─────────────────── MODULE $malgtd1ex4$ ───────────────────

EXTENDS $Naturals,\ TLC,\ Integers$

───

contract
variables $x,y1,y2,z,pc$
requires $x0 \in Nat \land y10,y20,z0 \in Nat \land pc =$ "l0"
ensures $zf = f91(x0)$

───

CONSTANTS $x0$

───

auxiliary definitions
$mini \quad \triangleq \quad -2^{15}$
$maxi \triangleq 2^{15} - 1$
$D \triangleq mini .. maxi$
$UND \triangleq -650000$
$f91 \quad \triangleq \quad [i \in Int \mapsto$ IF $i > 100$ THEN $i - 10$ ELSE $91]$

───

VARIABLES $\quad x,\ y1,\ y2,\ z,\ pc$

───

preconditions
ASSUME $x0 \geq 0$

───

actions
$a \quad \triangleq$
$\quad \land pc =$ "START"
$\quad \land y1' = x \land y2' = 1$
$\quad \land pc' =$ "LOOP"
$\quad \land$ UNCHANGED $\langle x,\ z \rangle$

$b \triangleq$
$\quad \land pc =$ "LOOP" $\land\ y1\ \leq 100$
$\quad \land y1' = y1 + 11 \land y2' = y2 + 1$
$\quad \land$ UNCHANGED $\langle x,\ z,\ pc \rangle$

$cc \triangleq$
$\quad \land pc =$ "LOOP" $\land\ y1\ > 100 \land y2 \neq 1$
$\quad \land y1' = y1 - 10 \land y2' = y2 - 1$
$\quad \land$ UNCHANGED $\langle x,\ z,\ pc \rangle$
$\quad \land PrintT(y1) \land PrintT(y2)$
$d \triangleq$
$\quad \land pc =$ "LOOP" $\land\ y1\ > 100 \land y2 = 1$
$\quad \land z' = y1 - 10 \land pc' =$ "HALT"
$\quad \land$ UNCHANGED $\langle x,\ y1,\ y2 \rangle$

───

spcification

1

$Next \triangleq a \lor b \lor cc \lor d \lor \text{UNCHANGED } \langle y1,\ y2,\ z,\ x,\ pc \rangle$

$init1 \triangleq y1 \in Int \land y2 \in Int \land z \in Int \land pc = \text{"START"}$

$Init \triangleq y1 = UND \land y2 = UND \land z = UND \land x = x0 \land pc = \text{"START"}$

---

analyse

$Q1 \triangleq pc \neq \text{"HALT"}$ c prned la valeur $HALT$

$Qpc \triangleq pc = \text{"HALT"} \Rightarrow z = \text{IF } x > 100 \text{ THEN } x - 10 \text{ ELSE } 91$

$Qy1 \triangleq y1 \neq UND \Rightarrow mini \leq y1 \land y1 \leq maxi$

$Qover \triangleq y1 \in D \land y2 \in D \land z \in D$

$Question \triangleq Qpc \land Qover$

$tocheck \triangleq Question$