Concepts of Programming Languages, CSCI 305, Fall 2021
Recursive Descent Parsing – Subroutines, pages 73-78, Oct. 6

Class Exercise - Parsing using subroutines

program ⟶ *stmt_list* `$$`
stmt_list ⟶ *stmt stmt_list* | ϵ
stmt ⟶ `id :=` *expr* | `read id` | `write` *expr*
expr ⟶ *term term_tail*
term_tail ⟶ *add_op term term_tail* | ϵ
term ⟶ *factor factor_tail*
factor_tail ⟶ *mult_op factor factor_tail* | ϵ
factor ⟶ `(` *expr* `)` | `id` | `number`
add_op ⟶ `+` | `-`
mult_op ⟶ `*` | `/`

```
procedure match(expected)
    if input_token = expected then consume_input_token()
    else parse_error

-- this is the start routine:
procedure program()
    case input_token of
        id, read, write, $$ :
            stmt_list()
            match($$)
        otherwise parse_error

procedure stmt_list()
    case input_token of
        id, read, write : stmt(); stmt_list()
        $$ : skip       -- epsilon production
        otherwise parse_error

procedure stmt()
    case input_token of
        id : match(id); match(:=); expr()
        read : match(read); match(id)
        write : match(write); expr()
        otherwise parse_error

procedure expr()
    case input_token of
        id, number, ( : term(); term_tail()
        otherwise parse_error

procedure term_tail()
    case input_token of
        +, - : add_op(); term(); term_tail()
        ), id, read, write, $$ :
            skip       -- epsilon production
        otherwise parse_error

procedure term()
    case input_token of
        id, number, ( : factor(); factor_tail()
        otherwise parse_error
```

```
procedure factor_tail()
    case input_token of
        *, / : mult_op(); factor(); factor_tail()
        +, -, ), id, read, write, $$ :
            skip        -- epsilon production
        otherwise parse_error

procedure factor()
    case input_token of
        id : match(id)
        number : match(number)
        ( : match(); expr(); match())
        otherwise parse_error

procedure add_op()
    case input_token of
        + : match(+)
        - : match(-)
        otherwise parse_error

procedure mult_op()
    case input_token of
        * : match(*)
        / : match(/)
        otherwise parse_error
```

Hand-execute the recursive descent parsing code that uses subroutines on the program:

read A
read B
sum := A + B
write sum
write sum / 2
$$ is sent to indicate the end-of-file'