Apuntes del For

Demuestre que es un teorema en Hoare:

```
⊢ {N≥1}
  BEGIN
    PROD=0;
    FOR X:=1 UNTIL N DO PROD := PROD+M
  END
   {PROD = M×N}
```

Solución

1)Demuestre que es un teorema en Hoare

E_1: 1

E_2: N

V: X

$P[E_2+1/V]$:	P[N+1/X]:	PROD=N*M
P[V+1/V]:	P[X+1/X]:	PROD=X*M
P:P[V]:	P[X]:	PROD=(X-1)*M
$P[E_1/V]$:	P[1/X]:	PROD=(1-1)*M

Verificando mediante el Ax3

P:P[V]:	P[X]: PROD=(X-1)*M
	P[X+1/X]: PROD=(X)*M
	P[N+1/X]: PROD=(N)*M
	P[1/X]: PROD=(1-1)*M

1) ├ {PROD+M=X*M} PROD:=PROD+M {PROD=X*M} Ax3
2) ├ (PROD=(X-1)*M) ∧(1≤X)∧(X≤N) → (PROD+M=X*M)
   ├ (PROD=(X-1)*M) ∧(1≤X)∧(X≤N) → (PROD=X*M-M)
   ├ (PROD=(X-1)*M) ∧(1≤X)∧(X≤N) → (PROD=M*(X*-1)
   ├(P∧Q∧R)→P por relación lógica
3) ├ {PROD=(X-1)*M) ∧(1≤X)∧(X≤N)} PROD:=PROD+M {PROD=X*M} Por RFP (2 en (1

4) ├{PROD=(1-1)*M∧(1≤N} FOR X:=1 UNTIL N DO PROD:=PROD+M
   {PROD=N*M} RFOR en (3

5) ├ {0=(1-1)*M∧(1≤N)} PROD:=0 {PROD=(1-1)*M∧(1≤N} Ax3

6) $\vdash (N \geq 1) \rightarrow 0=(1-1)*M \wedge (1 \leq N)$

$\vdash (N \geq 1) \rightarrow 0=0 \wedge (1 \leq N)$

$\vdash (N \geq 1) \rightarrow T \wedge (1 \leq N)$

$\vdash (N \geq 1) \rightarrow (1 \leq N)$ $\vdash$ P→P por relación lógica

7) $\vdash$ $\{N \geq 1\}$ PROD:=0 $\{PROD=(1-1)*M \wedge (1 \leq N\}$RFP (6 en (5

8) $\{N \geq 1\}$

```
        PROD:=0;
        FOR  X:=1 UNTIL N DO
                PROD:=PROD+M
```

$\{PROD=N*M\}$ RS en (7 y (4

9) $\{N \geq 1\}$

```
        BEGIN
                PROD:=0;
                FOR  X:=1 UNTIL N DO
                        PROD:=PROD+M
        END
```

$\{PROD=N*M\}$ RB en (8 lqqd