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Test Case 1

```
/* Test case for WhileStatement. Prints 23458 */
{
   int a

   {
      int a

      print(a)
   }
   {
      while (a != a) {
         a = 1 + a
         print(a)
      }
      print(3 + a)
   }
} $
```

Output:

```
INFO SEMANTIC - Analyzing Program 1
DEBUG SEMANTIC - Variable Declared [a] as Type int at 3,9
DEBUG SEMANTIC - Variable Declared [a] as Type int at 6,13
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [a] is used in print statement at 8,15
DEBUG - SEMANTIC ANALYSIS - WARNING - [a] was used before being initialized at 8,15
DEBUG SEMANTIC - WARNING - Variable [a] is used before being initialized at 11,16
DEBUG SEMANTIC - WARNING - Variable [a] is used before being initialized at 11,21
DEBUG SEMANTIC - WARNING - Variable [a] is used before being initialized at 12,17
DEBUG SEMANTIC - SUCCESS - Variable [ a ] is initialized at 12,17
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [a] is used in print statement at 13,19
DEBUG SEMANTIC - WARNING - Variable [ a ] was declared at 6,13, but was never initialized.
INFO SEMANTIC - PROGRAM SUCCESSFULLY FINISHED WITH 0 ERRORS AND 5
WARNINGS
```

Test Case 2

```
/* This is a simple program with no operations */
{}$
```

Output:

```
INFO SEMANTIC - Analyzing Program 1
INFO SEMANTIC - PROGRAM SUCCESSFULLY FINISHED WITH 0 ERRORS AND 0
WARNINGS
```

Test Case 3

```
/* Test case for a 'regular' program. Prints 1true23strastrbtrue */
{
   int a
   a = 1
   print(a)
   boolean b
   b = true
   print(b)
   {
      int a
      a = 2
      print(a)
   }
   {
      int a
      a = 3
      print(a)
   }
   string s
   s = "stra"
   print(s)
   s = "strb"
   print(s)
   if (a != 5) {
      print("true")
   }
   if (a == 5) {
      print("false")
   }
}$
```

Output:

```
INFO SEMANTIC - Analyzing Program 1
DEBUG SEMANTIC - Variable Declared [a] as Type int at 3,9
DEBUG SEMANTIC - SUCCESS: Variable a has been initialized with the correct type as int at 4,9
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [a] is used in print statement at 5,11
DEBUG SEMANTIC - Variable Declared [b] as Type boolean at 6,13
```

DEBUG SEMANTIC - SUCCESS: Variable b has been initialized with the correct type as boolean at 7,9
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [b] is used in print statement at 8,11
DEBUG SEMANTIC - Variable Declared [a] as Type int at 10,13
DEBUG SEMANTIC - SUCCESS: Variable a has been initialized with the correct type as int at 11,13
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [a] is used in print statement at 12,15
DEBUG SEMANTIC - Variable Declared [a] as Type int at 15,13
DEBUG SEMANTIC - SUCCESS: Variable a has been initialized with the correct type as int at 16,13
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [a] is used in print statement at 17,15
DEBUG SEMANTIC - Variable Declared [s] as Type string at 19,12
DEBUG SEMANTIC - SUCCESS: Variable [s] has been initialized with the correct type as string at 20,14
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [s] is used in print statement at 21,11
DEBUG SEMANTIC - SUCCESS: Variable [s] has been initialized with the correct type as string at 22,14
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [s] is used in print statement at 23,11
INFO SEMANTIC - PROGRAM SUCCESSFULLY FINISHED WITH 0 ERRORS AND 0 WARNINGS

Test Case 4

```
/* Test case for multiple programs */
{
   print("i love compilers")
   int a
   a = 2
   string s
   s = "ha"
}$
{
   int b
   b = 4
   string s
   s = "hey"
}$
```

Output:

```
INFO SEMANTIC - Analyzing Program 1
DEBUG SEMANTIC - Variable Declared [a] as Type int at 4,9
DEBUG SEMANTIC - SUCCESS: Variable a has been initialized with the correct type as int at 5,9
DEBUG SEMANTIC - Variable Declared [s] as Type string at 6,12
DEBUG SEMANTIC - SUCCESS: Variable [s] has been initialized with the correct type as string at 7,12
DEBUG SEMANTIC - WARNING - Variable [ a ] was declared at 4,9, but was never used.
DEBUG SEMANTIC - WARNING - Variable [ a ] was initialized at 4,9, but was never used.
DEBUG SEMANTIC - WARNING - Variable [ s ] was declared at 6,12, but was never used.
DEBUG SEMANTIC - WARNING - Variable [ s ] was initialized at 6,12, but was never used.
INFO SEMANTIC - PROGRAM SUCCESSFULLY FINISHED WITH 0 ERRORS AND 4 WARNINGS

INFO SEMANTIC - Analyzing Program 2
DEBUG SEMANTIC - Variable Declared [b] as Type int at 3,9
DEBUG SEMANTIC - SUCCESS: Variable b has been initialized with the correct type as int at 4,9
DEBUG SEMANTIC - Variable Declared [s] as Type string at 5,12
DEBUG SEMANTIC - SUCCESS: Variable [s] has been initialized with the correct type as string at 6,13
DEBUG SEMANTIC - WARNING - Variable [ b ] was declared at 3,9, but was never used.
DEBUG SEMANTIC - WARNING - Variable [ b ] was initialized at 3,9, but was never used.
DEBUG SEMANTIC - WARNING - Variable [ s ] was declared at 5,12, but was never used.
DEBUG SEMANTIC - WARNING - Variable [ s ] was initialized at 5,12, but was never used.
INFO SEMANTIC - PROGRAM SUCCESSFULLY FINISHED WITH 0 ERRORS AND 4 WARNINGS
```

Test Case 5:

```
/* Test case for WhileStatement. Prints 23458 */
{
   int a
   a = 1
   {
      int a
      a = 2
      print(a)
   }
   {
      while (a != 5) {
         a = 1 + a
         print(a)
      }
      print(3 + a)
   }
} $
```

Output:

```
INFO SEMANTIC - Analyzing Program 1
DEBUG SEMANTIC - Variable Declared [a] as Type int at 3,9
DEBUG SEMANTIC - SUCCESS: Variable a has been initialized with the correct type as int at
4,9
DEBUG SEMANTIC - Variable Declared [a] as Type int at 6,13
DEBUG SEMANTIC - SUCCESS: Variable a has been initialized with the correct type as int at
7,13
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [a] is used in print statement at 8,15
DEBUG SEMANTIC - SUCCESS - Variable [ a ] is initialized at 12,17
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [a] is used in print statement at 13,19
INFO SEMANTIC - PROGRAM SUCCESSFULLY FINISHED WITH 0 ERRORS AND 0
WARNINGS
```

Test Case 6:

```
/* Test case for IfStatement. Prints numsidsstringsbooleans */
{
   int a
   a = 1
   if(1 == 1){
      print("nums")
   }
   if(a == a){
      print("ids")
   }
   if("hey" == "hey"){
      print("strings")
   }
   if(true == true){
      print("booleans")
   }
} $
```

Output:

```
INFO SEMANTIC - Analyzing Program 1
DEBUG SEMANTIC - Variable Declared [a] as Type int at 3,9
DEBUG SEMANTIC - SUCCESS: Variable a has been initialized with the correct type as int at
4,9
INFO SEMANTIC - PROGRAM SUCCESSFULLY FINISHED WITH 0 ERRORS AND 0
WARNINGS
```

Test Case 7:

```
/* Has unused and undeclared variables */
{
  int a
  int b
  a = 3
  b = 4
  {
    string a
    a = "hey"
    print(a)
    print(b)
  }
  print(b)
  string s
  {
    boolean b
    b = false
  }
  string r
  r = "hey"
  int d
  print(d)
  d = 3
}$
```

Output:

```
INFO SEMANTIC - Analyzing Program 1
DEBUG SEMANTIC - Variable Declared [a] as Type int at 3,7
DEBUG SEMANTIC - Variable Declared [b] as Type int at 4,7
DEBUG SEMANTIC - SUCCESS: Variable a has been initialized with the correct type as int at
5,7
DEBUG SEMANTIC - SUCCESS: Variable b has been initialized with the correct type as int at
6,7
DEBUG SEMANTIC - Variable Declared [a] as Type string at 8,12
DEBUG SEMANTIC - SUCCESS: Variable [a] has been initialized with the correct type as string
at 9,13
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [a] is used in print statement at 10,11
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [b] is used in print statement at 11,11
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [b] is used in print statement at 13,9
DEBUG SEMANTIC - Variable Declared [s] as Type string at 14,10
DEBUG SEMANTIC - Variable Declared [b] as Type boolean at 16,13
```

DEBUG SEMANTIC - SUCCESS: Variable b has been initialized with the correct type as boolean at 17,9
DEBUG SEMANTIC - Variable Declared [r] as Type string at 19,10
DEBUG SEMANTIC - SUCCESS: Variable [r] has been initialized with the correct type as string at 20,11
DEBUG SEMANTIC - Variable Declared [d] as Type int at 21,7
DEBUG - SEMANTIC ANALYSIS - SUCCESS - Variable [d] is used in print statement at 22,9
DEBUG - SEMANTIC ANALYSIS - WARNING - [d] was used before being initialized at 22,9
DEBUG SEMANTIC - SUCCESS: Variable d has been initialized with the correct type as int at 23,7
DEBUG SEMANTIC - WARNING - Variable [a] was declared at 3,7, but was never used.
DEBUG SEMANTIC - WARNING - Variable [a] was initialized at 3,7, but was never used.
DEBUG SEMANTIC - WARNING - Variable [s] was declared at 14,10, but was never used.
DEBUG SEMANTIC - WARNING - Variable [s] was declared at 14,10, but was never initialized.
DEBUG SEMANTIC - WARNING - Variable [r] was declared at 19,10, but was never used.
DEBUG SEMANTIC - WARNING - Variable [r] was initialized at 19,10, but was never used.
DEBUG SEMANTIC - WARNING - Variable [b] was declared at 16,13, but was never used.
DEBUG SEMANTIC - WARNING - Variable [b] was initialized at 16,13, but was never used.
INFO SEMANTIC - PROGRAM SUCCESSFULLY FINISHED WITH 0 ERRORS AND 9 WARNINGS

Test Case 8

Test Case 9

Test Case 10

Test Case 11

Test Case 12

Test Case 13

Test Case 14

Test Case 15