

CS4182 Homework 3

1. Consider the following code:

$x = x * x; \quad y = y * y; \quad z = x + y$

Suppose the initial state is $x = 3, y = 4, z = 0$. Determine the state after each statement and find the final state.

2. State whether the following Hoare Triples are correct or incorrect. Explain your answer.

(a) $\{i > 10\}i = i + 3\{i > 20\}$

(b) $\{i > 10\}i = i + 3\{i > 10\}$

(c) $\{a < b\}a = b\{a < b\}$

3. Determine two different preconditions for each of the following Hoare Triples which make the Hoare Triple correct. Explain your answer.

(a) $\{?\}i = i + 5\{i > 25\}$

(b) $\{?\}i = i + 3\{i > 10\}$

(c) $\{?\}i = i + 5\{i < 25\}$

(d) $\{?\}i = i - 5\{i < 25\}$

(e) $\{?\}i = i + 3\{i \geq 10\}$

(f) $\{?\}i = i - 3\{i \geq 10\}$

4. Determine two different postconditions for each of the following Hoare Triples which make the Hoare Triples correct. Explain your answer.

(a) $\{i > 10\}i = i + 8\{?\}$

(b) $\{i < 10\}i = i + 8\{?\}$

(c) $\{i > 3\}i = i - 5\{?\}$

(d) $\{i < 3\}i = i - 5\{?\}$

5. Suppose that $\{sum < 1\}C\{sum < 5\}$ is correct. The program C is not known. Can you deduce which of the following triples are guaranteed to be correct?

- $\{sum < 2\}C\{sum < 5\}$
- $\{sum \leq 1\}C\{sum < 5\}$
- $\{sum < 0\}C\{sum < 5\}$
- $\{sum < 1\}C\{sum < 6\}$
- $\{sum < 1\}C\{sum < 4\}$