

## Plan for Today

### Ambiguous Grammars

- Due to associativity
- Due to precedence

### Making Grammars Non-Ambiguous

- example related to PA3

### What do the SableCC errors look like for ambiguous grammars?

## Example Ambiguous Grammars: Associativity

```
Productions
stm = exp ;
exp =
    {minus_rule} [left]:exp minus [right]:exp
  | {num_rule}   num
  ;
```

```
Productions
stm = exp ;
exp =
    {assign_rule} [left]:exp assign [right]:exp
  | {id_rule}     id
  ;
```

## Example Ambiguous Grammars: Precedence

```
Productions
stm = exp ;
exp =
    {or_rule}    [left]:exp or [right]:exp
  | {and_rule}   [left]:exp and [right]:exp
  | {true_rule} true
  | {false_rule} false
  ;
```

## Example Ambiguous Grammars: Both

```
Tokens
pow = '^'; dot = '.';
Productions
stm = exp ;
exp =
    {pow_rule}    [left]:exp pow [right]:exp
  | {field_rule}  exp dot id
  | {paren_rule}  lparen exp rparen
  | {plus_rule}   [left]:exp plus [right]:exp
  | {id_rule}    id
  ;
```

```
Precedence (high to low)
() id
.
^
+
```

### Example Ambiguous Grammars: SableCC errors

```
Productions
stm = exp ;
exp =
    {minus_rule} exp minus exp
    | {num_rule}  num
    ;
```

```
Verifying identifiers.
java.lang.RuntimeException: [30,35] Redefinition of AMinusRuleExp.Exp.
```

```
Productions
stm = exp ;
exp =
    {minus_rule} [left]:exp minus [right]:exp
    | {num_rule}  num
    ;
```

```
shift/reduce conflict in state [stack: PExp TMinus PExp *] on TMinus in {
  [ PExp = PExp * TMinus PExp ] (shift),
  [ PExp = PExp TMinus PExp * ] followed by TMinus (reduce)
}
```