i116: Basic of Programming

12. Programming language processor: interpreter

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Roadmap

- Interpreter for Minila

Interpreter for Minila

- The three new statements have been introduced:
  - Empty statement
  - Conditional (**if**) statement
  - Loop (**while**) statement
- Then, we need to have method interpret(…) in the class for each of the three statements.

Interpreter for Minila

```
class EmptyParseTree(StmParseTree):
    ...
    def interpret(self,env):
        return env
```

EmptyStm .interpret({...})

returns

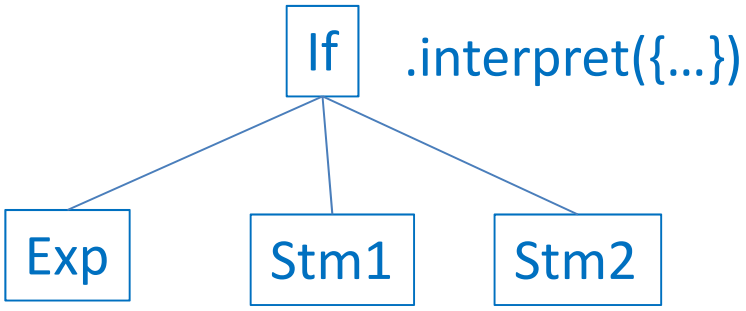
{...}

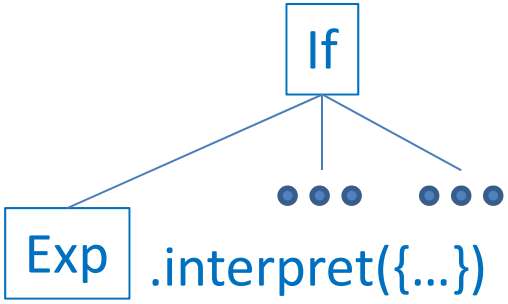
without changing the environment as it is.

Interpreter for Minila

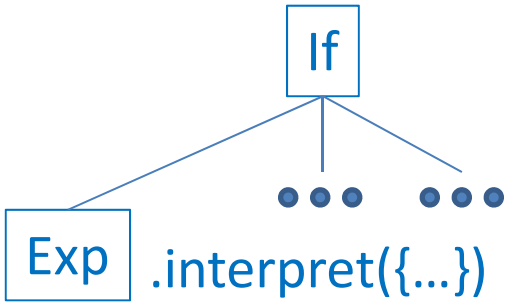
```
class IfParseTree(StmParseTree):
    exp = ExpParseTree()
    stm1 = StmParseTree()
    stm2 = StmParseTree()
    ...
    def interpret(self,env):
        if self.exp.interpret(env) != 0:
            return self.stm1.interpret(env)
        else:
            return self.stm2.interpret(env)
```

Interpreter for Minila



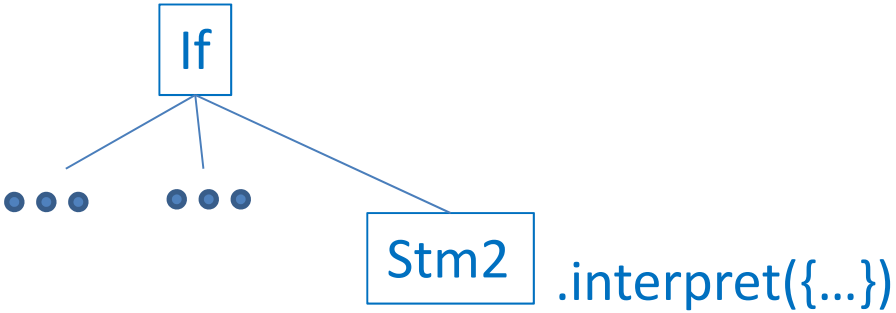


Interpreter for Minila

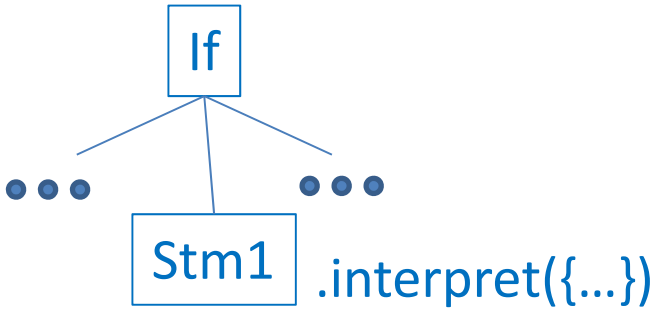


Note that an exception may be raised in Exp.interpret({…}).

If it returns 0,

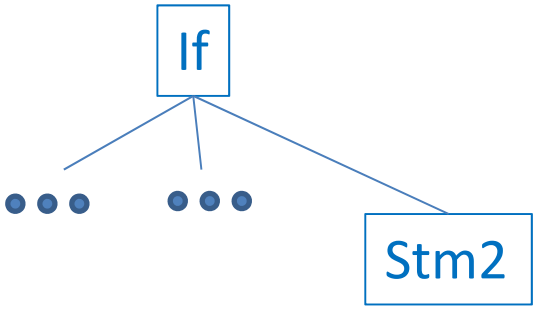


Otherwise,



Interpreter for Minila

If it returns 0,

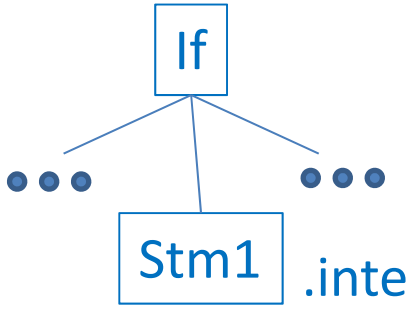


.interpret({…})

which returns the new environment obtained by Stm2.interpret({…}).

Note that an exception may be raised in Stm2.interpret({…}).

Otherwise,



.interpret({…})

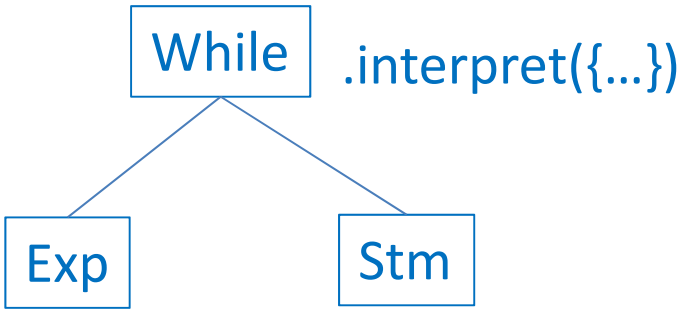
which returns the new environment obtained by Stm1.interpret({…}).

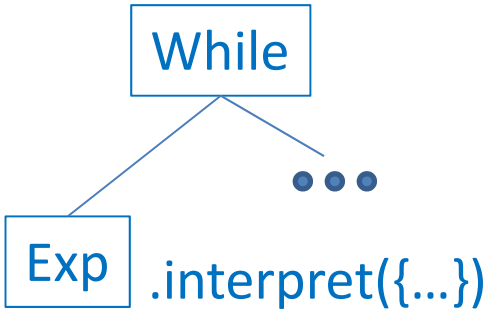
Note that an exception may be raised in Stm1.interpret({…}).

Interpreter for Minila

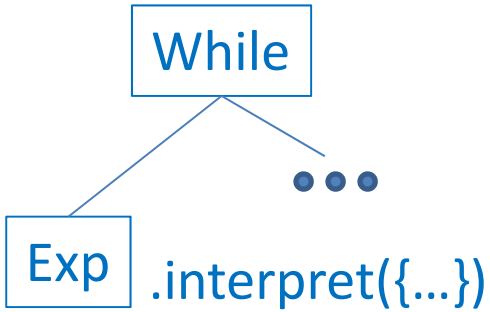
```
class WhileParseTree(StmParseTree):
    exp = ExpParseTree()
    stm = StmParseTree()
    ...
    def interpret(self,env):
        if self.exp.interpret(env) == 0:
            return env
        else:
            return self.interpret(self.stm.interpret(env))
```

Interpreter for Minila





Interpreter for Minila

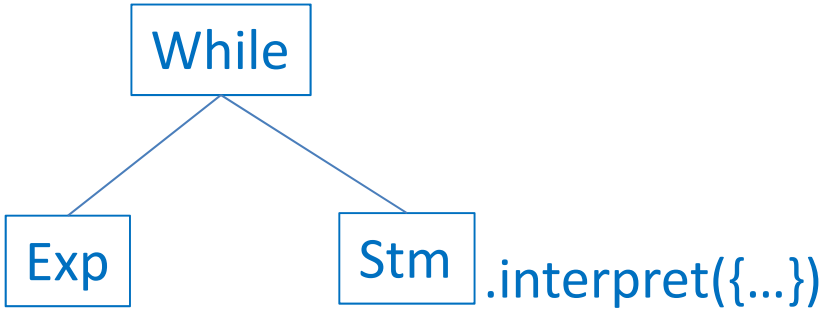


Note that an exception may be raised in Exp.interpret({...}).

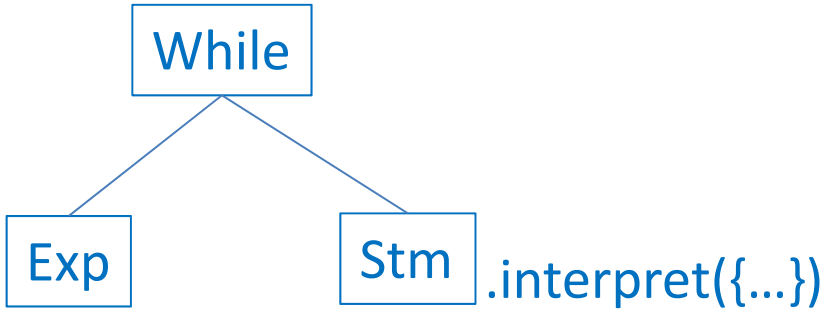
If it returns 0,

{...} is returned as the result of interpreting the While statement.

Otherwise,

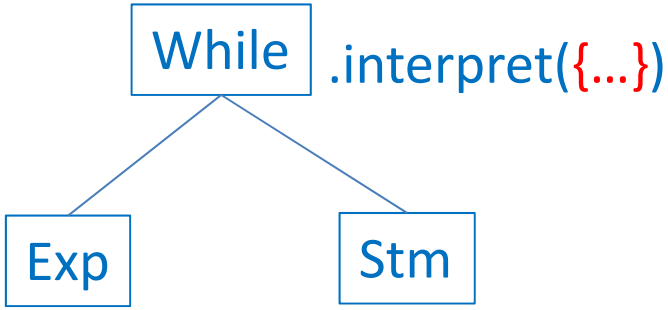


Interpreter for Minila



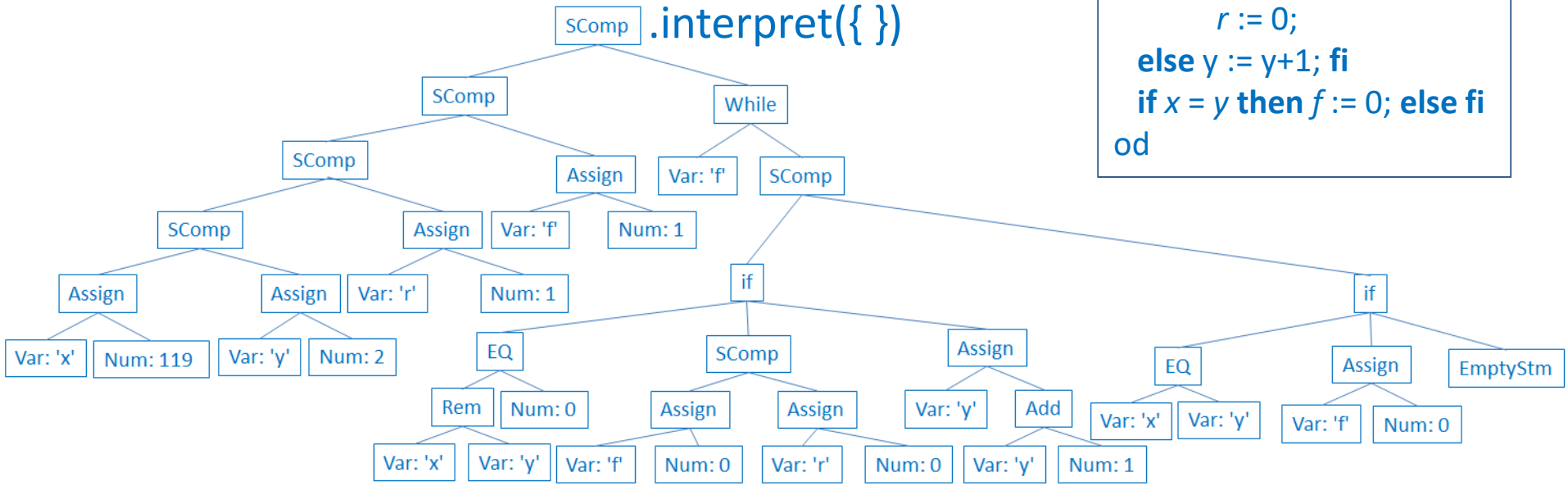
Note that an exception may be raised in Stm.interpret({...}).

If Stm.interpret({...}) returns a new environment {...},

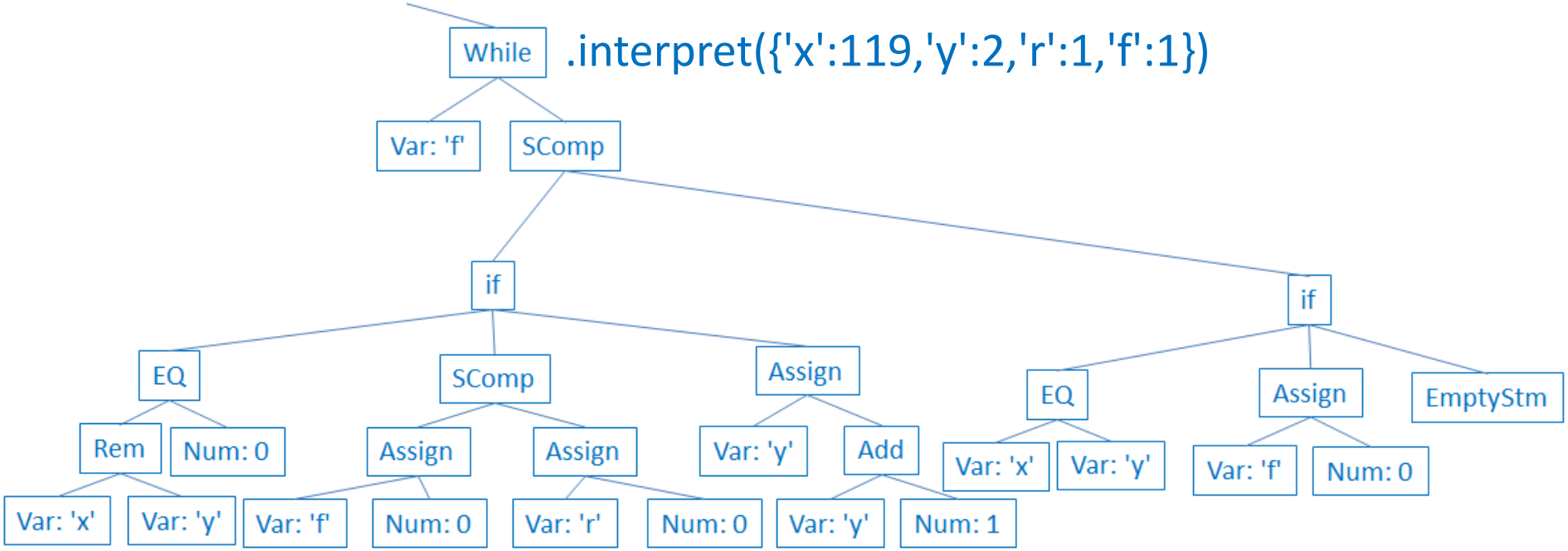


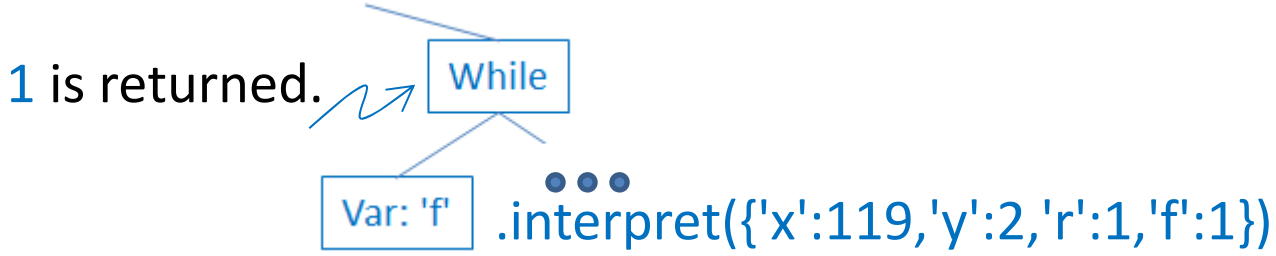
Interpreter for Minila

```
x := 119;
y := 2;
r := 1;
f := 1;
while f do
   if x % y = 0
   then f := 0;
        r := 0;
  else y := y+1; fi
  if x = y then f := 0; else fi
od
```



Interpreter for Minila





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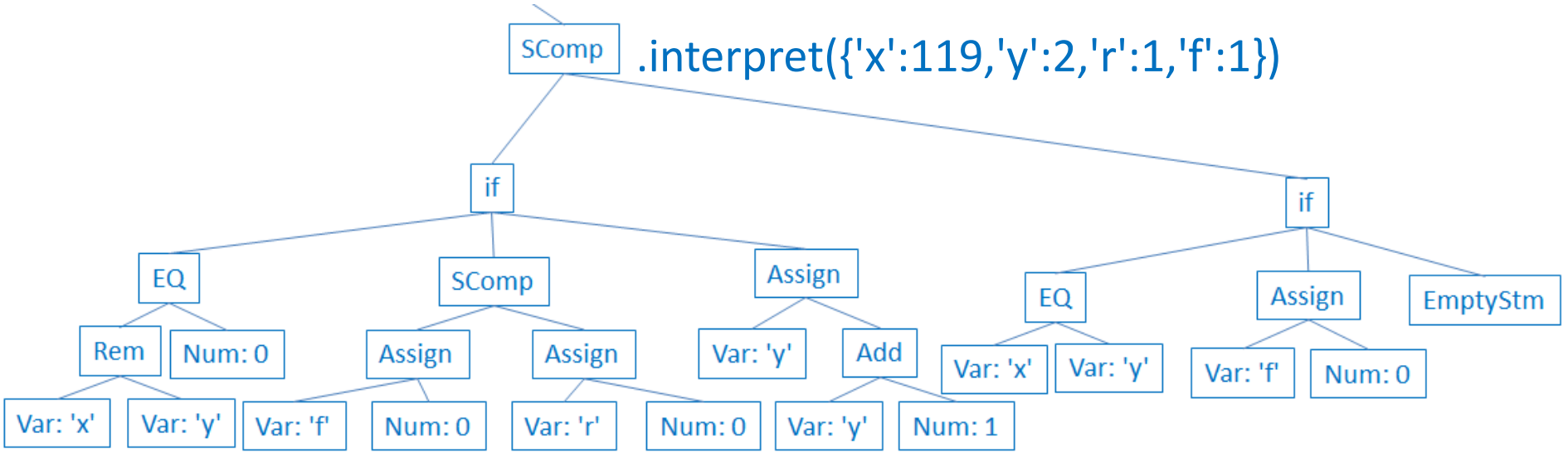

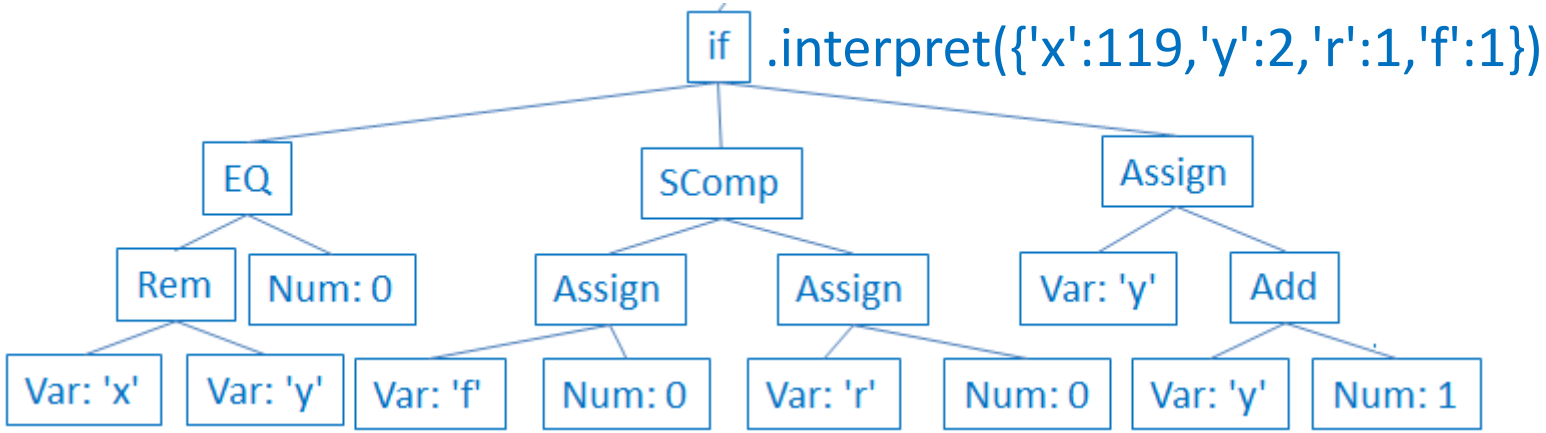

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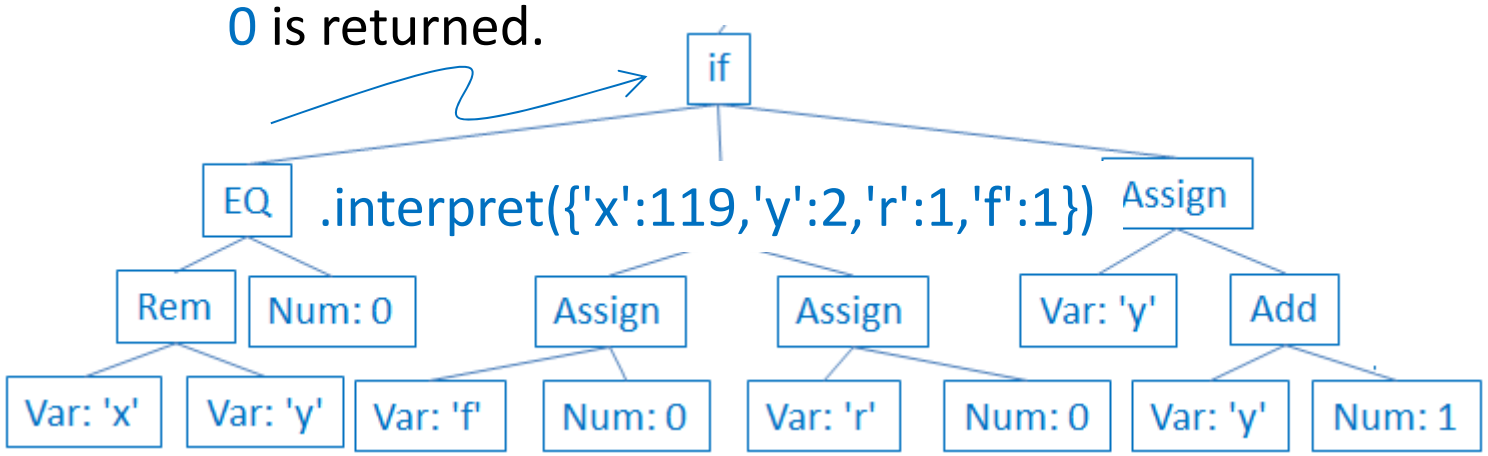

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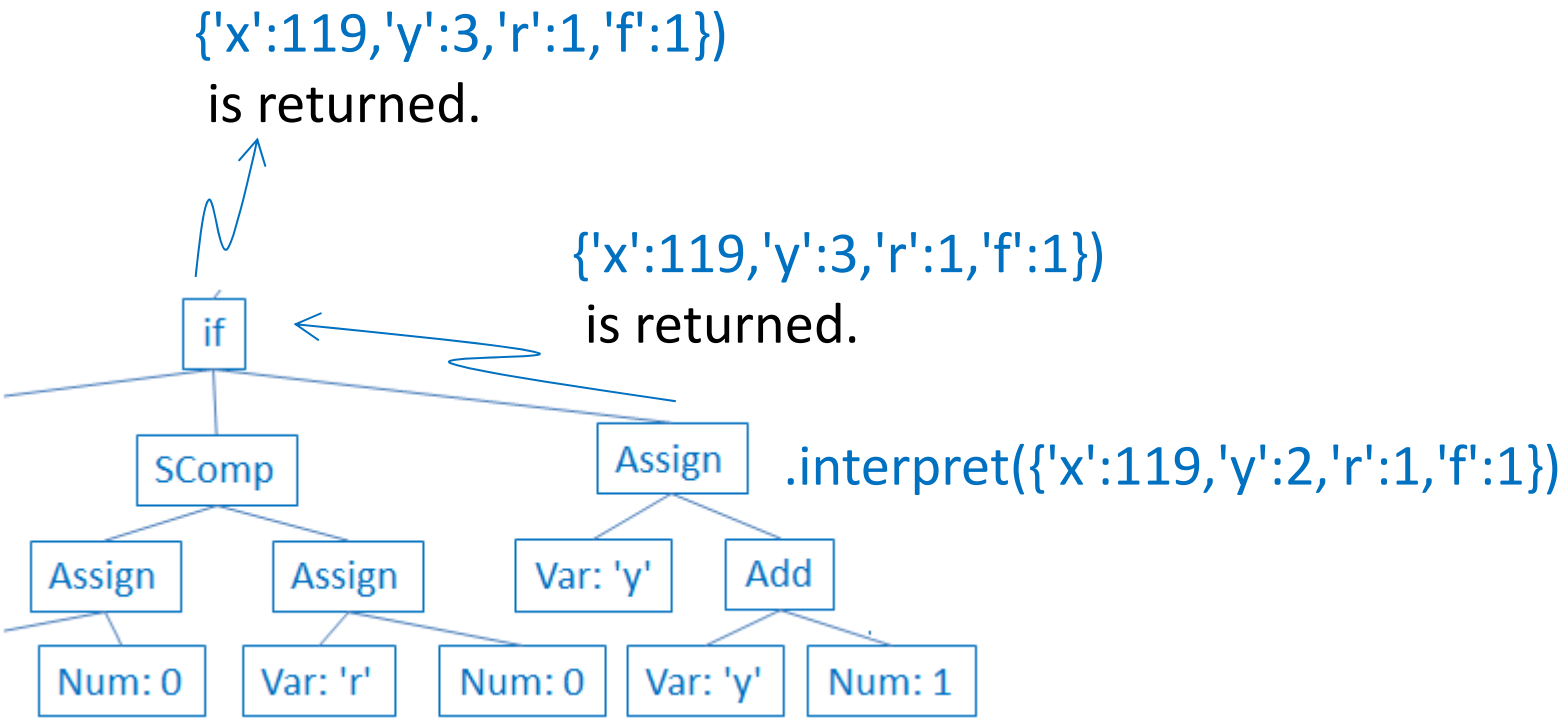

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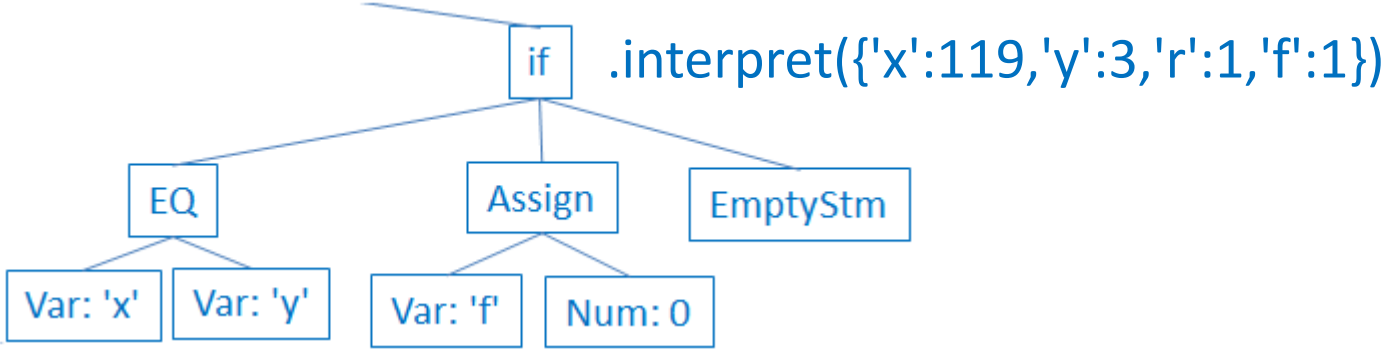

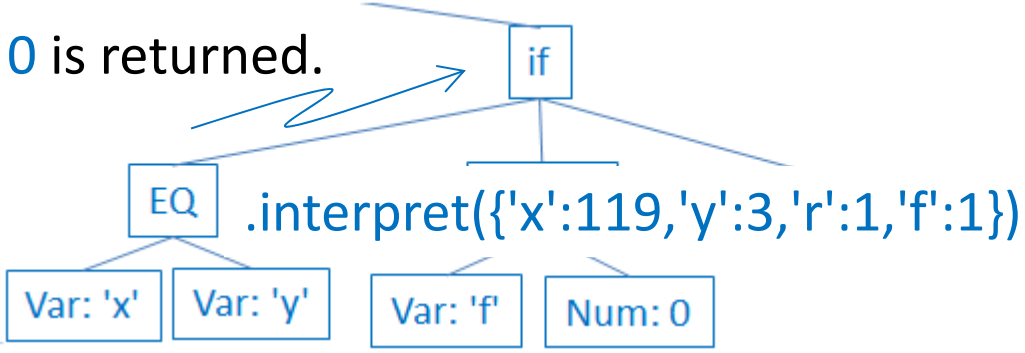

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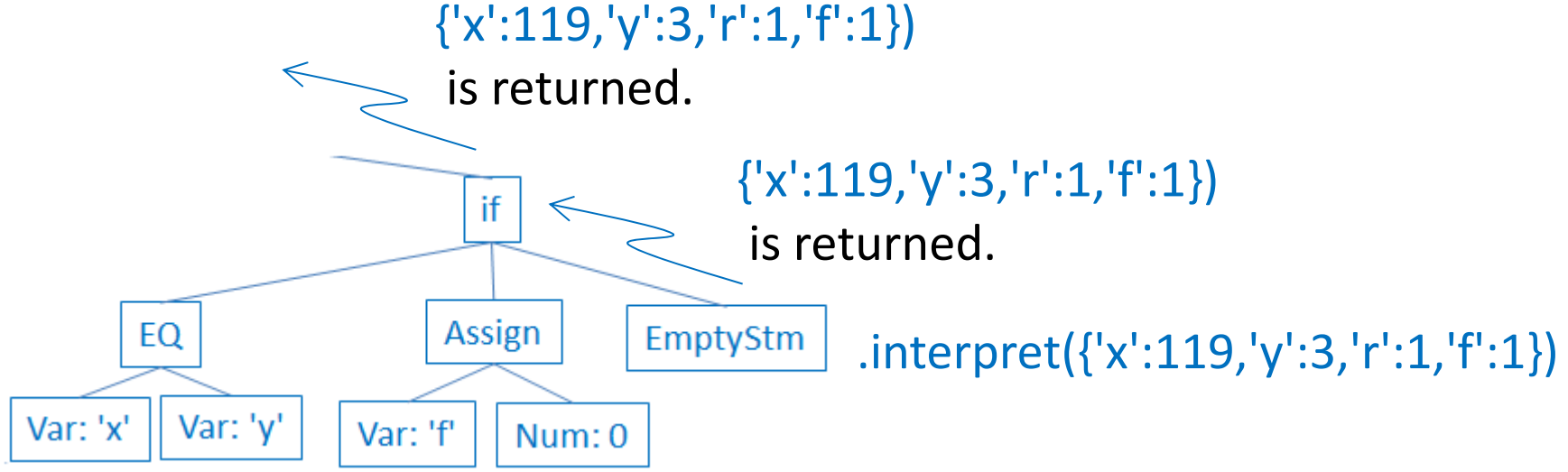

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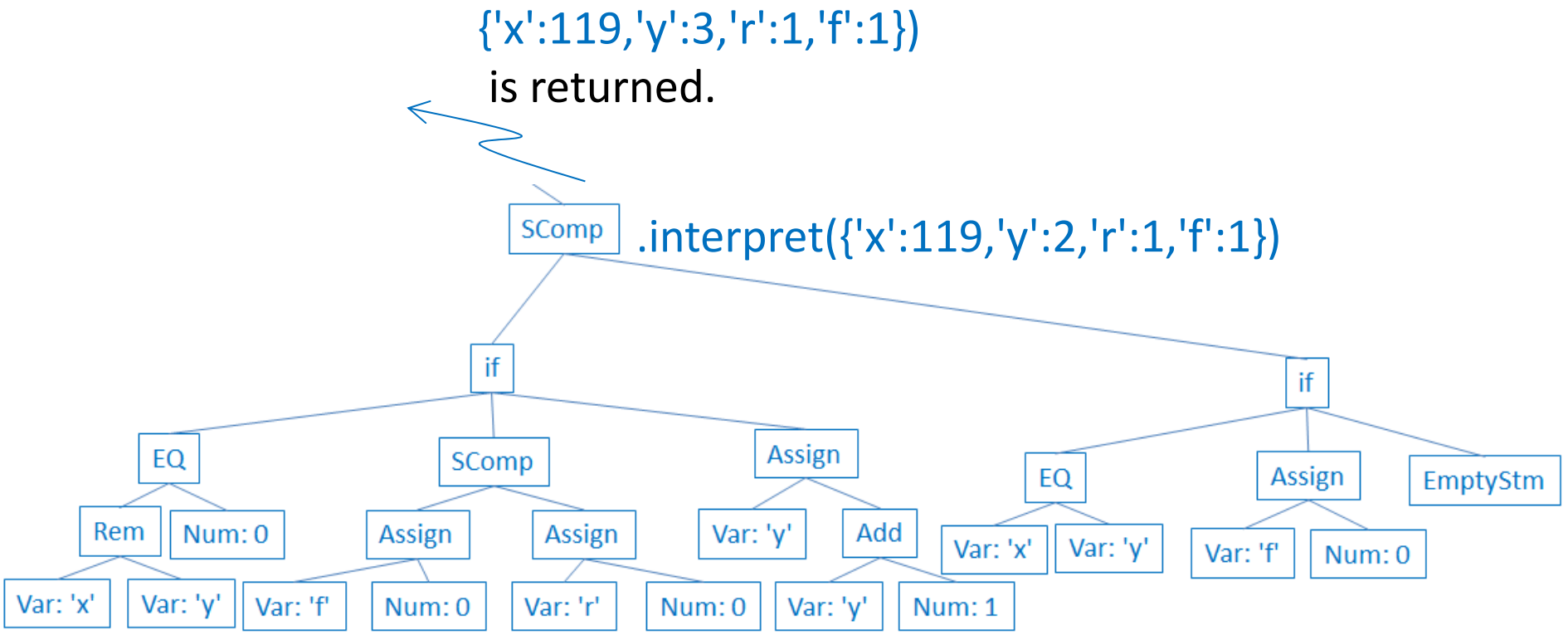

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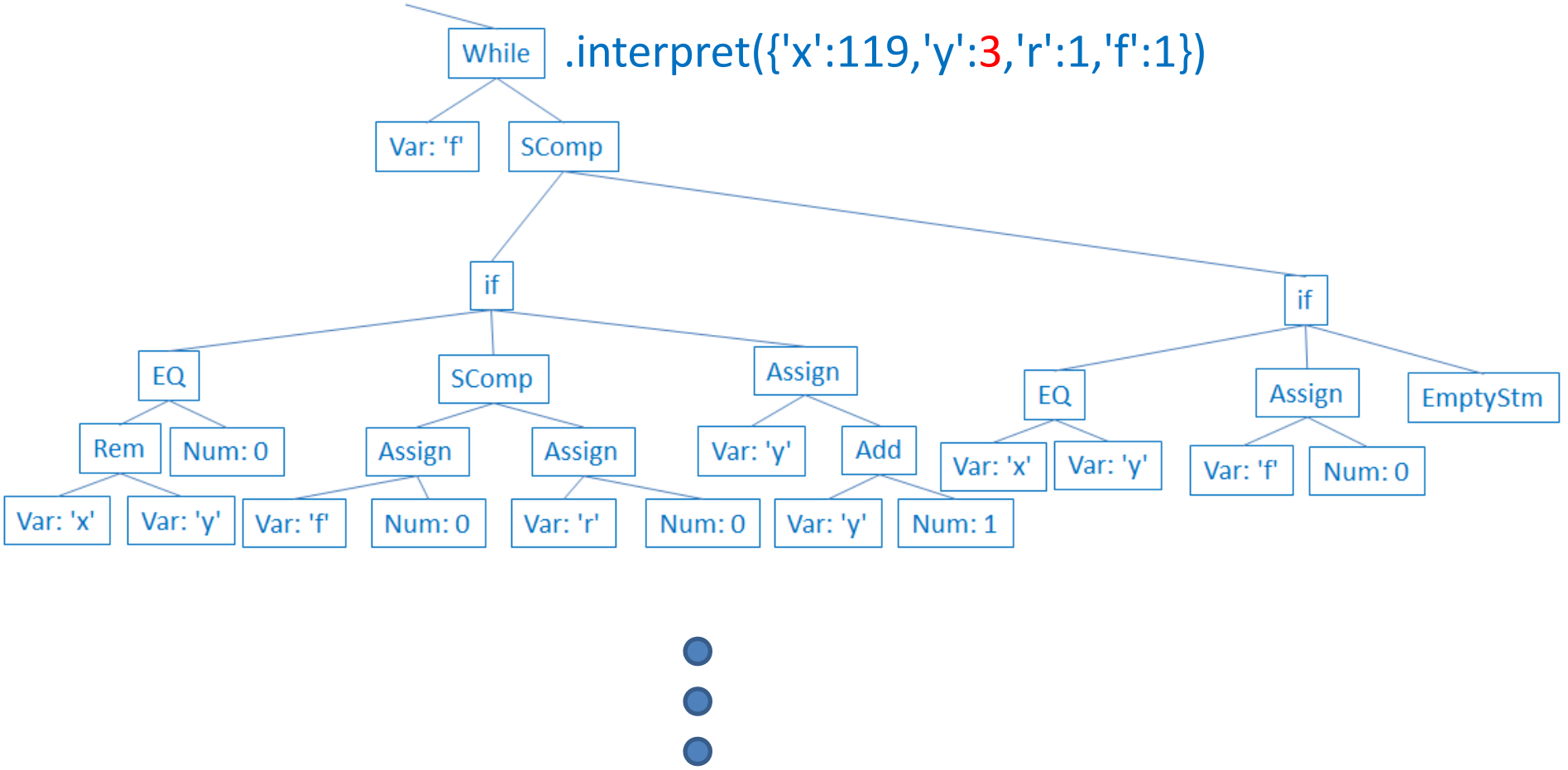

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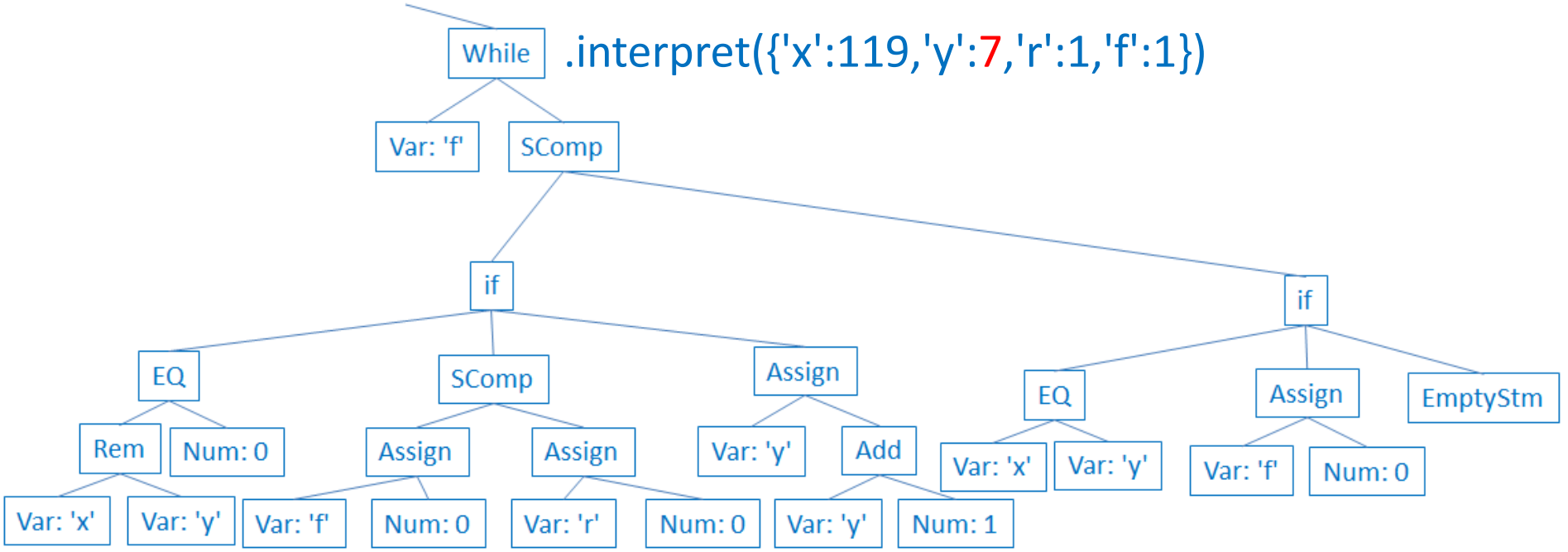

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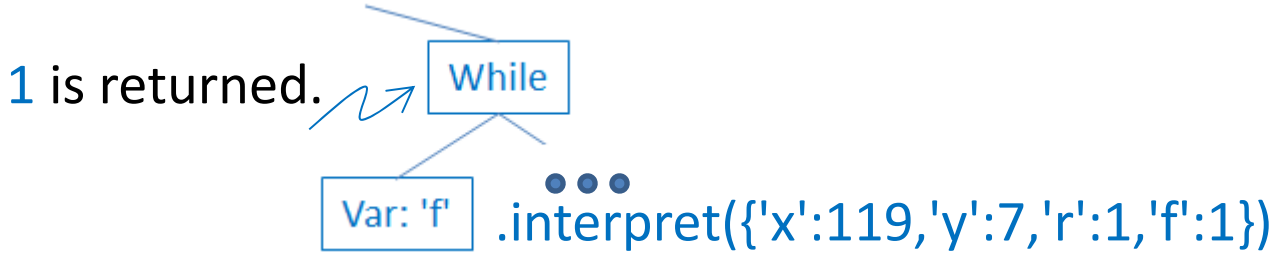

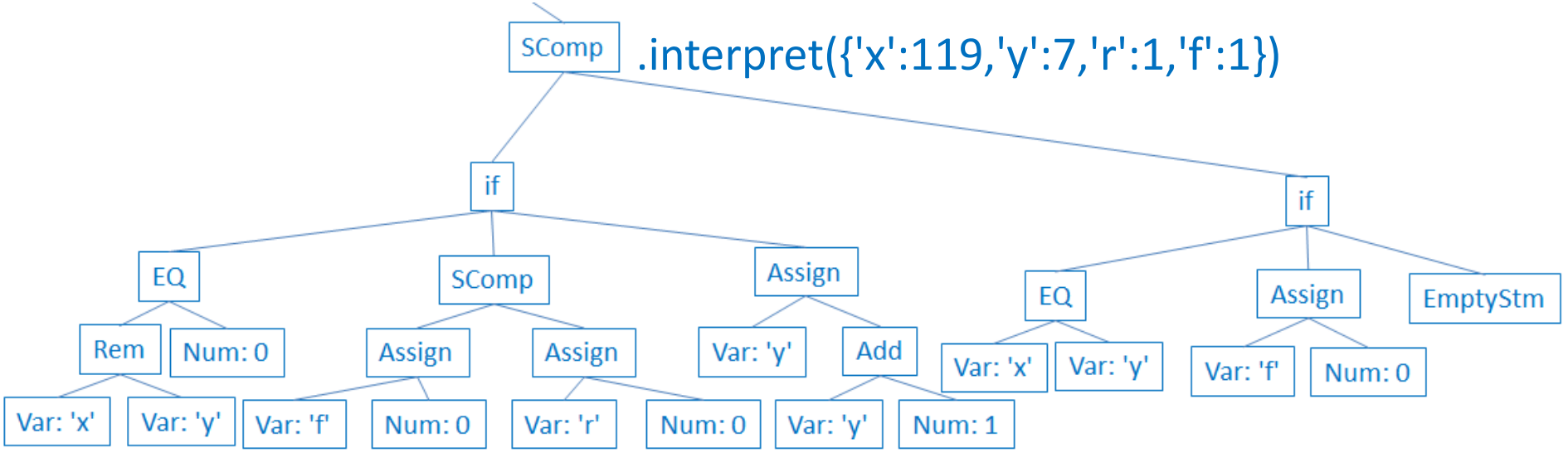

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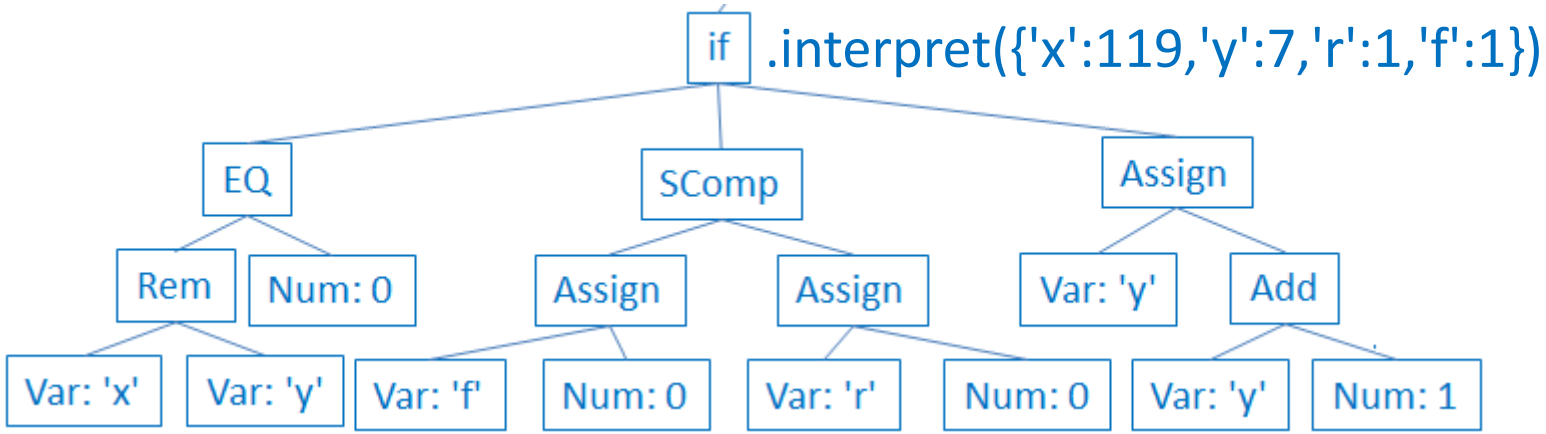

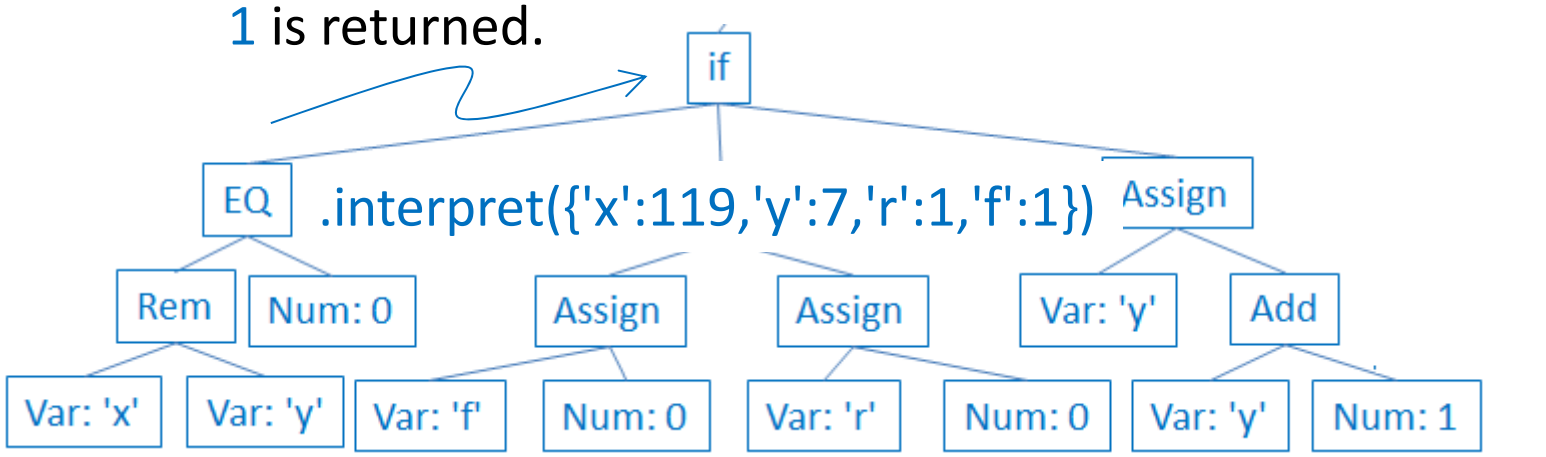

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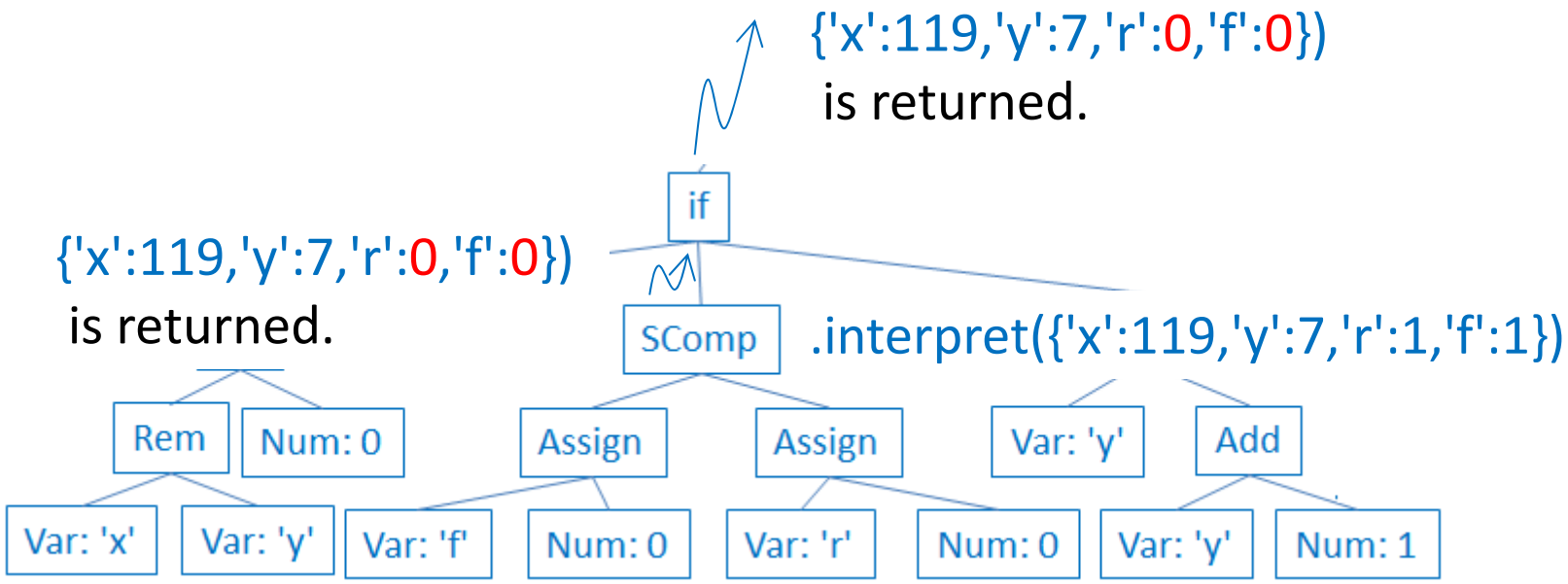

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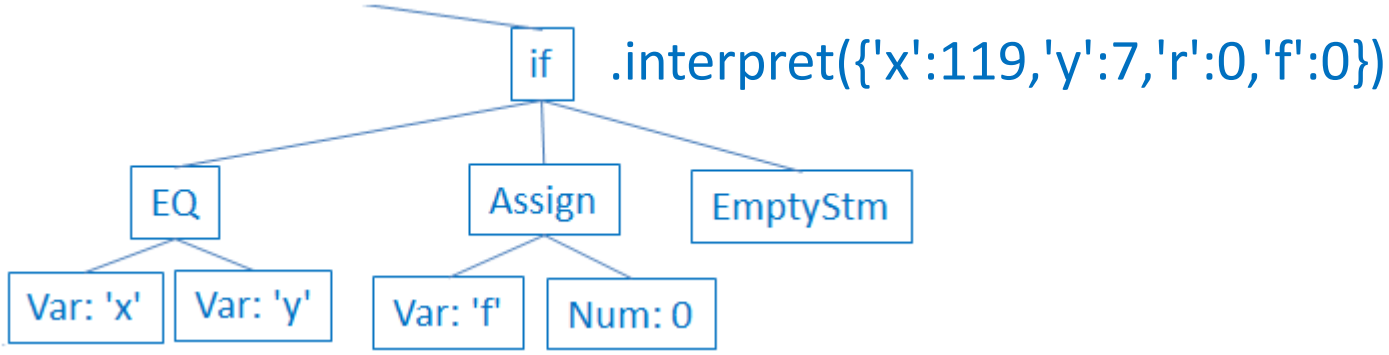

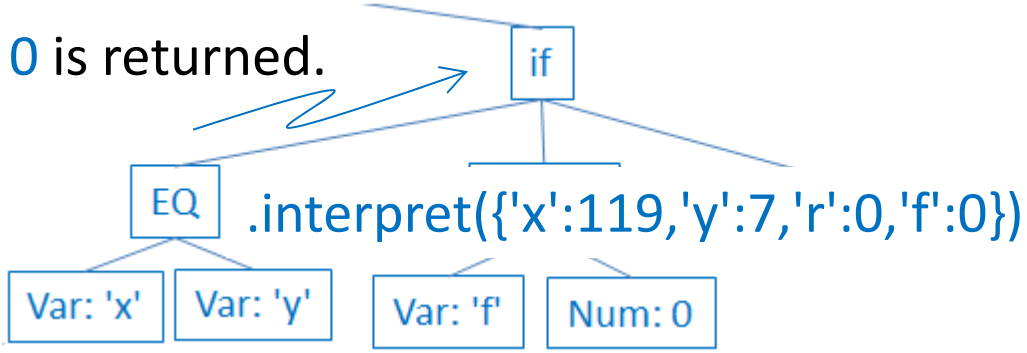

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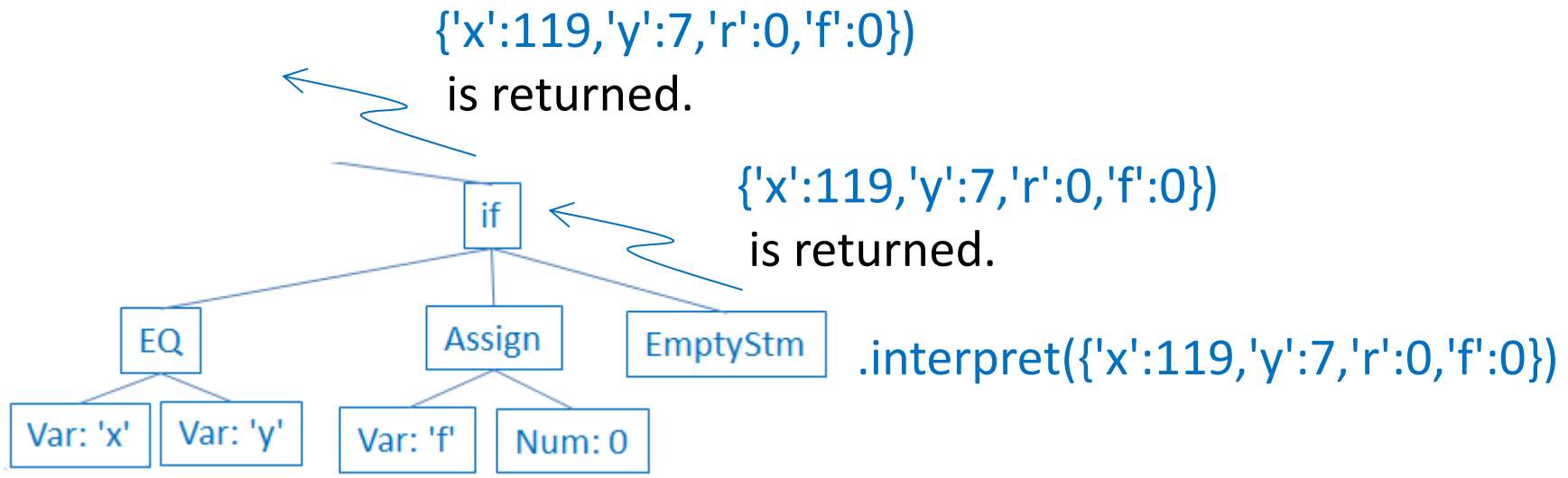

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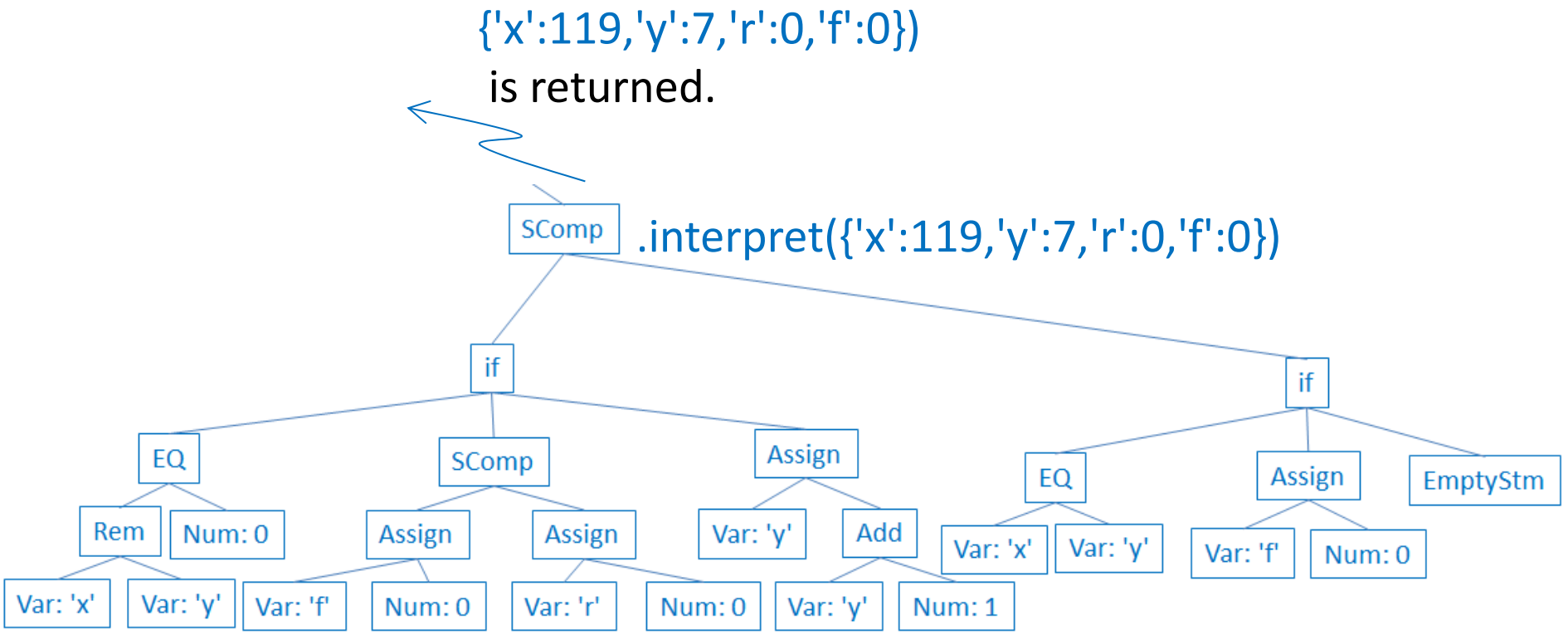

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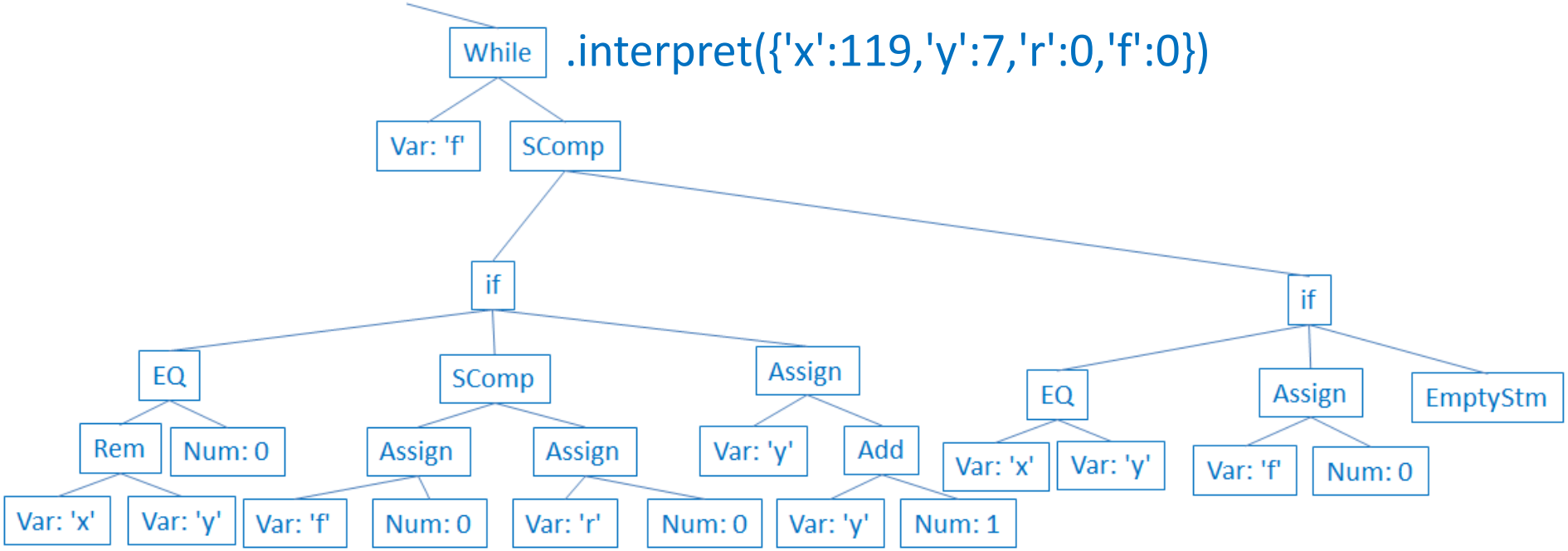
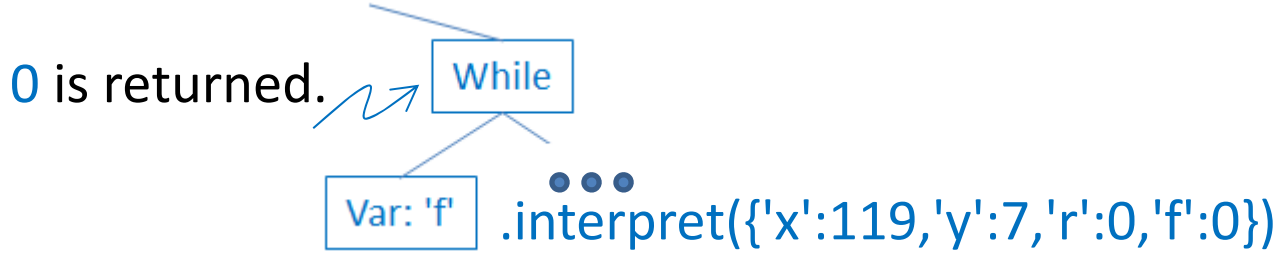
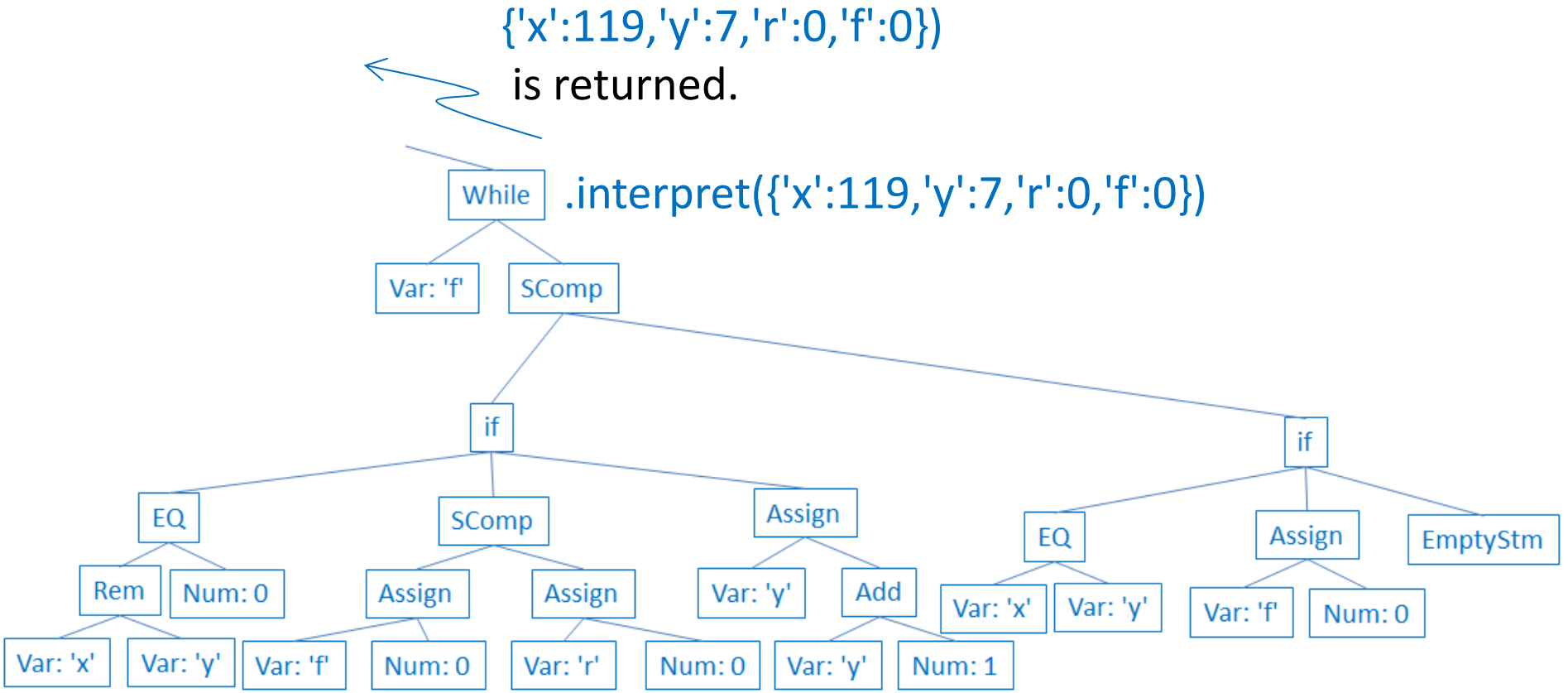




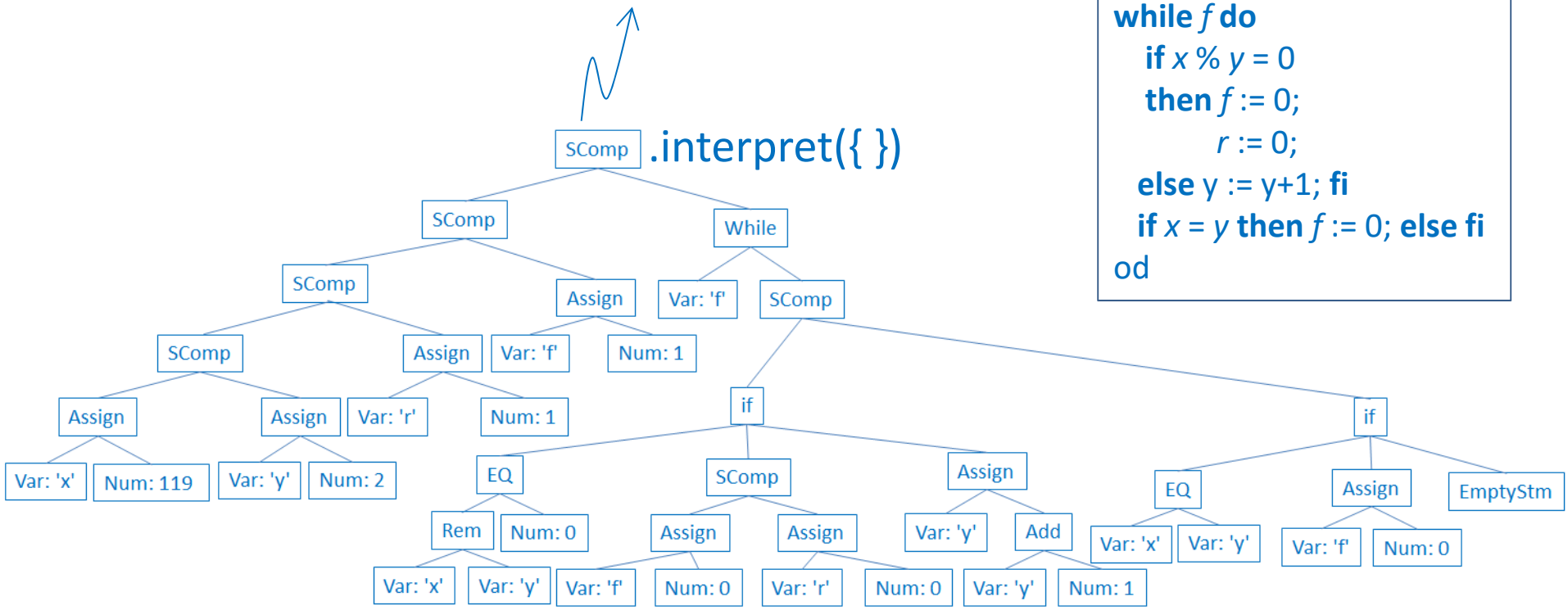
Interpreter for Minila



Interpreter for Minila

{'x':119,'y':7,'r':0,'f':0})
is returned.

```
x := 119;
y := 2;
r := 1;
f := 1;
while f do
   if x % y = 0
   then f := 0;
          r := 0;
  else y := y+1; fi
  if x = y then f := 0; else fi
od
```



Interpreter for Minila

```
from scan import *
from parse import *
fact = ' '\
'   x := 1;'\
'   y := 1;'\
'   while y < 5'\
'   do'\
'      x := x * y;'\
'      y := y + 1;'\
'   od'
tl = scan(fact)
tlo = TokenList(tl)
pt = tlo.parse()
print(pt.interpret({ }))
```

```
from scan import *
from parse import *
fact = ' '\
'   x := 1;'\
'   y := 1;'\
'   while y < 10 || y = 10'\
'   do'\
'      x := x * y;'\
'      y := y + 1;'\
'   od'
tl = scan(fact)
tlo = TokenList(tl)
pt = tlo.parse()
print(pt.interpret({ }))
```

Interpreter for Minila

```
from scan import *
from parse import *
gcd = ' '\
'    x := 19110; '\
'    y := 17850; '\
'    while y != 0 do '\
'      tmp := x%y; '\
'      x := y; '\
'      y := tmp; '\
'    od '
tl = scan(gcd)
tlo = TokenList(tl)
pt = tlo.parse()
print(pt.interpret({ }))
```

Interpreter for Minila

```
from scan import *
from parse import *
isPrime = ' '\
'   x := 119; '\
'   y := 2; '\
'   r := 1; '\
'   f := 1; '\
'   while f do '\
'      if x % y = 0 '\
'      then f := 0; '\
'               r := 0; '\
'     else y := y+1; fi '\
'     if x = y then f := 0; else fi '\
'   od '
```

```
tl = scan(isPrime)
tlo = TokenList(tl)
pt = tlo.parse()
print(pt.interpret({ }))
```

Interpreter for Minila

```
from scan import *
from parse import *
sr = ' '\
'   v0 := 2000000000000000; '\
'   v1 := 0; '\
'   v2 := v0; '\
'   while v1 != v2 do '\
'    if (v2-v1)%2 = 0 '\
'     then v3 := v1+(v2-v1)/2; '\
'     else v3 := v1+(v2-v1)/2+1; '\
'    fi '\
'    if v3*v3 > v0 '\
'     then v2 := v3-1; '\
'     else v1 := v3; '\
'    fi '\
'   od '
```

```
tl = scan(sr)
tlo = TokenList(tl)
pt = tlo.parse()
print(pt.interpret({ }))
```