2019CSB1071

Written Assignment - IV

Ans-1

$\Rightarrow b > 5$

$\Rightarrow 2*a - 1 > 5$

$\Rightarrow a > 3$

Given that, $a = 3*(2*b + a)$

$\Rightarrow a > 3$

$\Rightarrow 3*(2*b + a) > 3$

$\Rightarrow 2*b + a > 1$

$\Rightarrow b > \frac{1-a}{2}$

weakest precondition is $b > \left(\frac{1-a}{2}\right)$

Ans-2

So. P: $\{n > 0$ & $count = n$ & $sum = 0\}$

Q: $\{sum = 1 + 2 + \dots n\}$

i) for 0th iteration : $\{sum = 0\}$
$\{count = n\}$

ii) for 1st iteration : $\{sum = 0 + n = n\}$
$\{count = n - 1\}$

iii) for 2nd iteration : $\{sum = n + n - 1\}$
$\{count = n - 2\}$

iv) for 3rd iteration : $\{sum = n + n - 1 + n - 2\}$
$\{count = n - 3\}$

v) for 4th iteration : $\{sum = n + n - 1 + n - 2 + n - 3$
$\{count\ n - 4\}$

The relationship between sum & count can be written as

$$sum = n + (n-1) + \dots + (count + 2) + (count + 1)$$

after each iteration

So,

$I = \{sum = n + (n-1) + \ldots (count + 2) + count + 1\}$

$P : \{n > 0 \ \& \ count = n \ \& \ sum = 0\}$

we need to show that

$$P \Rightarrow I$$

In other words, we need to prove,

$n + (n-1) + \ldots + (count+1) + (count+2) = 0$

when count $= n$

$\Rightarrow n + (n-1) + \ldots + (count+1) + (count+2)$

$\Rightarrow n + (n-1) + \ldots + (count+1) + (count+2) +$

$(count + (count-1) + \ldots\ldots + 1) -$

$(count + (count-1) + \ldots + 1)$

{Adding & subtracting count + (count-1) + ... + 1)

$\Rightarrow \sum_{x=1}^{n} x - (count + (count-1) + \ldots + 1)$

When count = n,

$$\Rightarrow \sum_{x=1}^{n} x - \sum_{x=1}^{n} x$$

$\Rightarrow 0$

Hence $P \Rightarrow I$

⊛ B = count != 0

$\Rightarrow \{I \& B\} = \{sum = n + (n-1) + \dots (count+1) + (count+2)\}$

& { count != 0

I: { sum = n + (n-1) + ... (count + 1) + count + 2 }

Hence, we observe that

$\{I \& B\}\ S\ \{I\}$

Also,

$$\{I \,\&\, !B\} = \{sum = n + (n-1) + \cdots (count+1) + (count+2)\} \;\&\&\; (count == 0)$$

$$\Rightarrow \{sum = n + (n-1) \cdots + 2 + 1\} = Q$$

Hence, we proved that

$$\{I \,\&\, !B\} \Rightarrow Q$$

In each iteration of while loop count decreases by 1, & $n>0$ & count >0 before start of loop. So, loop will always terminate & become equal to 0 in n steps.

Hence, at the end of loop

$$sum = n + (n-1) + \cdots + (count+1) + (count+2)$$

& count $= 0$, so

$$sum = n + (n-1) + \cdots + 2 + 1$$