

17-355/17-655/17-819: Program Analysis

Lecture 14, Axiomatic Semantics and Hoare-style verification

In-Class Exercises

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1. What are reasonable pre- or post- conditions for the following incomplete Hoare triples?

$\{ \text{true} \} \ x := 5 \quad \{ \quad \}$

$\{ \quad \} \ x := x + 3 \quad \{ x = y + 3 \}$

$\{ \quad \} \ x := x * 2 + 3 \quad \{ x > 1 \}$

$\{ x = a \} \ \text{if } (x < 0) \ \text{then } x := -x \quad \{ \quad \}$

$\{ \text{false} \} \ x := 3 \quad \{ \quad \}$

$\{ x < 0 \} \ \text{while } (x \neq 0) \ x := x - 1 \quad \{ \quad \}$

2. Consider the following triples:

$\{ z=y+1 \} \ x:=z*2 \quad \{ x=4 \}$

$\{ y=7 \} \ x:=y+3 \quad \{ x>5 \}$

$\{ \text{false} \} \ x:=2/y \quad \{ \text{true} \}$

$\{ y<16 \} \ x:=2/y \quad \{ x<8 \}$

- a. Which of the above are valid?

- b. For which of the valid triples:

- i. Can you write a stronger postcondition? Leave the precondition unchanged, and ensure the resulting triple is still valid.
- ii. Can you write a weaker precondition? Leave the postcondition unchanged, and ensure the resulting triple is still valid.