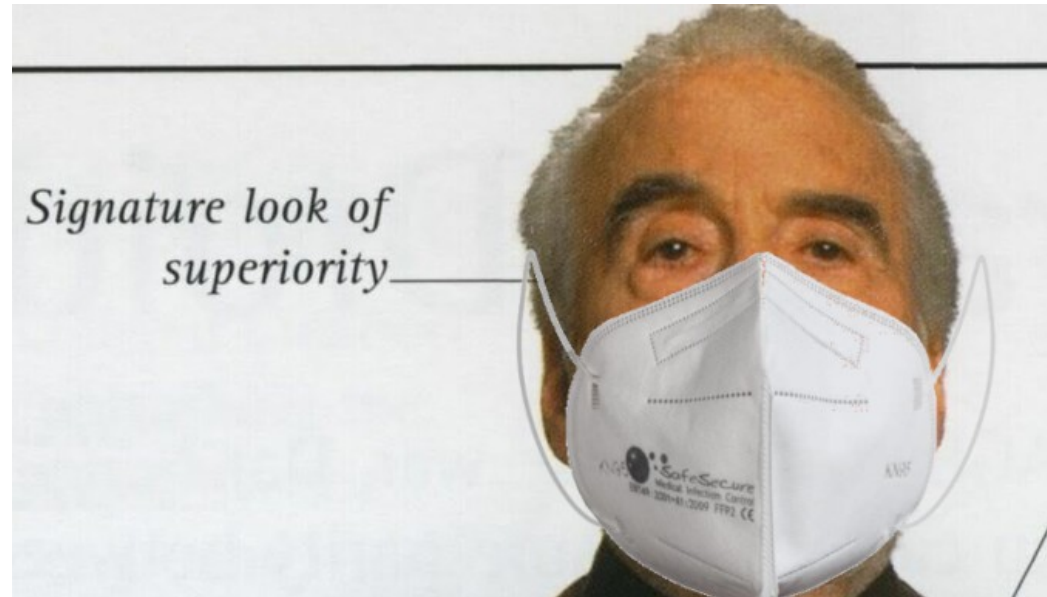


FPV Week 1: Implications, Assertions and Conditions



- Successful participation ($\geq 70\%$) in quizzes and programming tasks will lead to a bonus of 0.3 in the final exam, provided that you passed the exam.
- Programming homework and quizzes are to be submitted individually.
- Discussing solutions before the end of the week is considered plagiarism.
- Plagiarism will not be tolerated and will (at the very least) lead to exclusion from the bonus system

Material

The screenshot shows a GitHub repository page for 'Funky-Punky / FPV_SoSe22_T2_Do-10-12'. The repository is public and has a dark theme. The main content area displays the README.md file, which contains the title 'FPV_SoSe22_T2_Do-10-12' and a description: 'Materialien für Jonas' Tutorium in FVP SoSe22'. It also includes a Zulip-Stream link: 'https://zulip.in.tum.de/#narrow/stream/1034-FPV_T_2'. The right sidebar shows repository statistics: 0 stars, 1 watching, and 0 forks. The bottom of the page features the GitHub footer with copyright information and various links.

Funky-Punky / **FPV_SoSe22_T2_Do-10-12** Public

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main 1 branch 0 tags

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README.md

FPV_SoSe22_T2_Do-10-12

Materialien für Jonas' Tutorium in FVP SoSe22

Zulip-Stream: https://zulip.in.tum.de/#narrow/stream/1034-FPV_T_2

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https://github.com/Funky-Punky/FPV_SoSe22_T2_Do-10-12

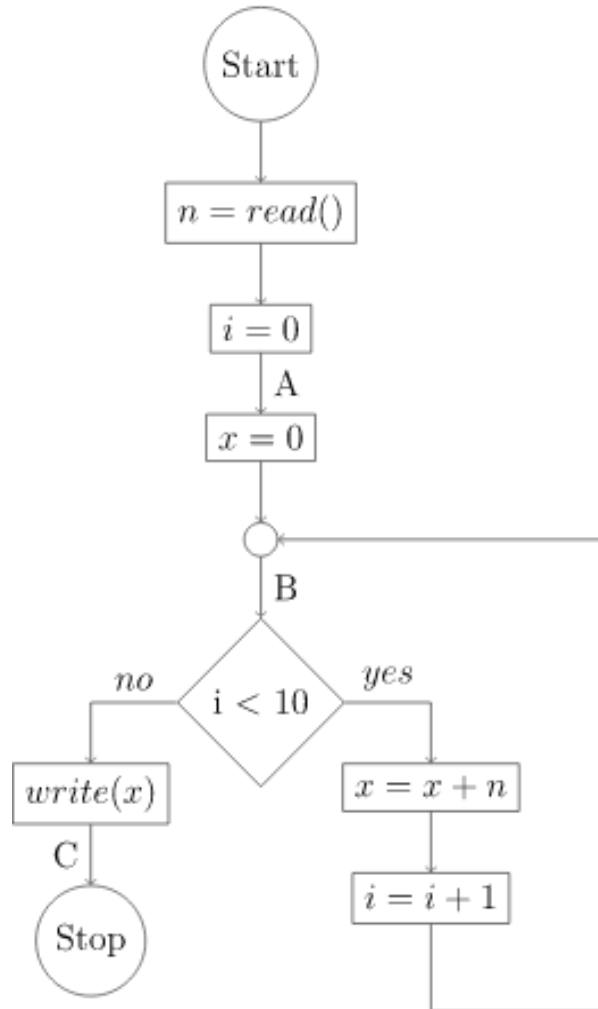
Week 01 Tutorial 01 Recap: Implications

1. $x = 1 \implies 0 < x$ ✓
2. $x < 6 \implies x = 3$ ✗
3. $x > 0 \implies x \geq 0$ ✓
4. $x = -2 \implies x < -1 \vee x > 1$ ✓
5. $x = 0 \vee x = 7 \implies 4 \neq x$ ✓
6. $x = 1 \implies x \leq 3 \wedge y > 0$ ✗
7. $x < 8 \wedge y = x \implies y \neq 12$ ✓
8. $x = 1 \vee y = 1 \implies x > 0$ ✗
9. $x \neq 5 \implies \text{false}$ ✗
10. $\text{true} \implies x \neq y$ ✗
11. $\text{false} \implies x = 1$ ✓
12. $x \geq 1 \implies 2x + 3 = 5$ ✗
13. $A \wedge (x = y) \implies A$ ✓
14. $B \implies A \vee B$ ✓ $\implies 1 \implies \bar{B} \vee A$ ✓
15. $A \implies (B \implies A)$ ✓
16. $(A \implies B) \implies A$ ✗

$\bar{a} \vee b$

A	B	$A \vee B$
0	0	0
0	1	1
1	0	1
1	1	1

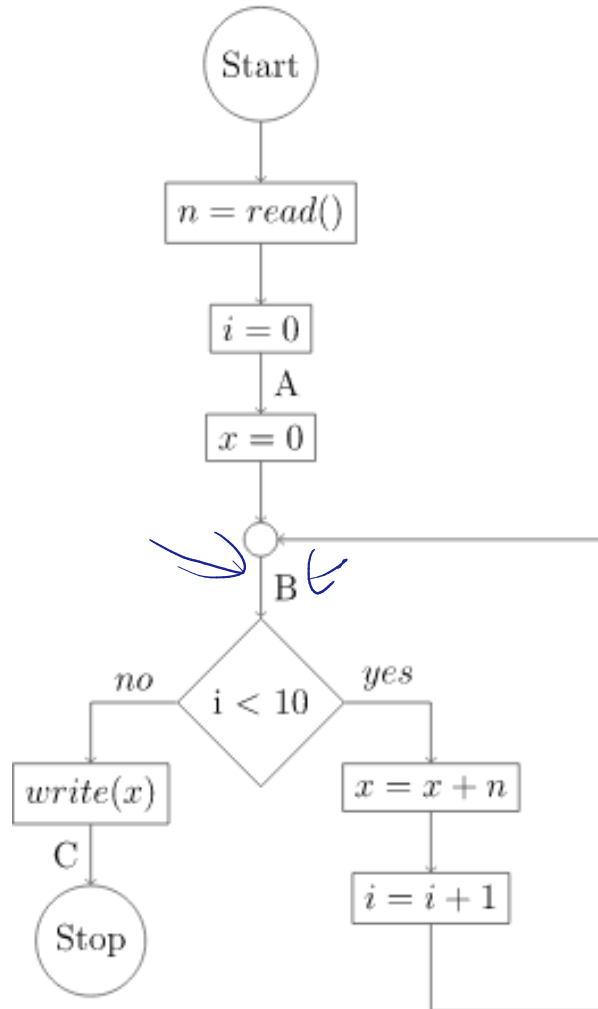
Week 01 Tutorial 02 Assertions



1. Which of the following assertions hold at point **A**?

- ☒ a) $i \geq 0$ ✓
- ☐ b) $x = 0$ ✗
- ☐ c) $i \leq 10 \wedge x \neq 0$ ✗
- ☒ d) $true$ ✓
- ☒ e) $i = 0$ ✓
- ☐ f) $x = i$ ✗

Week 01 Tutorial 02 Assertions

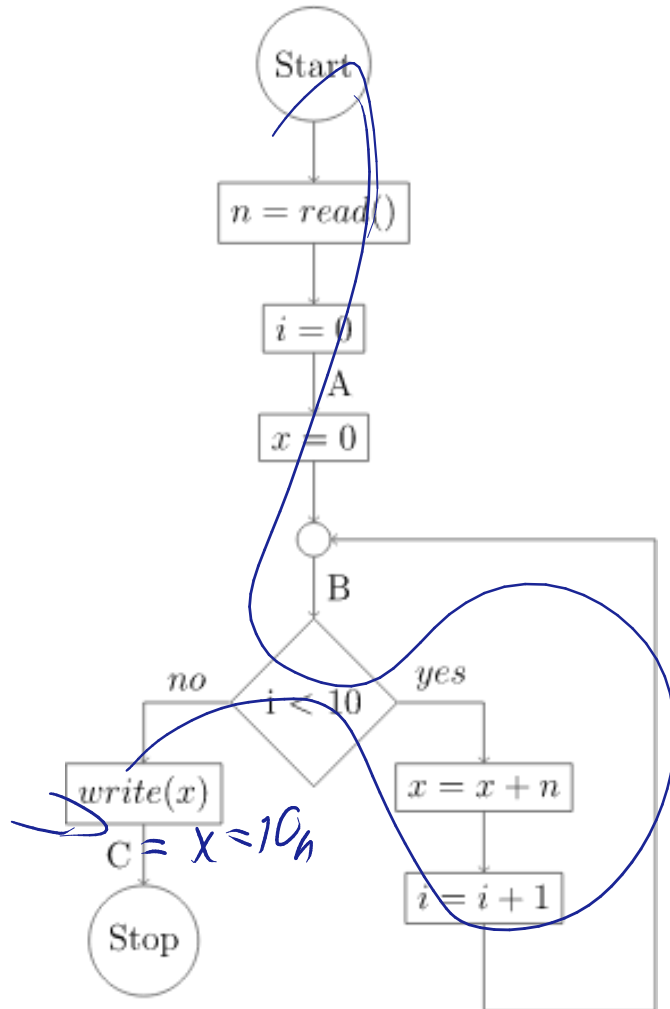


2. Which of the following assertions hold at point **B**?

- a) $x = 0 \wedge i = 0$ ✗
 - b) $x = i$ ✗
 - c) $i < x$ ✗
 - d) $0 \leq i \leq 10$ ✓
 - e) $i \geq 0 \wedge x \geq 0$ ✗
 - f) $n = 1 \implies x = i$ ✓
- $0 \leq i \leq 10$ ✓

$$\beta \equiv 0 \leq i \leq 10 \\ \wedge x = i \cdot n$$

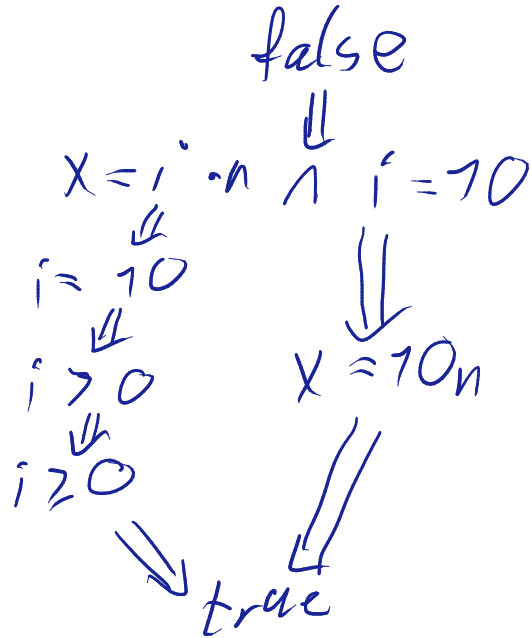
Week 01 Tutorial 02 Assertions



3. Which of the following assertions hold at point C ?

- a) $i \geq 0$ ✓
- b) $i = 10$ ✓
- c) $i > 0$ ✓
- d) $x \neq n$ ✗
- e) $x = 10n$ ✓
- f) $x = i * n \wedge i = 10$ ✓

Week 01 Tutorial 03 The Strong and the Weak



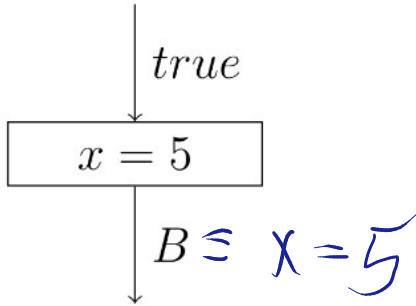
3. Which of the following assertions hold at point *C*?

- a) $i \geq 0$
- b) $i = 10$
- c) $i > 0$
- ~~◦ d) $x = 10n$~~
- e) $x = 10n$
- f) $x = i * n \wedge i = 10$

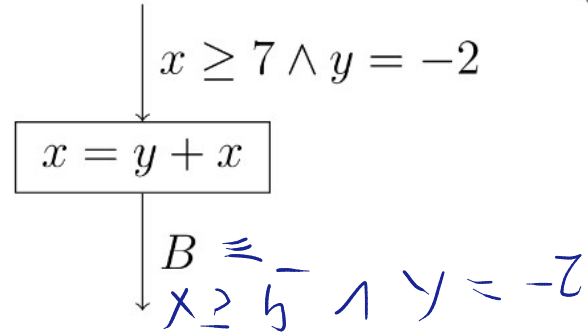
- Handwritten notes on the left side of the list:
- 1. When annotating the control flow graph, can you say that one of the given assertions is "better" than the others?
 - 2. Can you arrange the given assertions in a meaningful order?
 - 3. How can you define a *stronger than* relation formally?
 - 4. How do **true** and **false** fit in and what is their meaning as an assertion?
 - 5. What are the strongest assertions that still hold at *A*, *B* and *C*?
-

Week 01 Tutorial 04 Strongest Postconditions

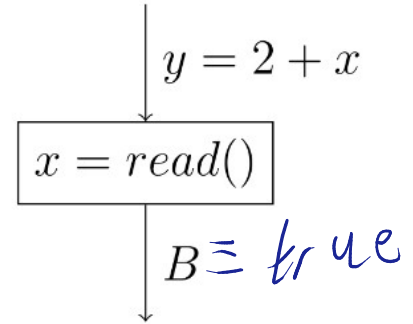
1.



3.

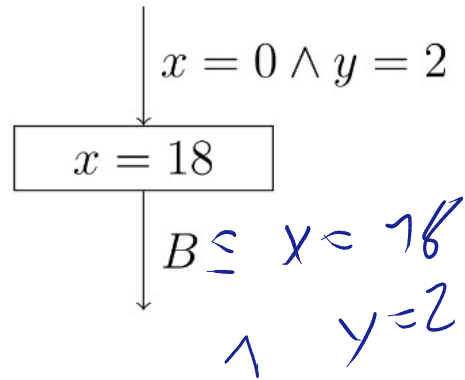


5.

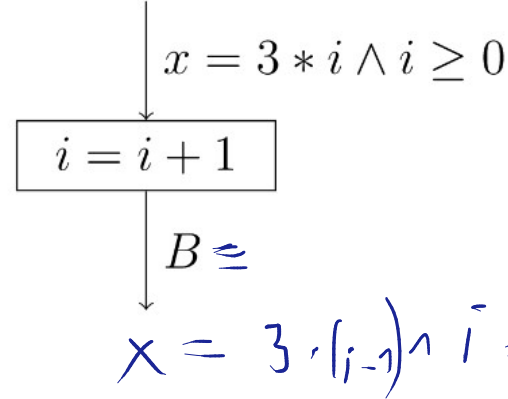


Week 01 Tutorial 04 Strongest Postconditions

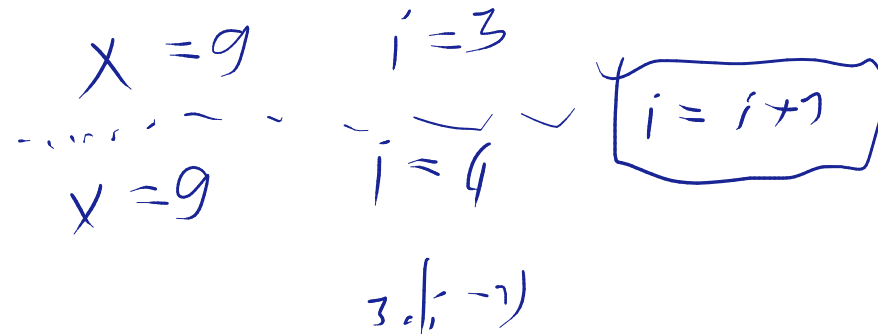
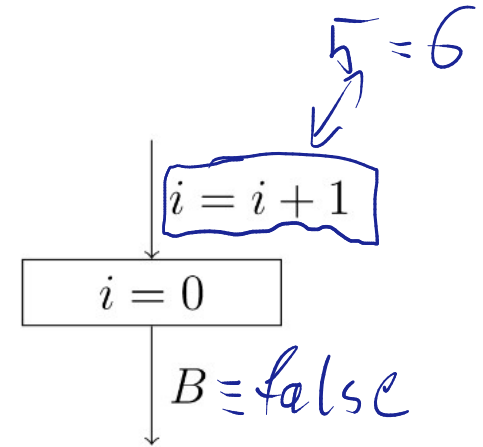
2.



4.

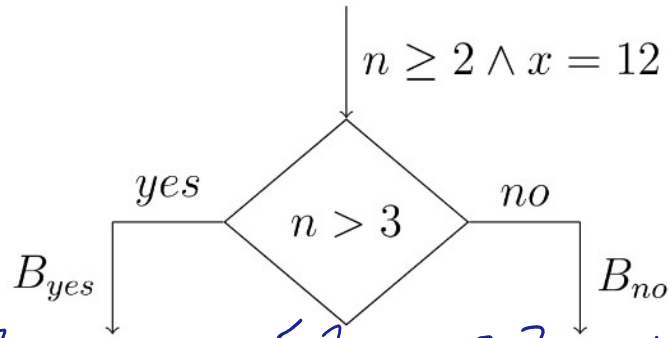


6.



Week 01 Tutorial 04 Strongest Postconditions

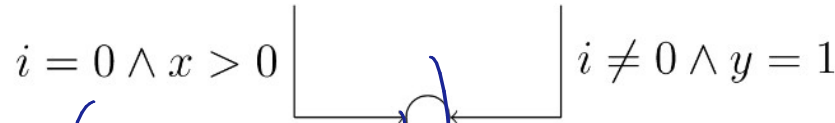
7.



$\equiv n > 3$
 $\wedge x = 12$

$\equiv \underbrace{n \leq 3 \wedge n \geq 2} \wedge \underbrace{x = 12}$

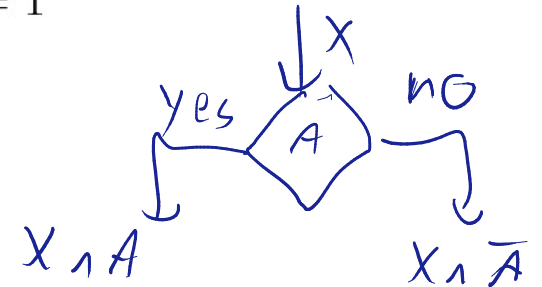
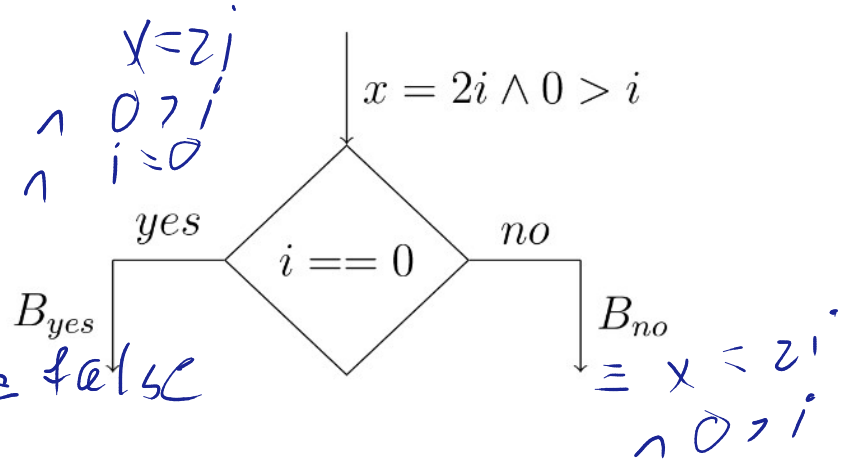
9.



$(i = 0 \Rightarrow x > 0)$
 $\wedge (i \neq 0 \Rightarrow y = 1) \equiv \left(\begin{array}{l} i = 0 \wedge x > 0 \\ \vee i \neq 0 \wedge y = 1 \end{array} \right)$



8.



$$\vee (\overline{i=0} \wedge \overline{i \neq 0})$$

$$\vee (\overline{i=0} \vee x > 0)$$

$$\wedge (\overline{i \neq 0} \vee y = 1)$$

\approx