* This module defines an hour clock. It is a counter which will increment from 1 to 12 and then reverts back to 1.
* This also allows stturing, ie., the clock can reach a state say 11 and remain in that state forever.

MODULE *HourClock*

EXTENDS *Naturals*
VARIABLE *hr*

This is the initial condition of the clock
$HCini \triangleq hr \in (1 \,..\, 12)$

We define the next state in two different ways. One using IF THEN ELSE condition and the other using *MOD* operator
Note that individually *HCnxt* and *HCnxt*2 are not equivalent. This is because in *HCnxt*, hr' will become 1 only when *hr* is 12, while in *HCnxt*2, hr' will become 1 when *hr* is a multiple of 12.
Lets assume that *hr* is set to 15. Then hr' will be 16 in *HCnxt* while in *HCnxt*2 it will be 15%12 which is 3.
$HCnxt \triangleq hr' = \text{IF } hr \neq 12 \text{ THEN } hr + 1 \text{ ELSE } 1$
$HCnxt2 \triangleq hr' = (hr\%12) + 1$

But when *HCnxt* and *HCnxt*2 taken together with *HCini*, the two statements are equivalent. Here *HC* and *HC*2 is the statem that defined *HCnxt* and *HCnxt*2 taken together with *HCini* respectively. Hence *HC* and *HC*2 are equivalent and is a theorem
$HC \triangleq HCini \wedge \Box[HCnxt]_{hr}$
$HC2 \triangleq HCini \wedge \Box[HCnxt2]_{hr}$

THEOREM $HC \Rightarrow \Box HCini$
THEOREM $HC2 \Rightarrow \Box HCini$
THEOREM $HC \triangleq HC2$

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