Homework 6

Yutong Huang (yxh589)

Problem 1

Algorithm 1: $M()$

```
⟨M⟩ ← {
1     "M(){"
2         "⟨M⟩ ← {",
3         "}"
4         "⟨N⟩ ← {",
5         "}"
6         "Print line 1 to 2 of ⟨N⟩"
7         "Print all lines of ⟨M⟩"
8         "Print line 3 to 4 of ⟨N⟩"
9         "Print all lines of ⟨N⟩"
10        "Print line 5 to 11 of ⟨N⟩"
11    "}"
};
⟨N⟩ ← {
1     "M(){"
2         "⟨M⟩ ← {",
3         "}"
4         "⟨N⟩ ← {",
5         "}"
6         "Print line 1 to 2 of ⟨M⟩"
7         "Print all lines of ⟨M⟩"
8         "Print line 3 to 4 of ⟨M⟩"
9         "Print all lines of ⟨N⟩"
10        "Print line 5 to 11 of ⟨M⟩"
11    "}"
};
Print line 1 to 2 of ⟨N⟩;
Print all lines of ⟨M⟩;
Print line 3 to 4 of ⟨N⟩;
Print all lines of ⟨N⟩;
Print line 5 to 11 of ⟨N⟩;
```

Algorithm 2: $N()$

```
⟨M⟩ ← {
1     "M(){"
2         "⟨M⟩ ← {",
3         "}"
4         "⟨N⟩ ← {",
5         "}"
6         "Print line 1 to 2 of ⟨N⟩"
7         "Print all lines of ⟨M⟩"
8         "Print line 3 to 4 of ⟨N⟩"
9         "Print all lines of ⟨N⟩"
10        "Print line 5 to 11 of ⟨N⟩"
11    "}"
};
⟨N⟩ ← {
1     "M(){"
2         "⟨M⟩ ← {",
3         "}"
4         "⟨N⟩ ← {",
5         "}"
6         "Print line 1 to 2 of ⟨M⟩"
7         "Print all lines of ⟨M⟩"
8         "Print line 3 to 4 of ⟨M⟩"
9         "Print all lines of ⟨N⟩"
10        "Print line 5 to 11 of ⟨M⟩"
11    "}"
};
Print line 1 to 2 of ⟨M⟩;
Print all lines of ⟨M⟩;
Print line 3 to 4 of ⟨M⟩;
Print all lines of ⟨N⟩;
Print line 5 to 11 of ⟨M⟩;
```

Problem 2

The following java program is submitted through canvas. A and B are implemented in such a way that they print each other.

```java
/**
 * Quine - a class with two method A and B such that the class prints the source code of itself,
 *          and A and B print each other.
 */
public class Quine {

    /**
     * This method prints the start of the class, start of the main function,
     * the string that contains the partial source code, and then the rest of this method; <p>
     * Then this method invokes B() to print method A, and then invokes A() to print B; <p>
     * And finally print the close brackets.
     * @param args - no args needed
     */
```

```
public static void main(String[] args) {
    String[] sourceOfMain = {
        "public class Quine {",
        "    public static void main(String[] args) {",
        "        String[] sourceOfMain = {",
        "            ",
        "        }",
        "        char q = 34;",
        "        for (int i = 0; i < 3; i++) {",
        "            System.out.println(sourceOfMain[i]);",
        "        }",
        "        for (String line : sourceOfMain) {",
        "            System.out.println(sourceOfMain[3] + q + line + q);",
        "        }",
        "        for (int i = 3; i < 21; i++) {",
        "            System.out.println(sourceOfMain[i]);",
        "        }",
        "        B();",
        "        A();",
        "        for (int i = 21; i < sourceOfMain.length; i++) {",
        "            System.out.println(sourceOfMain[i]);",
        "        }",
        "    }",
        "    ",
        "}"
    };

    char q = 34;
    for (int i = 0; i < 3; i++) {
        System.out.println(sourceOfMain[i]);
    }
    for (String line : sourceOfMain) {
        System.out.println(sourceOfMain[3] + q + line + q);
    }
    for (int i = 3; i < 21; i++) {
        System.out.println(sourceOfMain[i]);
    }
    B();
    A();
    for (int i = 21; i < sourceOfMain.length; i++) {
        System.out.println(sourceOfMain[i]);
    }

}

/**
 * Print method {@code Quine.B}
 */
public static void A(){

    String[] sourceOfA = {
        "    public static void A(){",
        "       String sourceOfA = {",
        "           ",
        "       };",
        "       String sourceOfB = {",
        "           ",
        "       };",
        "       char q = 34;",
```

```
    "      for (int i = 0; i < 2; i++) {",
    "          System.out.println(sourceOfB[i]);",
    "      }",
    "      for (String line : sourceOfA) {",
    "          System.out.println(sourceOfB[2] + q + line + q);",
    "      }",
    "      for (int i = 3; i < 5; i++) {",
    "          System.out.println(sourceOfB[i]);",
    "      }",
    "      for (String line : sourceOfB) {",
    "          System.out.println(sourceOfB[5] + q + line + q);",
    "      }",
    "      for (int i = 6; i < sourceOfB.length; i++) {",
    "          System.out.println(sourceOfB[i]);",
    "      }",
    "   }"
};

String[] sourceOfB = {
    "   public static void B(){",
    "      String sourceOfA = {",
    "          ",
    "      };",
    "      String sourceOfB = {",
    "          ",
    "      };",
    "      char q = 34;",
    "      for (int i = 0; i < 2; i++) {",
    "          System.out.println(sourceOfA[i]);",
    "      }",
    "      for (String line : sourceOfA) {",
    "          System.out.println(sourceOfA[2] + q + line + q);",
    "      }",
    "      for (int i = 3; i < 5; i++) {",
    "          System.out.println(sourceOfA[i]);",
    "      }",
    "      for (String line : sourceOfB) {",
    "          System.out.println(sourceOfA[5] + q + line + q);",
    "      }",
    "      for (int i = 6; i < sourceOfB.length; i++) {",
    "          System.out.println(sourceOfA[i]);",
    "      }",
    "   }"
};

char q = 34;
for (int i = 0; i < 2; i++) {
    System.out.println(sourceOfB[i]);
}
for (String line : sourceOfA) {
    System.out.println(sourceOfB[2] + q + line + q);
}
for (int i = 3; i < 5; i++) {
    System.out.println(sourceOfB[i]);
}
for (String line : sourceOfB) {
    System.out.println(sourceOfB[5] + q + line + q);
}
for (int i = 6; i < sourceOfB.length; i++) {
```

```
        System.out.println(sourceOfB[i]);
    }
}

/**
 * Print method {@code Quine.A}
 */
public static void B(){

    String[] sourceOfA = {
        "   public static void A(){",
        "      String sourceOfA = {",
        "          ",
        "      };",
        "      String sourceOfB = {",
        "          ",
        "      };",
        "      char q = 34;",
        "      for (int i = 0; i < 2; i++) {",
        "          System.out.println(sourceOfB[i]);",
        "      }",
        "      for (String line : sourceOfA) {",
        "          System.out.println(sourceOfB[2] + q + line + q);",
        "      }",
        "      for (int i = 3; i < 5; i++) {",
        "          System.out.println(sourceOfB[i]);",
        "      }",
        "      for (String line : sourceOfB) {",
        "          System.out.println(sourceOfB[5] + q + line + q);",
        "      }",
        "      for (int i = 6; i < sourceOfB.length; i++) {",
        "          System.out.println(sourceOfB[i]);",
        "      }",
        "   }"
    };

    String[] sourceOfB = {
        "   public static void B(){",
        "      String sourceOfA = {",
        "          ",
        "      };",
        "      String sourceOfB = {",
        "          ",
        "      };",
        "      char q = 34;",
        "      for (int i = 0; i < 2; i++) {",
        "          System.out.println(sourceOfA[i]);",
        "      }",
        "      for (String line : sourceOfA) {",
        "          System.out.println(sourceOfA[2] + q + line + q);",
        "      }",
        "      for (int i = 3; i < 5; i++) {",
        "          System.out.println(sourceOfA[i]);",
        "      }",
        "      for (String line : sourceOfB) {",
        "          System.out.println(sourceOfA[5] + q + line + q);",
        "      }",
        "      for (int i = 6; i < sourceOfB.length; i++) {",
        "          System.out.println(sourceOfA[i]);",
```

```
            "      }",
            "   }"
        };

        char q = 34;
        for (int i = 0; i < 2; i++) {
            System.out.println(sourceOfA[i]);
        }
        for (String line : sourceOfA) {
            System.out.println(sourceOfA[2] + q + line + q);
        }
        for (int i = 3; i < 5; i++) {
            System.out.println(sourceOfA[i]);
        }
        for (String line : sourceOfB) {
            System.out.println(sourceOfA[5] + q + line + q);
        }
        for (int i = 6; i < sourceOfB.length; i++) {
            System.out.println(sourceOfA[i]);
        }
    }
}
```