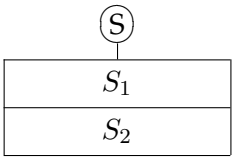
# Program constructs and their verification rules

## Sequence

$S = (S_1; S_2)$ is the sequence of two programs $S_1$, $S_2$. $Q$, $R$ and $Q'$ are logical functions over $A$. If

1. $Q \implies wp(S_1, Q')$ and
2. $Q' \implies wp(S_2, R)$

then $Q \implies wp(S, R)$

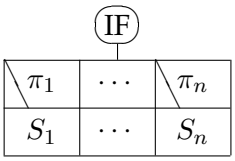



## Selection

$IF = (\pi_1 \colon S_1, \ldots, \pi_n \colon S_n)$ is a branches constructed from programs $S_1, \ldots, S_n$ and logical functions $\pi_1, \ldots, \pi_n$. $Q$ and $R$ are logical functions over $A$. If

1. $Q \implies \bigvee_{i=1}^{n} \pi_i$ and
2. $Q \implies \bigwedge_{i=1}^{n} (\pi_i \vee \neg\pi_i)$ and
3. $\forall i \in [1..n] : Q \wedge \pi_i \implies wp(S_i, R)$

then $Q \implies wp(IF, R)$




## Loop

$DO = (\pi, S_0)$ denotes the loop constructed from the program $S_0$ and the logical function $\pi$.
$Inv$, $Q$, $R$ are logical functions over $A$ and $t \colon A \to \mathbb{Z}$ is a function. If

1. $Q \implies Inv$ and
2. $Inv \wedge \neg\pi \implies R$ and
3. $Inv \implies \pi \vee \neg\pi$ and
4. $Inv \wedge \pi \implies t > 0$ and
5. $Inv \wedge \pi \wedge t = t_0 \implies wp(S_0, Inv \wedge t < t_0)$ for any $t_0$ integer number

then $Q \implies wp(DO, R)$
($Inv$ is called loop invariant, $t$ is called variant function.)