

- 166 Let n be a natural variable, and let b be a binary variable. Write a program to determine whether 3 is a factor of n (whether 3 divides evenly into n with no remainder), reporting the answer as the final value of b . Your program can use addition, subtraction, comparison, and binary operators, but not multiplication, division, *div*, *mod*, *floor*, or *ceil*. (Your non-program specifications can use anything.)
- (a) Write a formal specification.
 - (b) Refine your specification to obtain a program. You do not need to prove the refinements.

After trying the question, scroll down to the solution.

(a) Write a formal specification.

§ $b' = (\text{mod } n \ 3 = 0)$

(b) Refine your specification to obtain a program. You do not need to prove the refinements.

§ $b' = (\text{mod } n \ 3 = 0) \Leftarrow$ **if** $n < 3$ **then** $b := (n=0)$
else $n := n-3$. $b' = (\text{mod } n \ 3 = 0)$ **fi**