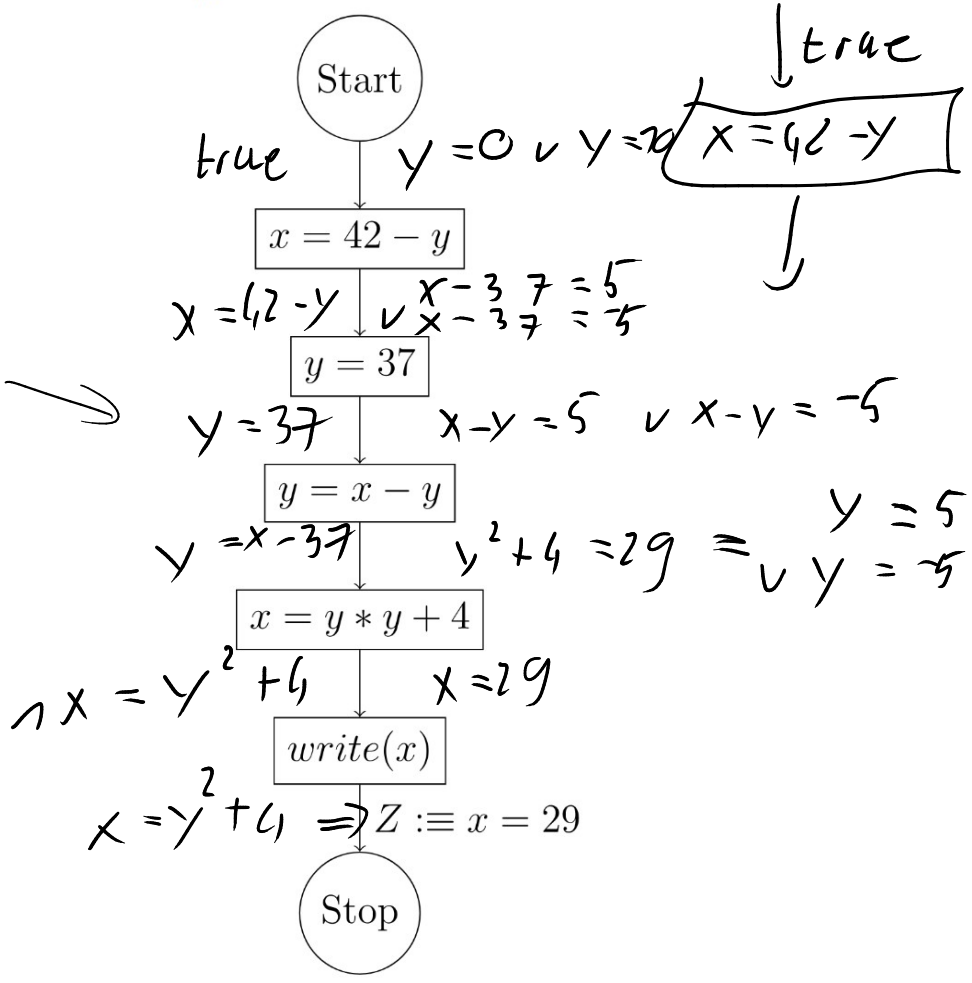
Week 02 Tutorial 01 — From Post- to Preconditions

1.



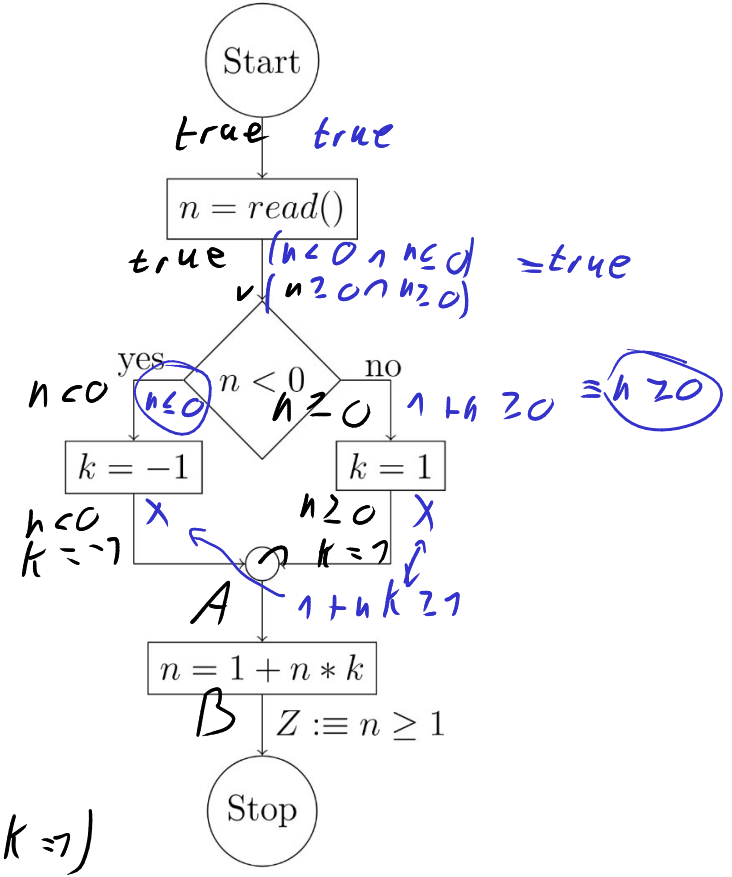
Week 02 Tutorial 01 — From Post- to Preconditions

2.



Week 02 Tutorial 01 — From Post- to Preconditions

3.



$wp[k=-1](1+nk\geq 1) \equiv n\leq 0$

$k=-1$

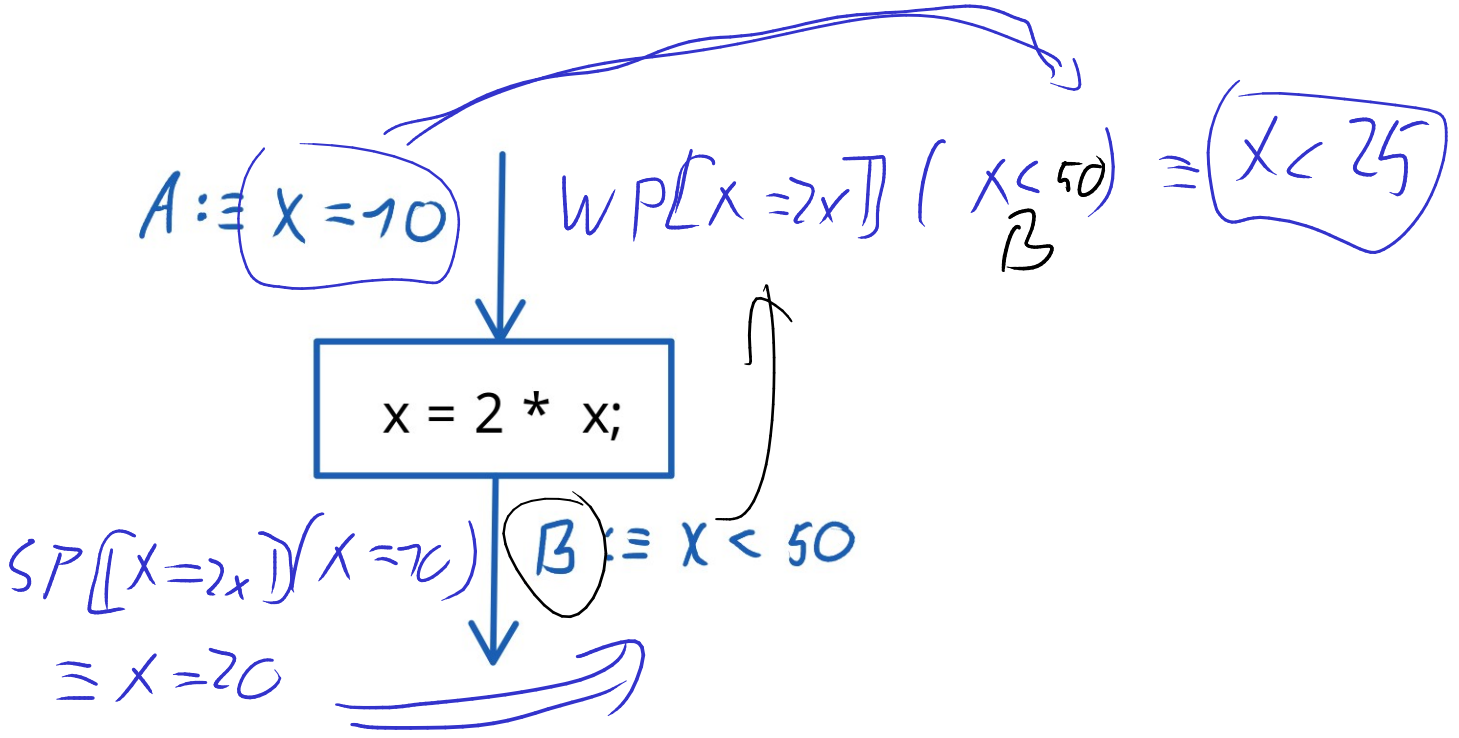
$1+nk\geq 1$

A	B	$A \Rightarrow B$
0	0	1
0	1	1
1	0	0
1	1	1

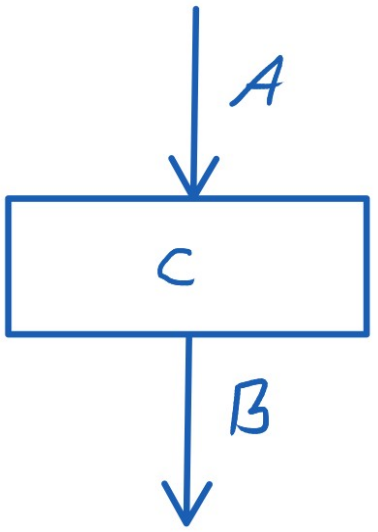
$A \equiv (n<0 \wedge k=-1) \vee (n\geq 0 \wedge k=1)$

$B \equiv n\geq 1 \wedge (k=-1 \vee k=1)$

Local Consistency



Local Consistency

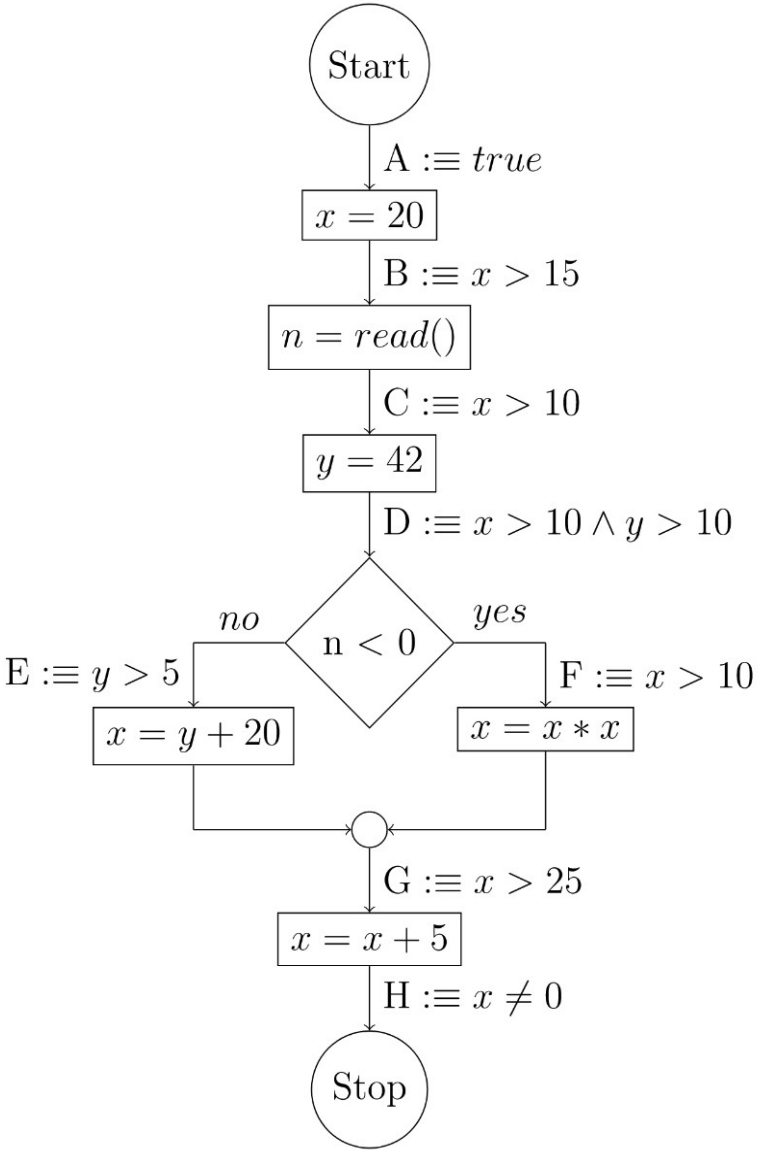


A, B und c sind Locally Consistent, falls eine der folgenden Aussagen gilt:

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

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

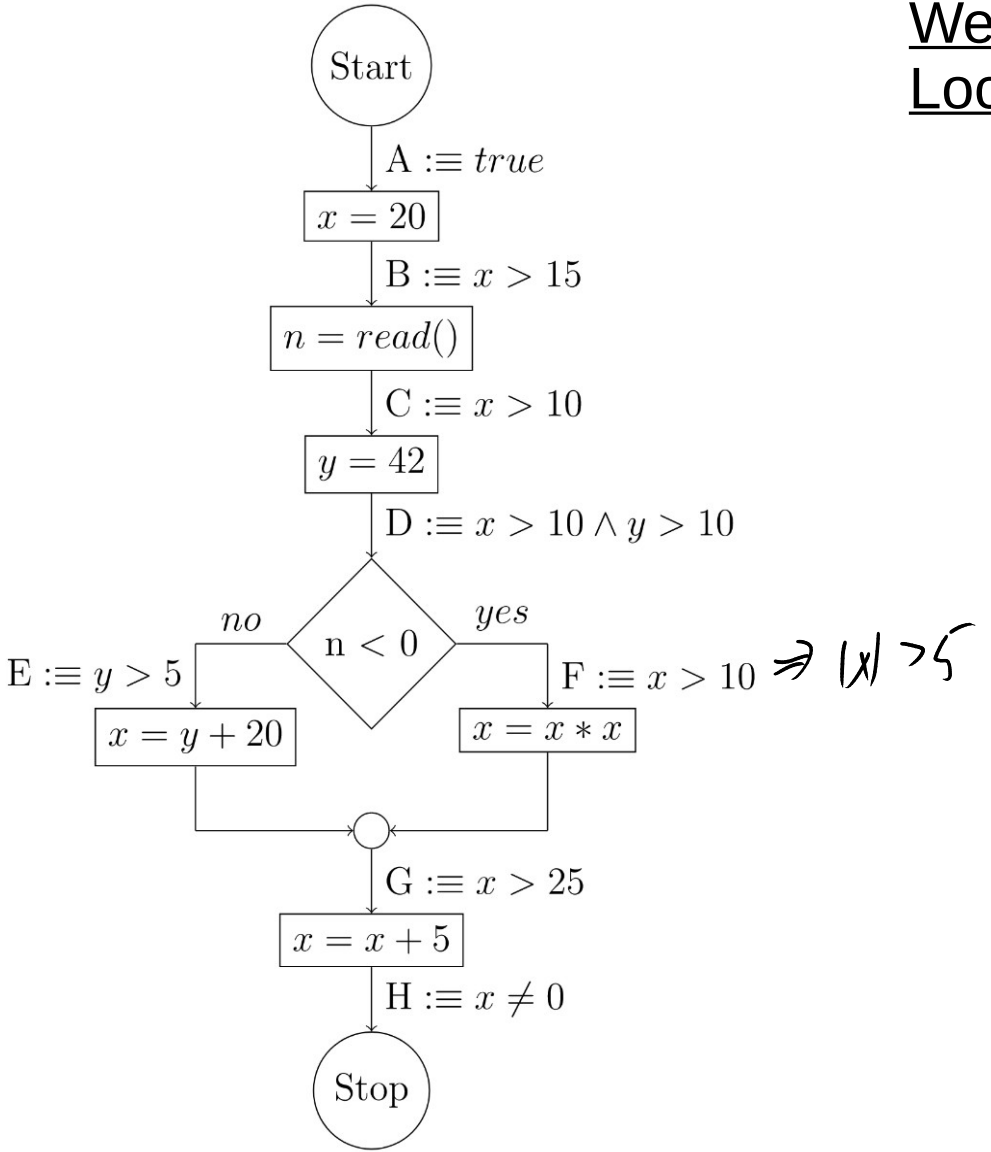
Beachte: 1) und 2) sind gleichbedeutend



Week 02 Tutorial 02
Local Consistency

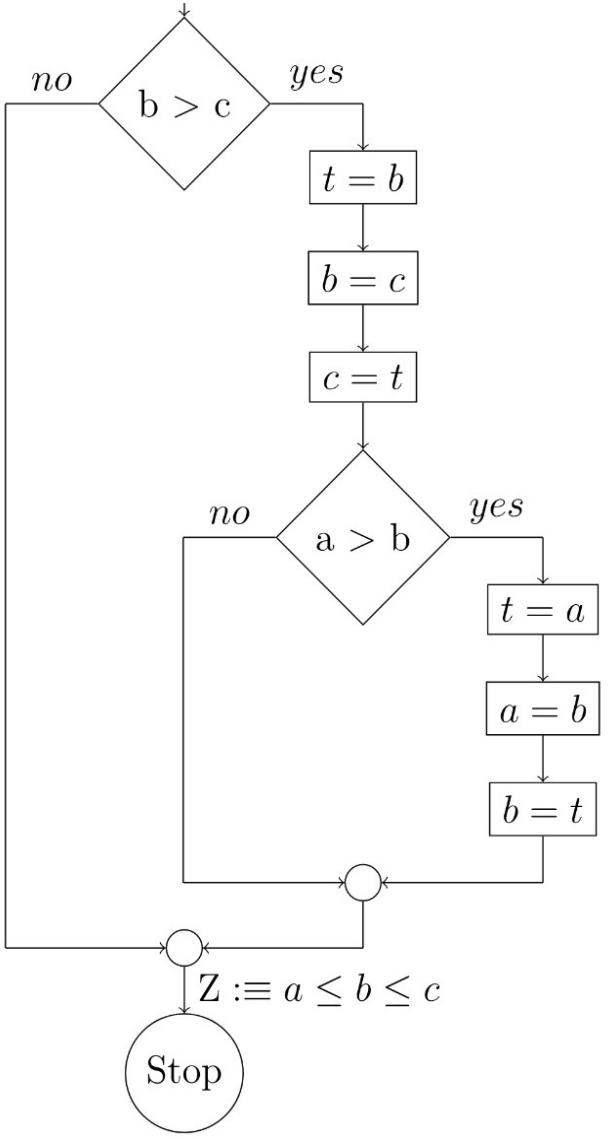
Check whether the annotated assertions prove that the program computes an x != 0 and discuss why this is the case.

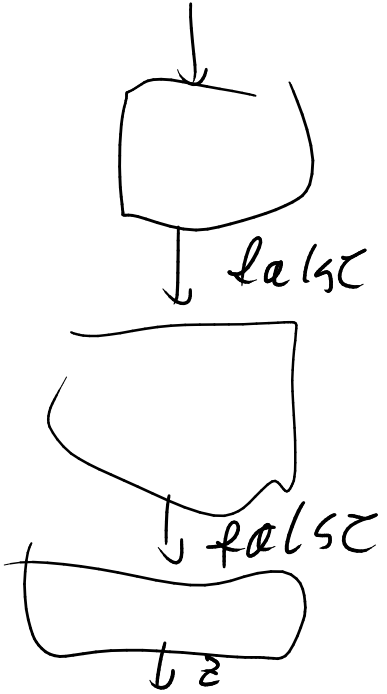
Week 02 Tutorial 02
Local Consistency



$\Rightarrow |x| > 5$

Week 02 Tutorial 03 — Trouble Sort





Week 02 Tutorial 03 — Trouble Sort