

LAB 6: Expression Evaluation

Vo Hoang Nhat Khang

Examples:

Example 1:

Given the following rules in ANTLR:

```
1 program: expr EOF;
2 expr: expr (ADD expr)+ | term;
3 term: term (MUL term)+ | FACTOR;
4 ADD: '+';
5 MUL: '*';
6 FACTOR: [0-9]+;
```

Evaluate the expression: 5+4+90, or 2+3*5.

```
class ASTGeneration(BKITVisitor):

    def visitProgram(self, ctx:BKITParser.ProgramContext):
        return self.visitExpr(ctx.expr())

    def visitExpr(self, ctx:BKITParser.ExprContext):
        if ctx.term():
            return self.visit(ctx.term())

        exprs = ctx.expr()
        return reduce(lambda x, y: x + self.visit(y), exprs[1:], self.visit(exprs[0]))

    def visitTerm(self, ctx:BKITParser.TermContext):
        if ctx.INTLIT():
            return int(ctx.INTLIT().getText())

        terms = ctx.term()
        return reduce(lambda x, y: x * self.visit(y), terms[1:], self.visit(terms[0]))
```

Example 2:

Given the following rules in ANTLR:

```
1 program: expr EOF;
2 expr: expr (ADD | SUB) expr | term;
3 term: term (MUL | DIV) term | factor;
4 factor: INTLIT | '(' expr ')';
5 ADD: '+';
6 SUB: '-';
7 MUL: '*';
8 DIV: '/';
9 INTLIT: [0-9]+;
```

Evaluate the expression: (7+3)*(4-2), or 8*(5-3).

```

class ASTGeneration(BKITVisitor):
    def visitProgram(self, ctx:BKITParser.ProgramContext):
        return self.visit(ctx.expr())

    def visitExpr(self, ctx:BKITParser.ExprContext):
        if ctx.term():
            return self.visit(ctx.term())

        left = self.visit(ctx.expr(0))
        right = self.visit(ctx.expr(1))
        if ctx.ADD():
            return left + right

        return left - right

    def visitTerm(self, ctx:BKITParser.TermContext):
        if ctx.factor():
            return self.visit(ctx.factor())

        left = self.visit(ctx.term(0))
        right = self.visit(ctx.term(1))
        if ctx.MUL():
            return left * right

        return left / right

    def visitFactor(self, ctx:BKITParser.FactorContext):
        if ctx.INTLIT():
            return int(ctx.INTLIT().getText())

        return self.visit(ctx.expr())

```

Exercises:

Exercise 1:

Given the following rules in ANTLR:

```

1 program: expr EOF;
2 expr: term (ADD term);
3 term: factor (MUL factor);
4 factor: INTLIT | BOOL;
5 ADD: '+';
6 SUB: '-';
7 MUL: '*';
8 DIV: '/';
9 INTLIT: [0-9]+;
10 BOOL: 'true' | 'false';

```

Evaluate the expression: (153)+(72), or (true*false)+(true+false).

Exercise 2:

Given the following rules in ANTLR:

```

1 program: expr EOF;
2 expr: term (OR term);
3 term: factor (AND factor);
4 factor: INTLIT | BOOL;
5 AND: '&&';
6 OR: '||';
7 INTLIT: [0-9]+;
8 BOOL: 'true' | 'false';

```

Evaluate the expression: `(true && false) || (true && false)`.

Exercise 3:

Given the following rules in ANTLR:

```
1 program: expr EOF;
2 expr: term (ADD term);
3 term: factor (MUL factor);
4 factor: INTLIT | BOOL;
5 ADD: '+';
6 SUB: '-';
7 MUL: '*';
8 DIV: '/';
9 INTLIT: [0-9]+;
10 BOOL: 'true' | 'false';
```

Evaluate the expression: `(20+5)(6+2)`, or `(true+false)(true+false)`.