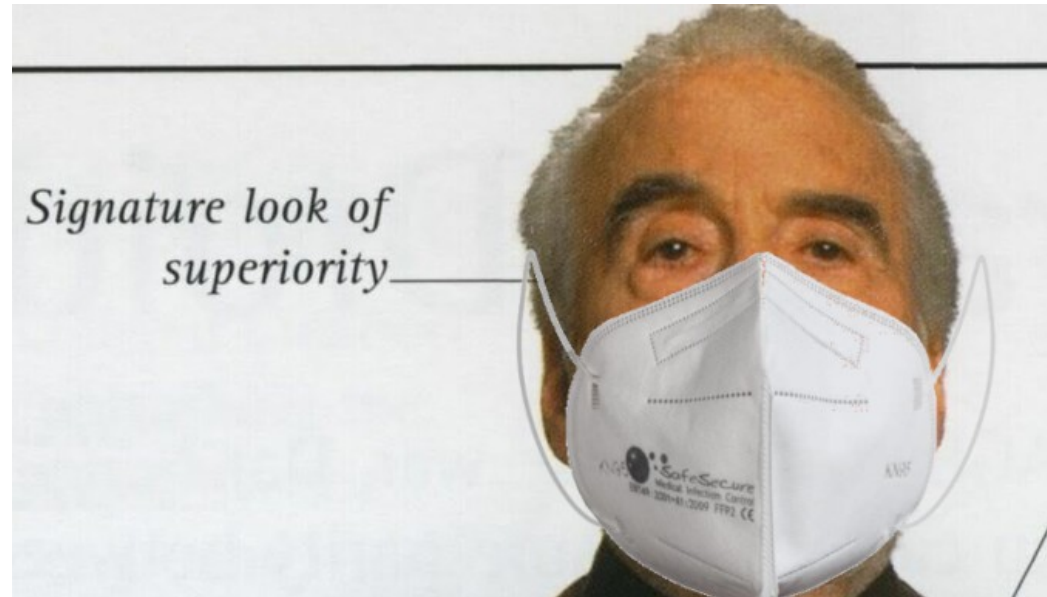


# FPV Week 1: Implications, Assertions and Conditions



- 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 the GitHub interface for the repository `Funky-Punky / FPV_SoSe22_T8_Di-15-17`. The repository is public and has a dark theme. The main content area displays the `README.md` file, which contains the title `FPV_SoSe22_T8_Di-15-17` and a description: "Materialien für Jonas' Tutorium in FVP SoSe22." It also includes a Zulip stream link: `https://zulip.in.tum.de/#narrow/stream/1030-FPV_T_8`. 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_T8_Di-15-17` Public

[Code](#) [Issues](#) [Pull requests](#) [Actions](#) [Projects](#) [Wiki](#) [Security](#) [Insights](#) [Settings](#)

[main](#) [1 branch](#) [0 tags](#) [Go to file](#) [Add file](#) [Code](#) [About](#)

**Funky-Punky** Update `README.md` 7a9065a 9 hours ago 2 commits

File	Commit	Time
<code>.gitignore</code>	Initial commit	9 hours ago
<code>README.md</code>	Update <code>README.md</code>	9 hours ago

**README.md**

## FPV\_SoSe22\_T8\_Di-15-17

Materialien für Jonas' Tutorium in FVP SoSe22.

Zulip-Stream: [https://zulip.in.tum.de/#narrow/stream/1030-FPV\\_T\\_8](https://zulip.in.tum.de/#narrow/stream/1030-FPV_T_8)

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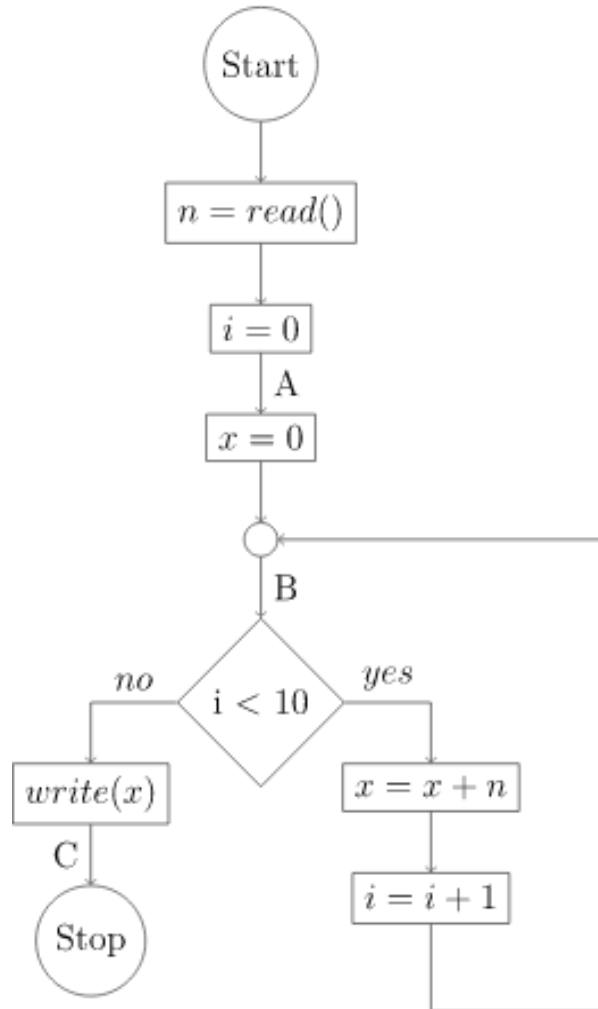
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[https://github.com/Funky-Punky/FPV\\_SoSe22\\_T8\\_Di-15-17](https://github.com/Funky-Punky/FPV_SoSe22_T8_Di-15-17)

# 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.  $B \implies A \vee B$
15.  $A \implies (B \implies A)$
16.  $(A \implies B) \implies A$

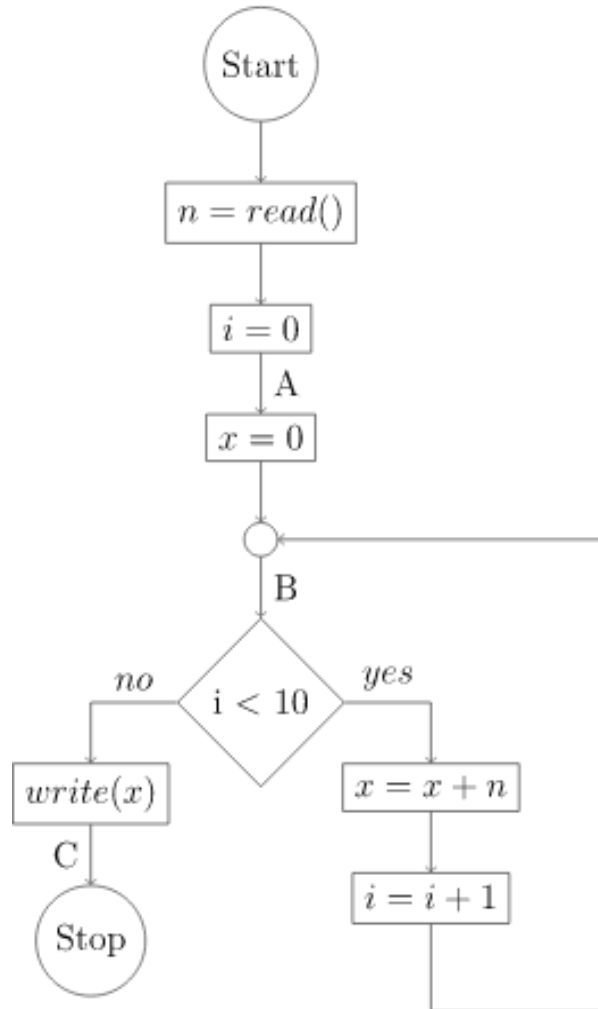
## Week 01 Tutorial 02 Assertions



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)  $x = i$

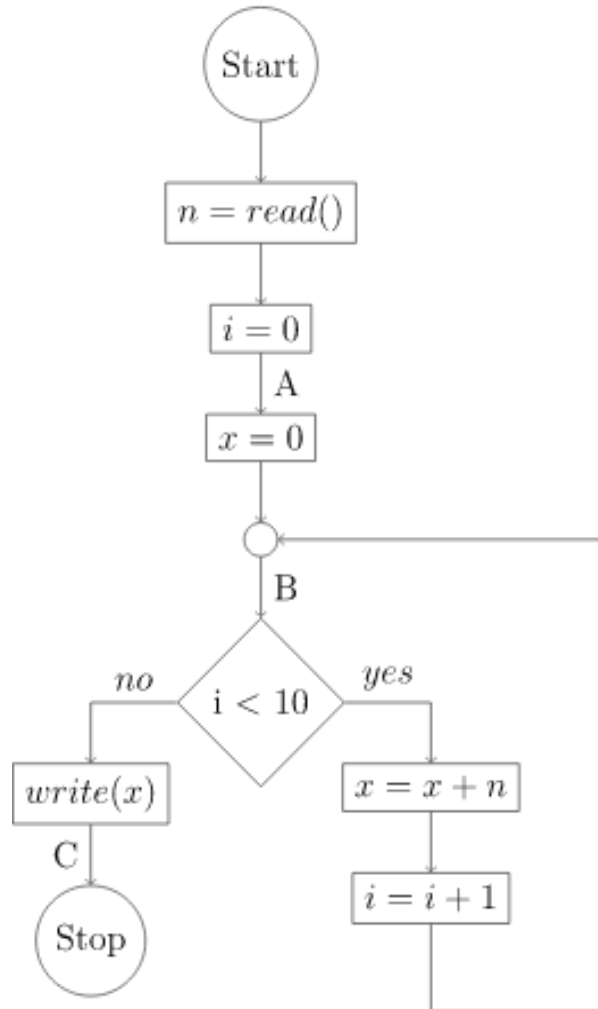
## Week 01 Tutorial 02 Assertions



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)  $n = 1 \implies x = i$

## 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  $C$ ?

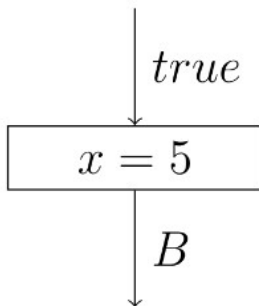
- a)  $i \geq 0$
- b)  $i = 10$
- c)  $i > 0$
- d)  $x \neq n$
- e)  $x = 10n$
- f)  $x = i * n \wedge i = 10$

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  $C$ ?

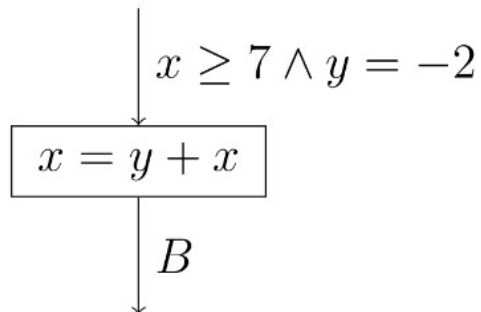


# Week 01 Tutorial 04 Strongest Postconditions

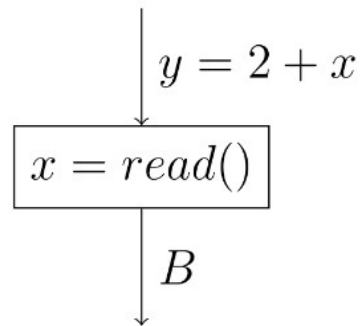
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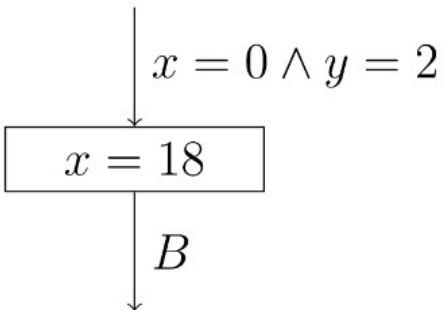


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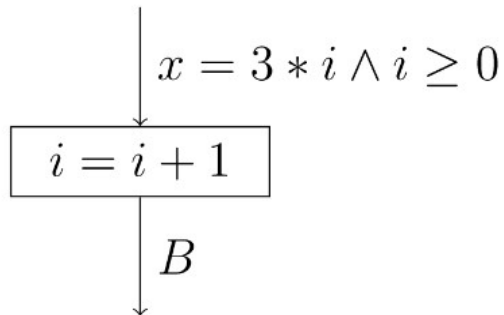


## Week 01 Tutorial 04 Strongest Postconditions

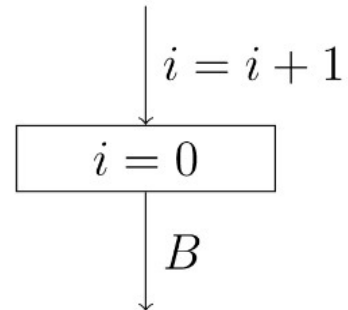
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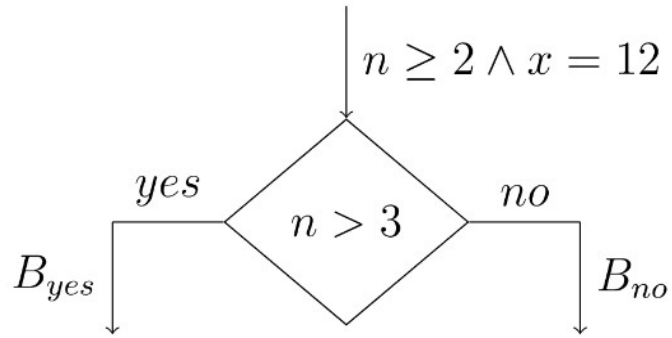


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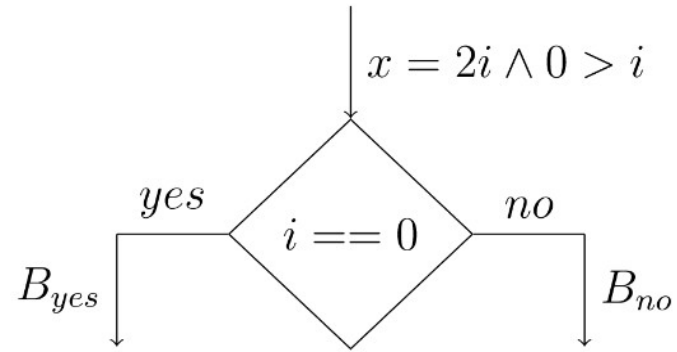


# Week 01 Tutorial 04 Strongest Postconditions

7.



8.



9.

