Program Correctness

Qornain Aif
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1 Prove the progam statement

$$\left.\begin{array}{l} y := 1 \\ z := x + y \end{array}\right\} S$$

is correct with respect to the initial assertion $x = 0$ and the final assertion $z = 1$

※ Prove: The innitial auertion of the program is $x = 0$.
First the program will assign $y = 1$. Because $z = x + y$ and $x = 0$; $y = 1$; so:

$$z = 0 + 1 = 1$$

The final asertion is $z = 1$; thus the program is true and statisfied. So, $y \{ S \} z$ is true ▨

4 Verify that the program segment

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if x < y then
    min := x
else
    min := y
```

is correct with respect to the initial assertion T and the final assertion $(x \leq y \wedge min = x) \vee (x > y \wedge mn = y)$

※ Prove : If the innitial assertion is true, so that $x < y \rightarrow min := x$.
The final assertion $(x \leq y \wedge min = x) \vee (x > y \wedge min = y)$ is true because :

$x \leq y \wedge min = x$ is true and
$x > y \wedge min = y$ is also true

Thus, true $\vee$ true is true.

Now, if the initial assertion is false so that $x \geq y \rightarrow min := y$.
The final assertion of $(x \leq y \wedge min = x) \vee (x > y \wedge min = y)$ is also true because :

- $x \leq y$ while $x \geq y$ is true. Then it is a part of $min = x$ statement. So, the statement is true!
- $x > y$ while x can be equal or greater than y is true. Then it is a part of $min = y$ statement. So the statement is also true!

Thus, true $\vee$ true is true.

Hence, using the rule of inference for program segments of this type, this segment is correct with respect to the given initial and final assertion.