Extra Exercise

- Why recursion is heavily used in the meaning function definition?
- What is the meaning of a program?
- What provides the precedence when determine the meaning of a program?
- Why for loop needs two meaning functions?

*Note: solutions are on the next page.*
Solution

- Why recursion is heavily used in the meaning function definition?
  
  • Because the meaning of the root depends on the meaning of each subtree. E.g., the meaning of an assignment \( a = b + 3 \times c \) depends on the right-hand-side expression. The meaning of the right-hand-side expression depends on the meaning of \( b \) and \( 3 \times c \), which are two expressions too. So, meaning function of expression is recursively used here to determine the meaning of the assignment.

- What is the meaning of a program?
  
  • It is the final state of the program when the program halts.

- What provides the precedence when determine the meaning of a program?
  
  • The structure of the abstract tree provides the precedence, and the precedence of the abstract tree is determined by the concrete syntax tree (parse tree).

- Why for loop needs two meaning functions?
  
  • The initial part of for loop only executes once, but the rest part are executed till the meaning of the test is false. So, a meaning function is used for the initial part, and the other is used for the rest.