

Homework 2: Grammar Precedence and Associativity (*Using jison*)

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```
<e> ::= <e> + <e>
      | <e> - <e>
      | <e> * <e>
      | <e> / <e>
      | <e> ^ <e>
      | <e> !
      | <e> %
      | ( <e> )
      | - <e>
      | E
      | PI
      | <NUMBER>
```

Note that your grammars do not consider white spaces and `<NUMBER>` is a non-terminal that refers to numbers.

Assignment

1. Your new grammar should have the following precedence. `+, -` `*, /` `^` `!` `%` `-2`.
2. Your new grammar should enforce left associativity for `+`, `-`, `*`, `/` and right associativity for `^`
3. You should add non-terminals to resolve the ambiguity. In particular, you should add non-terminals called ...
 - `<RootExp>`: any expression that does not include operators
 - `<NegExp>`: negation expression
 - `<UnaryExp>`: unary expressions `!` and `%`
 - `<PowExp>`: exponentiation
 - `<MulExp>`: multiplication and division

```
<e> ::= <e> '+' <MulExp>
      | <e> '-' <MulExp>
      | <MulExp>
<MulExp> ::= <MulExp> '*' <PowExp>
            | <MulExp> '/' <PowExp>
            | <PowExp>
<PowExp> ::= <UnaryExp> '^' <PowExp>
            | <UnaryExp>
<UnaryExp> ::= <NegExp> '!'
            | <NegExp> '%'
            | <NegExp>
<NegExp> ::= '-' <RootExp>
            | <RootExp>
<RootExp> ::= '(' <e> ')'
            | E
            | PI
            | <NUMBER>
```