

Exercises.

Determine whether the following Hoare triples are valid.

$$\{y > 16\} \ x := x + 2 \ \{y > 15\}$$

$$\{x = 4\} \ x := x + 1 \ \{x > 4\}$$

$$\{y = z\} \ z := z + 1 \ \{y - 1 > z\}$$

$$\{17 = 18\} \ x := x + 1 \ \{x > z\}$$

$$\{x = 4\} \ x := 4 \ \{x = 4\}$$

$$\{x = 4\} \ x := x + 1 \ \{x = 4\}$$

Determine the Weakest Preconditions of the following.

$$x := x + 1 \ \{x = 12\}$$

$$x := y + 2 \ \{x > 17\}$$

$$y := 4 \ \{x = y + 2\}$$

$$x := y \ \{x \leq 0\}$$

$$x := 74 \ \{x = 73\}$$

What assignments would make the following into valid Hoare triples?

$$\{x = y + z\} \quad ? \quad \{x = z\}$$

$$\{y * 2 = 12\} \quad ? \quad \{y = 24\}$$

$$\{\text{true}\} \quad ? \quad \{y = 12\}$$

$$\{x > y\} \quad ? \quad \{x < y\}$$

$$\{x = X \wedge y = Y\} \quad ? \quad \{x = Y \wedge y = X\}$$

Given an array $f[0..100)$ of int. Express the following in Quantified form

r is the sum of the values in f

p is the product of the values in the 2nd half of f

r is the largest value in f

s is the smallest value in f

k is the sum of the last 20 elements in f

v is the product of the middle 20 elements in f

r is the sum of the even elements in f

p is the product of the negative elements in f

v is the smallest positive element in the first half of f

p is the largest even value in the 2nd half of f

i is the smallest index in f where $f.i = X$

k is the largest index in f where $f.k = 7$

All of the elements in f are greater than 10

All of the elements in f are even numbers

None of the elements in f is larger than 123