
MODULE *DieHarder*

EXTENDS *Integers*

CONSTANT *JugIds* The set of Jug *IDs*

CONSTANT *JugCapacity* Map from Jug *ID* to capacity of that jug

CONSTANT *Goal* The number of gallons we're shooting for

VARIABLES *jugContents* The current capacity of each jug

Every jugs starts out empty

$Init \triangleq jugContents = [j \in JugIds \mapsto 0]$

We can fill, empty, or transfer from one jug to another

$FillJug(j) \triangleq jugContents' = [jugContents \text{ EXCEPT } ![j] = JugCapacity[j]]$

$EmptyJug(j) \triangleq jugContents' = [jugContents \text{ EXCEPT } ![j] = 0]$

$Min(m, n) \triangleq \text{IF } m < n \text{ THEN } m \text{ ELSE } n$

$Transfer(from, to) \triangleq \wedge from \neq to$

$\wedge \text{LET } poured \triangleq Min(jugContents[from] + jugContents[to], JugCapacity[to]) - jugContents[to]$
 $jugContents' = [jugContents \text{ EXCEPT } ![from] = jugContents[from] - poured, ![to] =$

$Next \triangleq \exists a, b \in JugIds : FillJug(a) \vee EmptyJug(a) \vee Transfer(a, b)$

$TypeOK \triangleq \forall j \in JugIds : jugContents[j] \in 0 \dots JugCapacity[j]$
