cons $x, y :$ Int;

Var $r :$ Int;

$\{True\}$

If $B_1 \longrightarrow S_1$

$\square$ $B_2 \longrightarrow S_2$

fi

$\{r = (x \vee y)\}$

1. $P \Longrightarrow B_1 \vee B_2$

2. Q_1 tal que $\{P \wedge B_1\} S_1 \{Q_1\}$

3. $(Q_1 \Longrightarrow Q_2) \wedge (Q_2 \Longrightarrow Q)$

Por ende o entonces:

P: $\{True\}$ $B_1 = x \geqslant y$ $\qquad B_2 = y > x$

$\qquad\qquad\qquad Q_1 = \{r = x\}$ $\quad Q_2 = \{r = y\}$

Por lo tanto, tenemos:

P: $\{True\}$

$\quad$ if $x \geqslant y \longrightarrow S_1$

$Q_1 : \{r = x\}$

$\quad \square$ $y > x \longrightarrow S_2$

$Q_2 : \{r = y\}$

$\quad$ fi

$Q : \{r = x \vee r = y\}$

$\quad$ Derivo S_1

$\qquad \{x \geqslant y\}$

$S_1 : r := E$

$\{r = x\}$

$wp.(r := E).(r = X) =$

$wp \doteq E = X$

Luego $x \geqslant y \Rightarrow E = X$

$\Rightarrow$ El programa

$P : \{True\}$

   IF $x \geqslant y \longrightarrow$

     $r := X$

$Q_1 : \{r = x\}$

   $\square \ y > x \longrightarrow S_2$

$Q_2 : \{r = y\}$

   fi

$Q : \{r = (x \vee y)\}$

Derivo S_2

$\{y > x\}$

$S_2 : r := F$

$\{r = y\}$

$wp.(r := F).(r = y)$

$wp = F = y$

  $\Rightarrow$ El programa nos queda

$P : \{True\}$

   IF $x > y \longrightarrow$

     $S_1 : r := y$

$Q_1 : \{r = y\}$

   $\square \; y > x \rightarrow$

   $r := x$

$Q_2 : \{r = x\}$

  fi

$Q : \{r = (x \vee y)\}$

<div style="border:2px solid green; display:inline-block; padding:2px">**Verificación**</div>

① $P \Rightarrow (B \vee B')$

  $True \Rightarrow (x \geqslant y \vee x < y)$

  $\equiv \{Tercero \; excluido\}$

  $True \Rightarrow True$

  $\equiv \{True\}$

② $\{P \wedge Q\} \; S \; \{Q\}$

  $\{True \wedge x \geqslant y\} \; r = y \; \{r = (x \vee y)\}$

  $wp \, (r = y) \, (r = (x \vee y)) \doteq W$

  $W = y = x \vee y$

  $(True \wedge x \geqslant y) \Rightarrow (y = x \vee y)$

  $True$

③ $\{P \wedge B'\} \; S' \; \{Q\}$

  $\{True \wedge x < y\} \; r = x \; \{r = x \vee y\}$

  $wp \, (r = x) \, (r = x \vee y) = W$

  $W \doteq x = x \vee y \quad \Rightarrow (True \wedge x < y) \Rightarrow x = x \vee y \Rightarrow True$

Cons $N: Int$;

Var $r: Int$;

$\{True\}$

　　If $B_1 \rightarrow S_1$

　　$\square$ $B_2 \rightarrow S_2$

　　fI

$Q: \{ (N \geq 0 \Rightarrow r = N) \wedge (N < 0 \Rightarrow r = -N) \}$

Busca B_1, Q_1, B_2, Q_2

　　$B_1 \hat{=} N \geq 0$　　　　　$B_2 \hat{=} N < 0$

　　$Q_1 = r = N$　　　　　$Q_2 = r = -N$

Nos queda.

$P: \{True\}$

　　If $N \geq 0 \rightarrow S_1$

　　$Q_1 : \{r = N\}$

　　$\square$ $N < 0 \rightarrow S_2$

　　$Q_2 : \{r = -N\}$

　　fi

$Q: \{N \geq 0 \Rightarrow r = N \wedge N < 0 \Rightarrow r = -N\}$

Derivo S_1

　　$r = -N$

El programa nos queda:

$P: \{True\}$

```
if N ≥ 0 →
    r := N;
Q₁ : { r = N }
□ N < 0 →
    r := -N;
Q₂ : } r = -N }
fi
```

$$Q : \langle N \geq 0 \Rightarrow r : N \wedge N < 0 \Rightarrow r = -N \}$$

$P: \{ x = S \wedge y = T \wedge z \}$

S_1

$Q_1: \{ z = x \}$

S_2

$Q_2: \{ x = y \}$

S_3

$Q_3: \{ y = S \wedge x = T \}$

Derivo S_1

$\quad$ wp. $(z = E) \cdot (z = x) \doteq P$

$\quad P = E = X \implies S_1 \doteq z = x$

Derivo S_2

$\quad$ wp. $(x = F) \cdot (x = y) \doteq P$

$\quad P \doteq F = Y \implies S_2 = x = y$

Derivo S_3

$\quad$ wp. $(y = H) \cdot (y = S \wedge x = T) \doteq P$

$\quad P \doteq H = z \implies S_3 = y = z$