

SoftwareFiavel-2

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1 Exercício 1

1.1

Expansion

$$WLP(Trick, b \iff res = n * 10 + 2)$$

$$\iff WLP(val := n * 2; val := val * 5; val := val - 5; val := val + 7; if res = val then b := true else b := false, b \iff res = n * 10 + 2)$$

$$\iff WLP(val := n * 2; WLP(val := val * 5; val := val - 5; val := val + 7; if res = val then b := true else b := false, b \iff res = n * 10 + 2))$$

$$\iff WLP(val := n * 2; WLP(val := val * 5; WLP(val := val - 5; val := val + 7; if res = val then b := true else b := false, b \iff res = n * 10 + 2)))$$

$$\iff WLP(val := n * 2; WLP(val := val * 5; WLP(val := val - 5; WLP(val := val + 7; if res = val then b := true else b := false, b \iff res = n * 10 + 2))))$$

$$\iff WLP(val := n * 2; WLP(val := val * 5; WLP(val := val - 5; WLP(val := val + 7; res = val \Rightarrow WLP(b := true, b \iff res = n * 10 + 2) \wedge res \neq val \Rightarrow WLP(b := false, b \iff res = n * 10 + 2)))))$$

$$\iff WLP(val := n * 2; WLP(val := val * 5; WLP(val := val - 5; WLP(val := val + 7; res = val \Rightarrow WLP(true \iff res = n * 10 + 2) \wedge res \neq val \Rightarrow WLP(false \iff res = n * 10 + 2)))))$$

Simplification

$$\iff WLP(val := n * 2; WLP(val := val * 5; WLP(val := val - 5; res = val + 7 \Rightarrow WLP(true \iff res = n * 10 + 2) \wedge res \neq val + 7 \Rightarrow WLP(false \iff res = n * 10 + 2)))))$$

$$\iff WLP(val := n * 2; WLP(val := val * 5; res = val + 2 \Rightarrow WLP(true \iff res = n * 10 + 2) \wedge res \neq val + 2 \Rightarrow WLP(false \iff res = n * 10 + 2))))$$

$$\iff WLP(val := n * 2; res = val * 5 + 2 \Rightarrow WLP(true \iff res = n * 10 + 2) \wedge res \neq val * 5 + 2 \Rightarrow WLP(false \iff res = n * 10 + 2)))$$

$$\iff res = n * 10 + 2 \Rightarrow WLP(true \iff res = n * 10 + 2) \wedge res \neq n * 10 + 2 \Rightarrow WLP(false \iff res = n * 10 + 2)$$

$$\iff WLP(true \iff res = res) \wedge WLP(false \iff res \neq res)$$

$$\iff WLP(true \iff true) \wedge WLP(false \iff false)$$

$$\iff true \wedge true \iff true$$

1.2

Given a certain triple $\{\varphi\}S\{\psi\}$, we can reduce the validity of the triple to $\varphi \rightarrow WLP(S, \psi)$, by using verification condition generation, this being the process of transforming a bounded program to a logical formula where the correctness of the program is reduced to the validity of the formula, this process relies on the weakest liberal precondition this being the weakest φ such that $\{\varphi\}S\{\psi\}$ is valid.

Taking the example given we can reduce $\{1 \leq n \leq 8\} Trick \{b \iff res = n * 10 + 2\}$ to the validity of $\{1 \leq n \leq 8\} \rightarrow WLP(Trick, b \iff res = n * 10 + 2)$ and since we proved the second part in 1.1 the triple is valid given we proved the right part of the implication.