Zuweisungsregel

$$\left\{P_E^x\right\} x := E \left\{P\right\}$$

Sequenzregel

$$\frac{\left\{P\right\} S_1 \left\{Q\right\}; \left\{Q\right\} S_2 \left\{R\right\}}{\left\{P\right\} S_1; S_2 \left\{R\right\}}$$

Iteration

$$\frac{\left\{P \wedge B\right\} S \left\{P\right\}}{\left\{P\right\} \text{while } B \text{ do } S \left\{P \wedge \neg B\right\}}$$

$$\frac{\begin{array}{c}\left\{P\right\} S \left\{Q\right\} \\ \left\{Q \wedge \neg B\right\} S \left\{Q\right\}\end{array}}{\left\{P\right\} \text{repeat } S \text{ until } B \left\{Q \wedge B\right\}}$$

Fallunterscheidung

$$\frac{\{P \wedge B\}\, S\, \{Q\} \qquad P \wedge \neg B \Rightarrow Q}{\{P\}\ \text{if } B \text{ then } S\, \{Q\}}$$

$$\frac{\{P \wedge B\}\, S_1\, \{Q\} \qquad \{P \wedge \neg B\}\, S_2\, \{Q\}}{\{P\}\ \text{if } B \text{ then } S_1 \text{ else } S_2\, \{Q\}}$$

Implikation

$$\frac{\{P\}\, S\, \{Q\}, Q \Rightarrow R}{\{P\}\, S\, \{R\}}$$

$$\frac{P \Rightarrow R, \{R\}\, S\, \{Q\}}{\{P\}\, S\, \{Q\}}$$

$$P \equiv \{b \in \mathbb{Z} \wedge \forall i \in \mathbb{Z}, 0 \leq i < b < a.length : c \leq a[i] < d\}$$

if (a[b]<=c)

$$\{b \in \mathbb{Z} \wedge \forall i \in \mathbb{Z}, 0 \leq i < b < a.length : c \leq a[i] < d \wedge a[b] \leq c\}$$

$$\{b \in \mathbb{Z} \wedge \forall i \in \mathbb{Z}, 0 \leq i < b < a.length : a[b] \leq a[i] < d \wedge a[b] \leq c\}$$

c=a[b]

$$\{b \in \mathbb{Z} \wedge \forall i \in \mathbb{Z}, 0 \leq i < b < a.length : c \leq a[i] < d \wedge a[b] = c\}$$

$$\{b \in \mathbb{Z} \wedge \forall i \in \mathbb{Z}, 0 \leq i \leq b < a.length : c \leq a[i] < d\}$$

else

$$\{b \in \mathbb{Z} \wedge \forall i \in \mathbb{Z}, 0 \leq i < b < a.length : c \leq a[i] < d \wedge a[b] > c\}$$

d=a[b]

$$\{b \in \mathbb{Z} \wedge \forall i \in \mathbb{Z}, 0 \leq i \leq b < a.length : c \leq a[i] \wedge d > c\}$$

$$Q \equiv \{b \in \mathbb{Z} \wedge \forall i \in \mathbb{Z}, 0 \leq i \leq b < a.length : c \leq a[i]\}$$

$$\{a,b,c \in \mathbb{N}_0 \wedge a = 0 \wedge c = 1 \wedge c = 2^a\}$$

while (a<b)

$$\{a,b,c \in \mathbb{N}_0 \wedge c = 2^a \wedge a < b\}$$

$$\{a,b,c \in \mathbb{N}_0 \wedge 2c = 2^{a+1} \wedge a < b\}$$

c=2*c

$$\{a,b,c \in \mathbb{N}_0 \wedge c = 2^{a+1} \wedge a < b\}$$

a=a+1

$$\{a,b,c \in \mathbb{N}_0 \wedge c = 2^a \wedge a \leq b\}$$

end while

$$\{a,b,c \in \mathbb{N}_0 \wedge c = 2^a \wedge a \leq b \wedge a \geq b\}$$

$$\{a,b,c \in \mathbb{N}_0 \wedge c = 2^a \wedge a = b\}$$

$$\frac{\{P \wedge B\}\, S\, \{P\}}{\{P\} \text{ while } B \text{ do } S \{P \wedge \neg B\}}$$

$P \equiv \{?\}$

if (b>c)

$P \wedge b > c$

b=b/2

$Q \equiv \{a = b\}$

else

$P \wedge b \leq c$

a=a+1

$Q \equiv \{a = b\}$

$$\frac{\{P \wedge B\}\, S_1\, \{Q\} \qquad \{P \wedge \neg B\}\, S_2\, \{Q\}}{\{P\} \text{ if } B \text{ then } S_1 \text{ else } S_2 \{Q\}}$$

$P \equiv \{?\}$

if (b>c)

$a = b/2 \wedge b > c$

b=b/2

$Q \equiv \{a = b\}$

else

$a + 1 = b \wedge b \leq c$

a=a+1

$Q \equiv \{a = b\}$

$$\frac{\{P \wedge B\}\, S_1\, \{Q\} \qquad \{P \wedge \neg B\}\, S_2\, \{Q\}}{\{P\}\ \text{if } B \text{ then } S_1 \text{ else } S_2\ \{Q\}}$$

$$P \equiv \{a = b/2 \wedge b > c \vee a + 1 = b \wedge b \leq c\}$$

if (b>c)

$$a = b/2 \wedge b > c$$

b=b/2

$$Q \equiv \{a = b\}$$

else

$$a + 1 = b \wedge b \leq c$$

a=a+1

$$Q \equiv \{a = b\}$$

$$\frac{\{P \wedge B\}\, S_1\, \{Q\} \qquad \{P \wedge \neg B\}\, S_2\, \{Q\}}{\{P\} \text{ if } B \text{ then } S_1 \text{ else } S_2 \{Q\}}$$

$$P \equiv \{?\}$$

while (a>b)

$$P \wedge a > b$$

b=b-a

c=c/2

$$P \equiv \{?\}$$

$$P \wedge a \leq b \equiv c = b - a$$

$$\frac{\{P \wedge B\}\, S\, \{P\}}{\{P\} \text{ while } B \text{ do } S \{P \wedge \neg B\}}$$

$$P \equiv \{?\}$$

while (a>b)

$$P \wedge a > b$$

b=b-a

$$c / 2 = b - a$$

c=c/2

$$P \equiv \{?\}$$

$$P \wedge a \leq b \equiv c = b - a$$

$$\frac{\{P \wedge B\}\, S\, \{P\}}{\{P\} \text{ while } B \text{ do } S \{P \wedge \neg B\}}$$

$P \equiv \{?\}$

while (a>b)

$c/4 = b - 3a$

b=b-a

$c/4 = b - 2a$

c=c/2

$c/2 = b - 2a$

$$\frac{\{P \wedge B\}\, S\, \{P\}}{\{P\} \text{ while } B \text{ do } S \{P \wedge \neg B\}}$$

$P \equiv \{?\}$

while (a>b)

$c/4 = b - 3a$

b=b-a

$c/4 = b - 2a$

c=c/2

$c/2 = b - 2a$

$$\frac{\{P \wedge B\}\, S\, \{P\}}{\{P\} \text{ while } B \text{ do } S \{P \wedge \neg B\}}$$

$c/2^i = b - (i+1)a$

$$c / 2^i = b - (i+1)a, i \in \mathbb{N}, a > b$$

$$\frac{\{P \wedge B\}\, S\, \{P\}}{\{P\} \text{ while } B \text{ do } S \{P \wedge \neg B\}}$$

while (a>b)

$$c / 2^i = b - (i+1)a \wedge a > b$$

b=b-a

$$c / 2^i = b - ia$$

c=c/2

$$c / 2^{l-1} = b - ia$$

$$c = b - a \wedge a \leq b$$

$$c / 2^i = b - (i+1)a, i \in \mathbb{N}, a > b$$

while (a>b)

$$c / 2^i = b - (i+1)a \wedge a > b$$

b=b-a

$$c / 2^i = b - ia$$

c=c/2

$$c / 2^{l-1} = b - ia$$

$$\frac{\{P \wedge B\}\, S\, \{P\}}{\{P\} \text{ while } B \text{ do } S \{P \wedge \neg$$