Week 2: Weakest Preconditions

99206170

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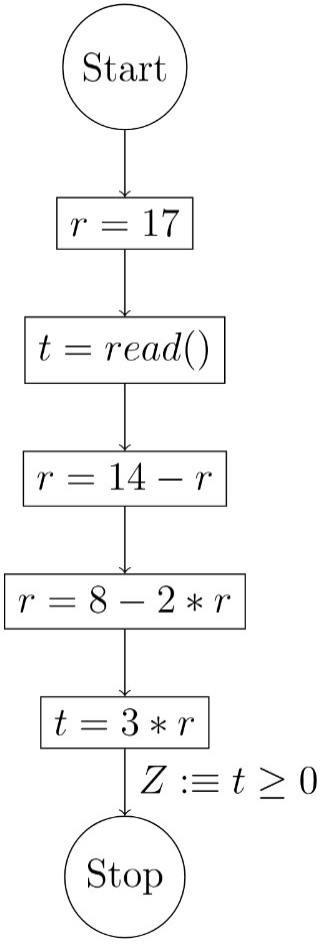
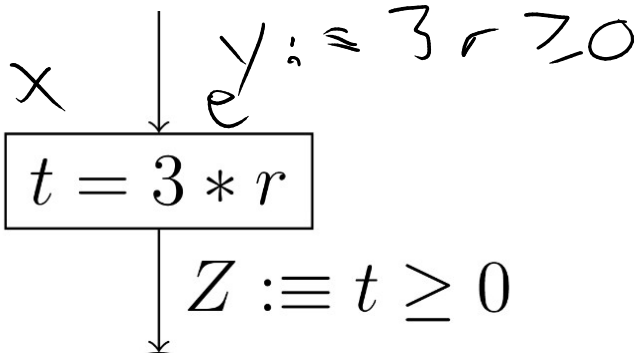
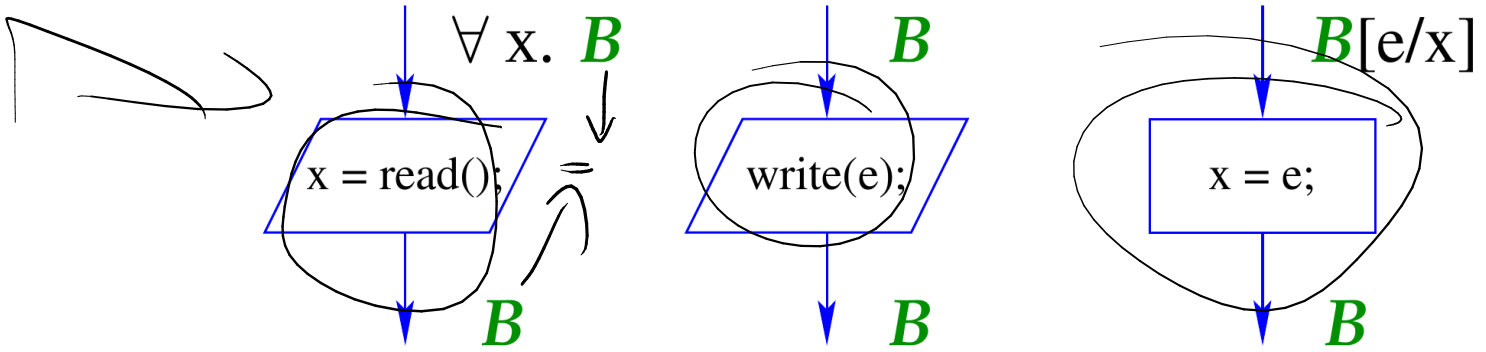
Quiz

Strongest Post → Weakest Pre



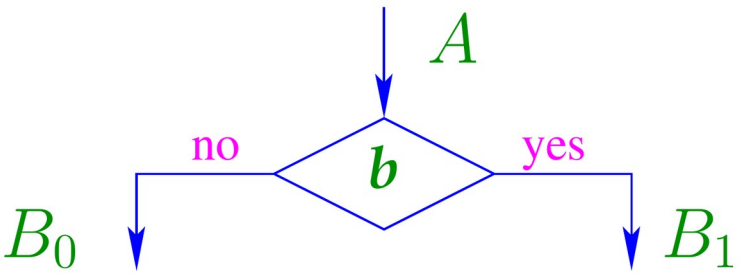


Strongest Post → Weakest Pre



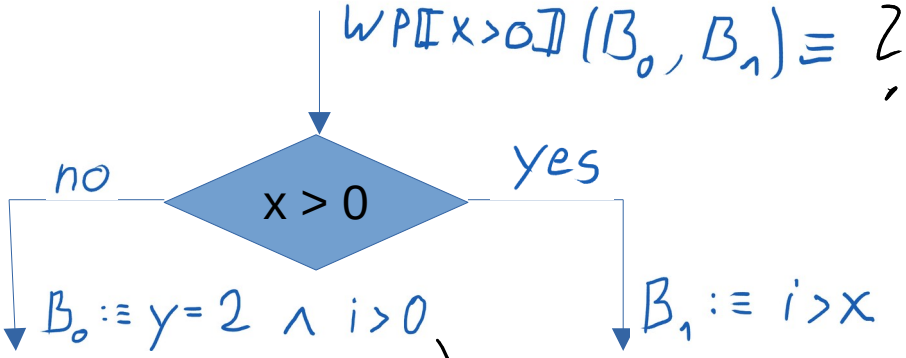
$$
\begin{aligned}
\mathbf{WP}[\![\texttt{;}]\!](B) &\equiv B \\
\mathbf{WP}[\![\texttt{x = e;}]\!](B) &\equiv B[e/x] \\
\mathbf{WP}[\![\texttt{x = read();}]\!](B) &\equiv \forall x.\, B \\
\mathbf{WP}[\![\texttt{write(e);}]\!](B) &\equiv B
\end{aligned}
$$

Strongest Post → Weakest Pre



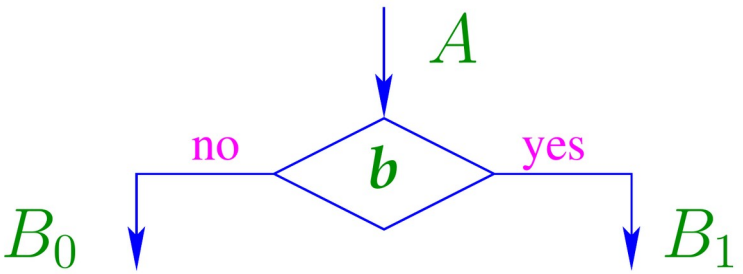
$(x>0 \wedge B_1) \vee (x \leq 0 \wedge B_0) \equiv$

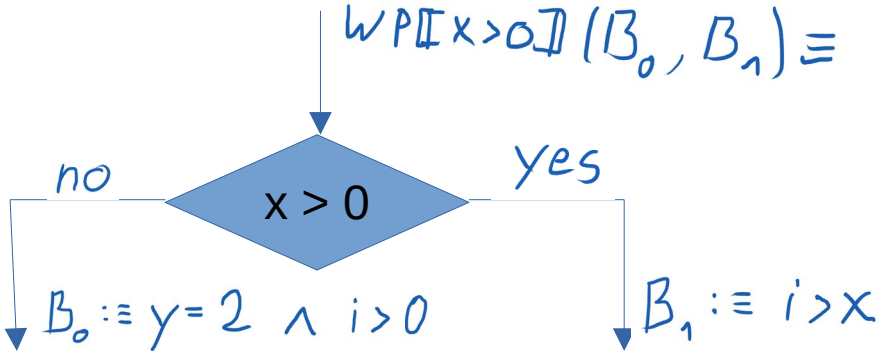
$\vdash$



$(x \leq 0 \Rightarrow B_0) \wedge (x > 0 \Rightarrow B_1)$

Strongest Post → Weakest Pre

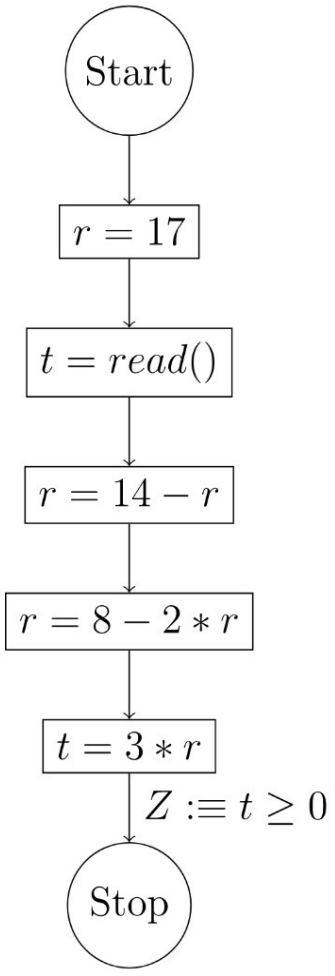




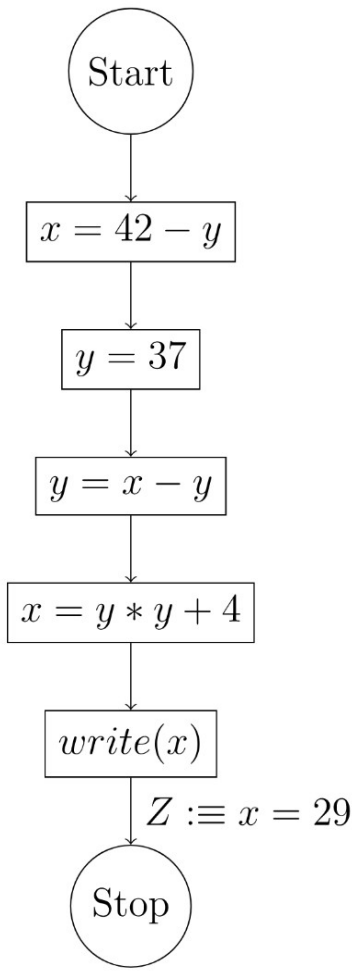
$$\mathbf{WP}[\![b]\!]\ (B_0, B_1) \equiv ((\neg b) \Rightarrow B_0) \wedge (b \Rightarrow B_1)$$
$$\equiv (\neg b \wedge B_0) \vee (b \wedge B_1)$$

Week 02 Tutorial 01 — From Post- to Preconditions

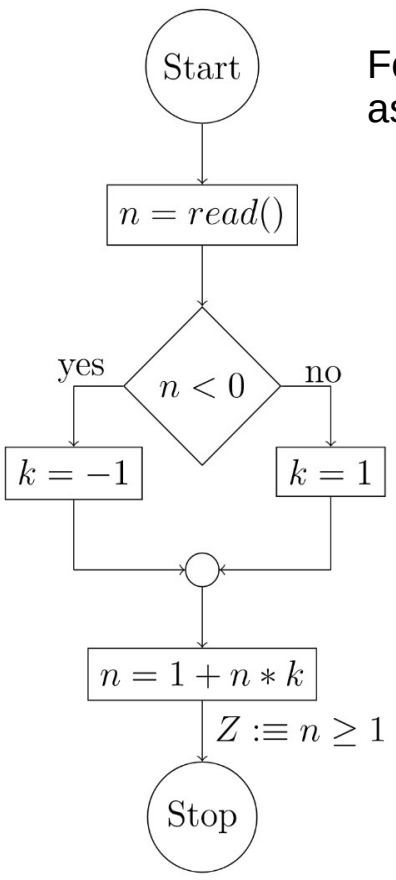
1.



2.



3.



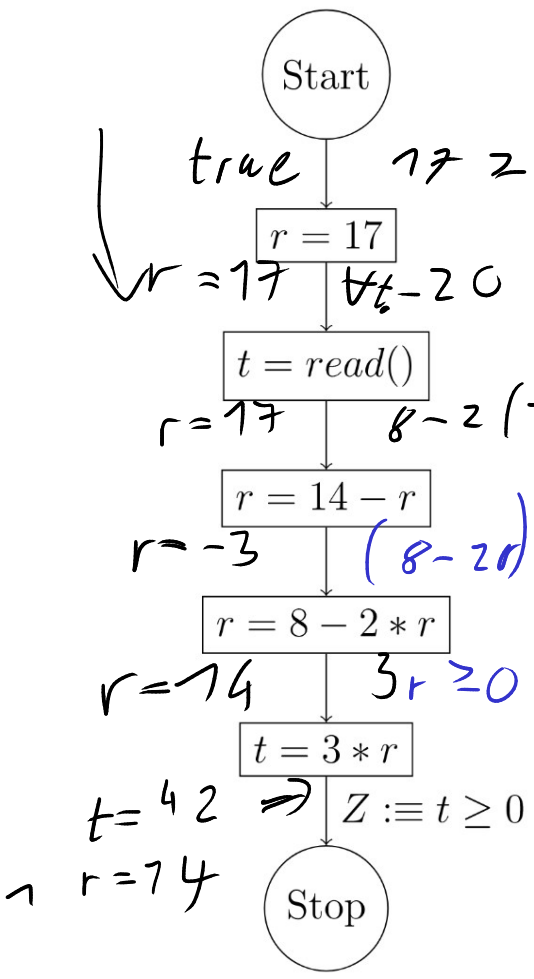
For each of these graphs show whether the assertion Z holds…

(a) …using strongest postconditions

(b) …using weakest preconditions.

Week 02 Tutorial 01 — From Post- to Preconditions

1.



true $17 \geq 10 \equiv$ true

$r = 17$ $t - 20 + 2r \geq 0 \equiv r \geq 10$

$r = 17$ $8 - 2(14 - r) \geq 0$

$\equiv -20 + 2r \geq 0$

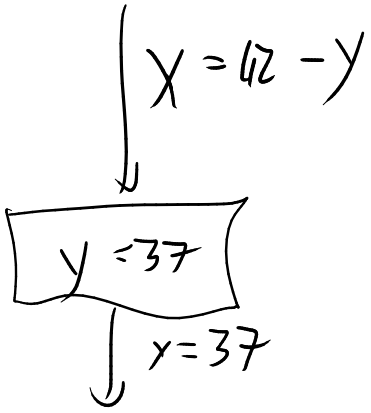
$r = -3$ $(8 - 2r) \geq 0$

$r = 14$ $3r \geq 0 \equiv r \geq 0$

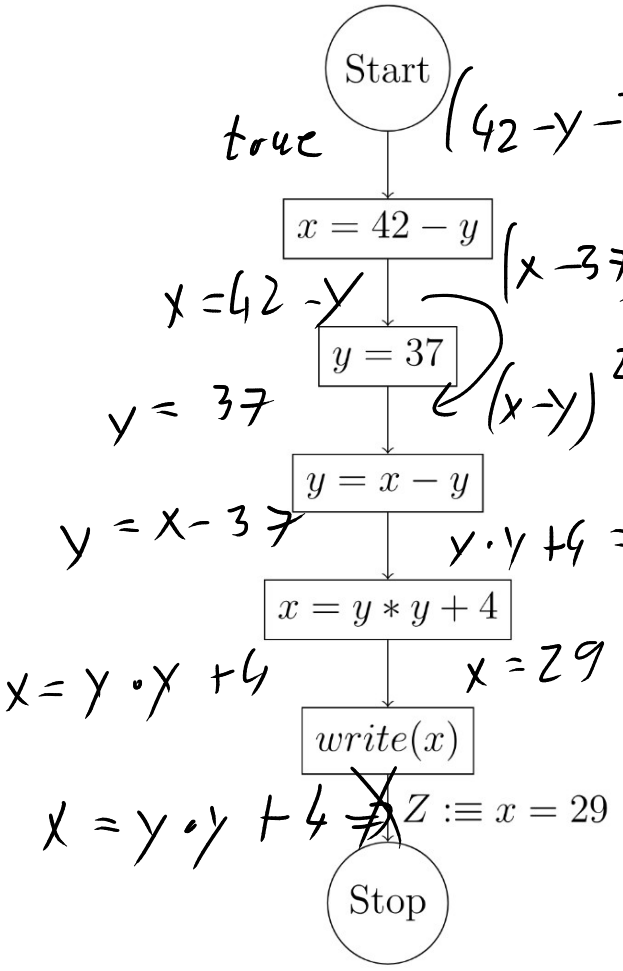
$t = 42 \Rightarrow$ $r = 14$

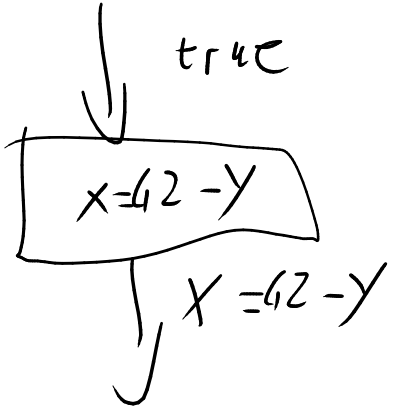
$WP[\![t = 3 * r]\!](Z) \equiv r \geq 0$

Week 02 Tutorial 01 — From Post- to Preconditions



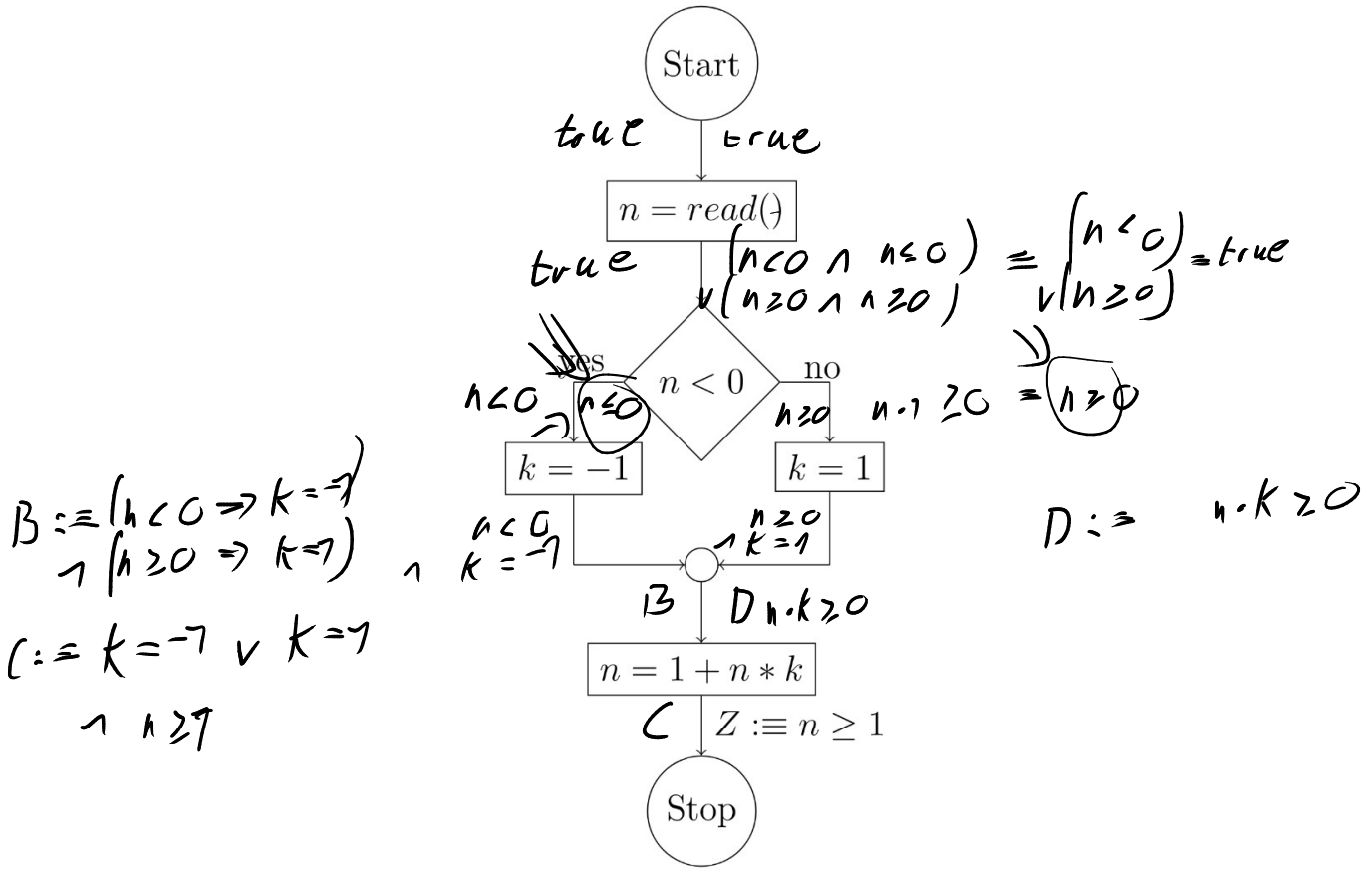
2.



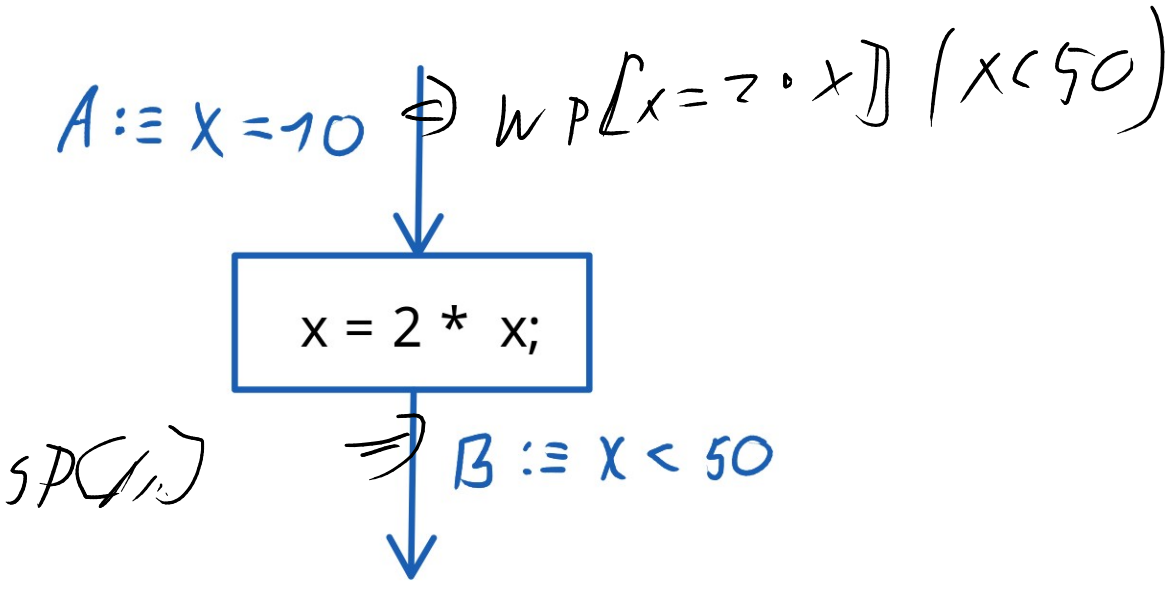


Week 02 Tutorial 01 — From Post- to Preconditions

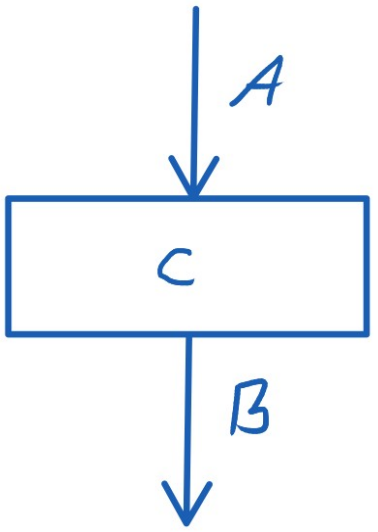
3.



Local Consistency



Local Consistency



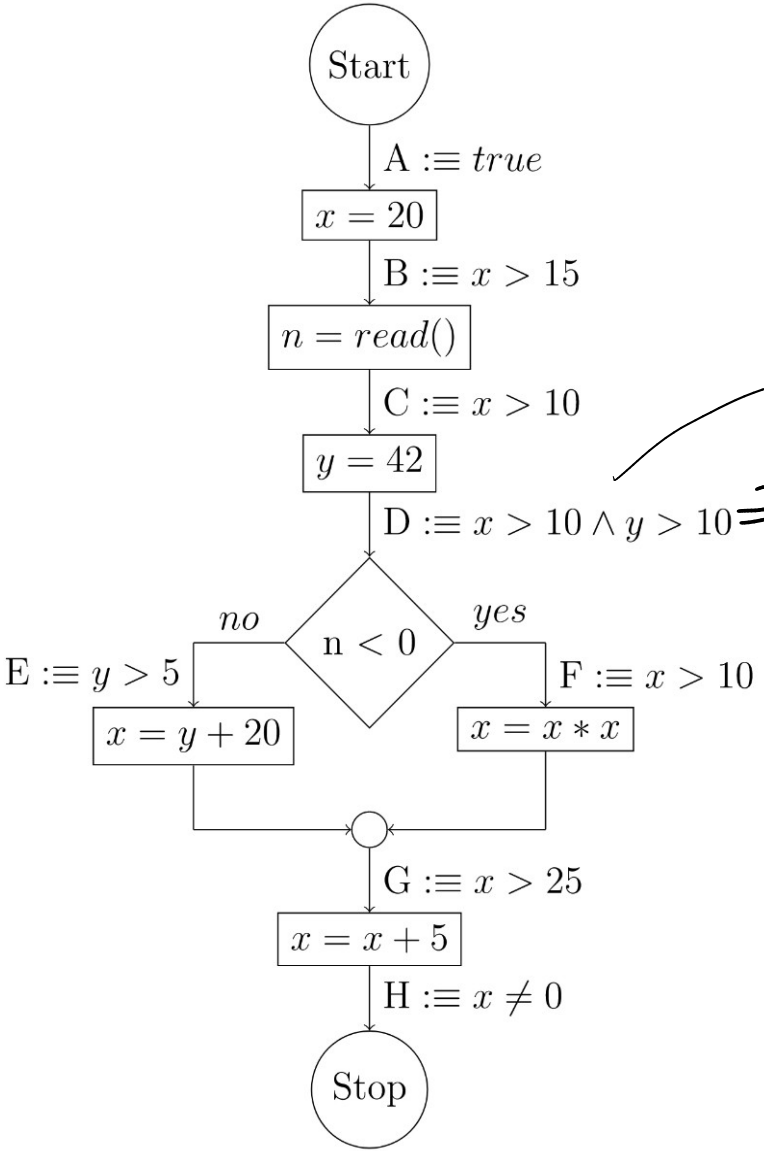
A, B und c sind Locally Consistent, falls eine der folgenden Aussagen gilt:

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

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

Beachte: 1) und 2) sind gleichbedeutend

Week 02 Tutorial 02
Local Consistency



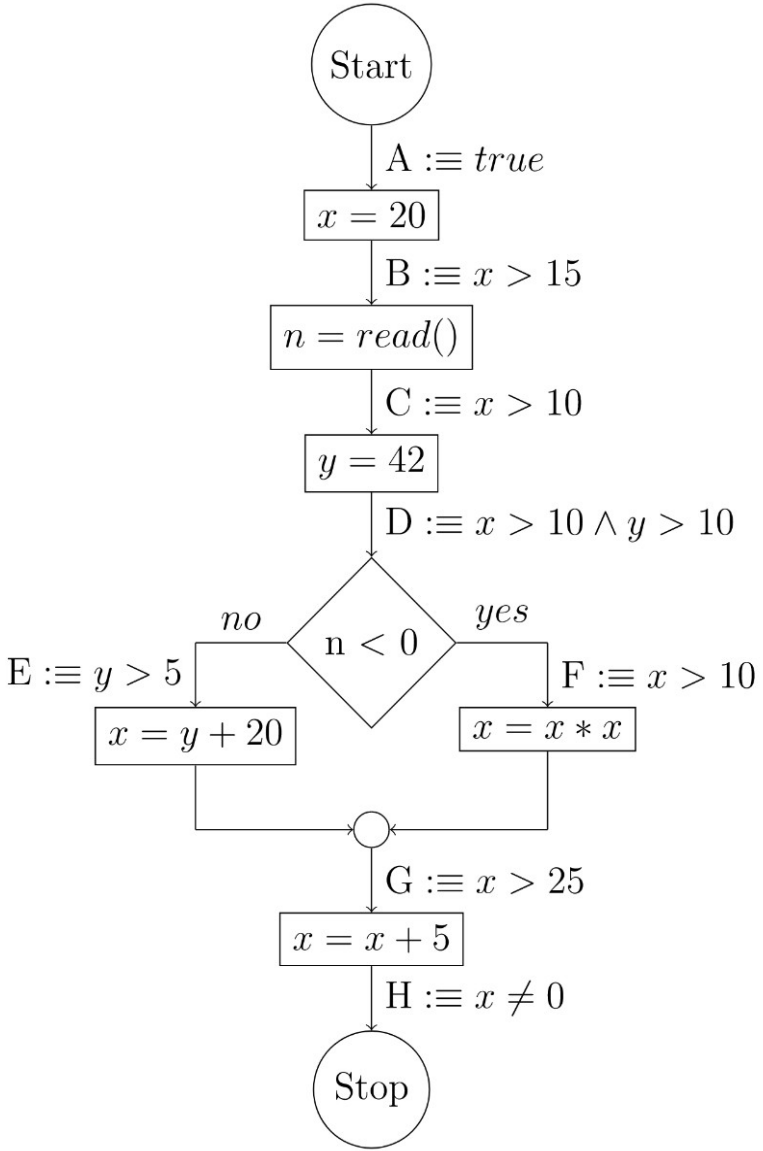
Check whether the annotated assertions prove that the program computes an x != 0 and discuss why this is the case.

$\Rightarrow wp = (n < 0 \wedge x > 10) \vee (n \geq 0 \wedge y > 5)$

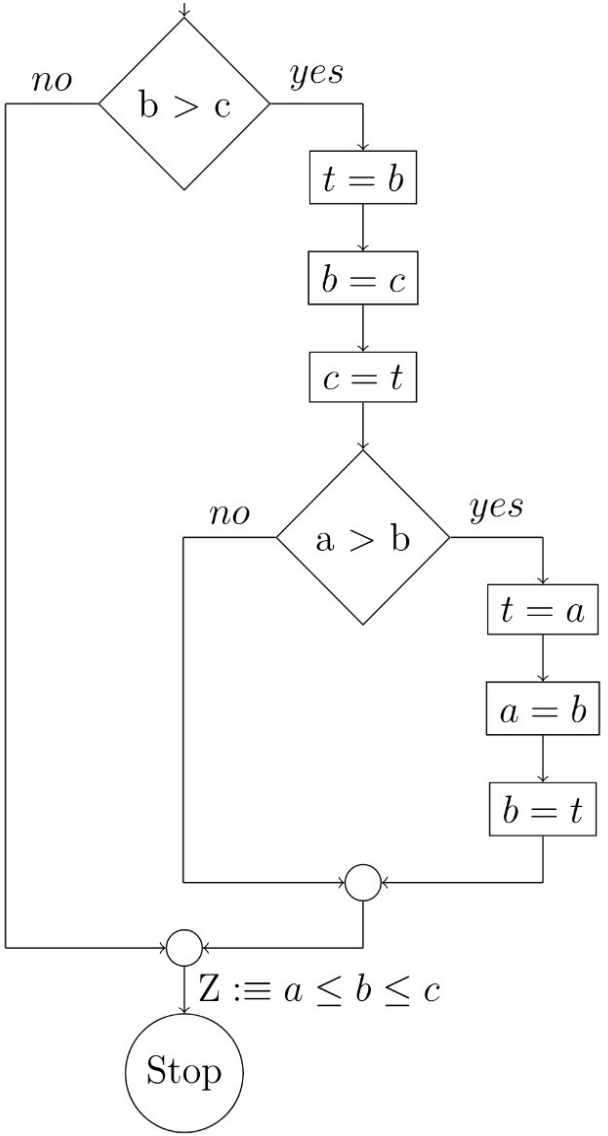
0 1

1 1

Week 02 Tutorial 02
Local Consistency



Week 02 Tutorial 03 — Trouble Sort



Week 02 Tutorial 03 — Trouble Sort