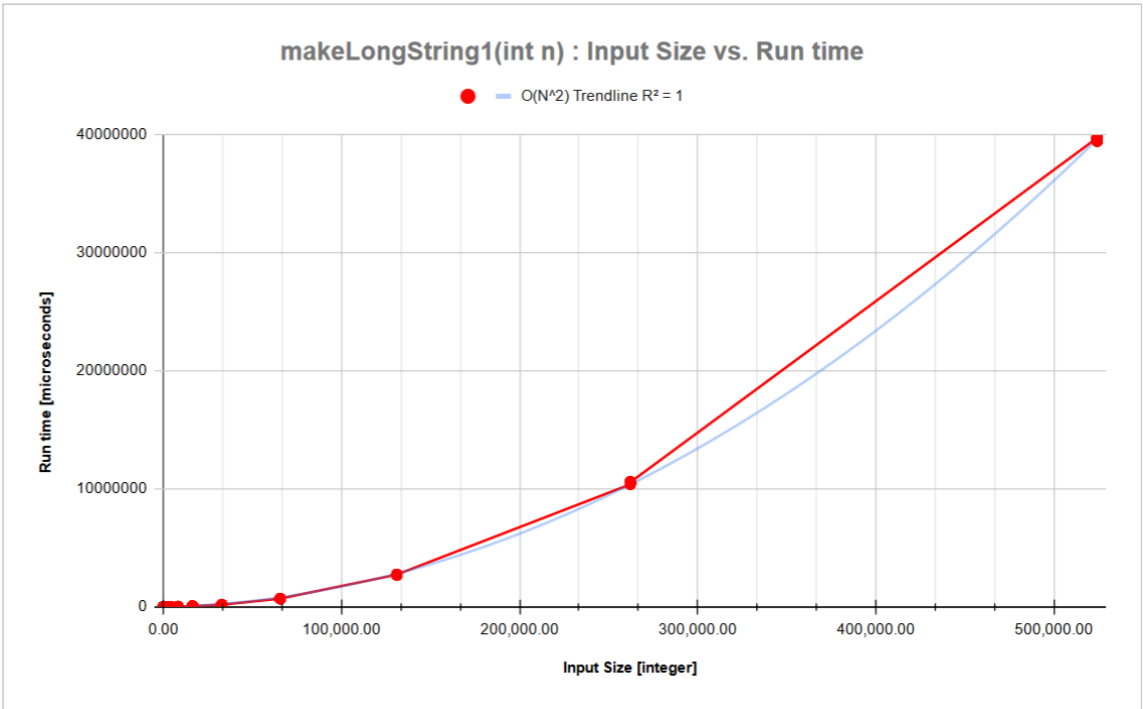*Chapter 5 Programming - Programming Projects*
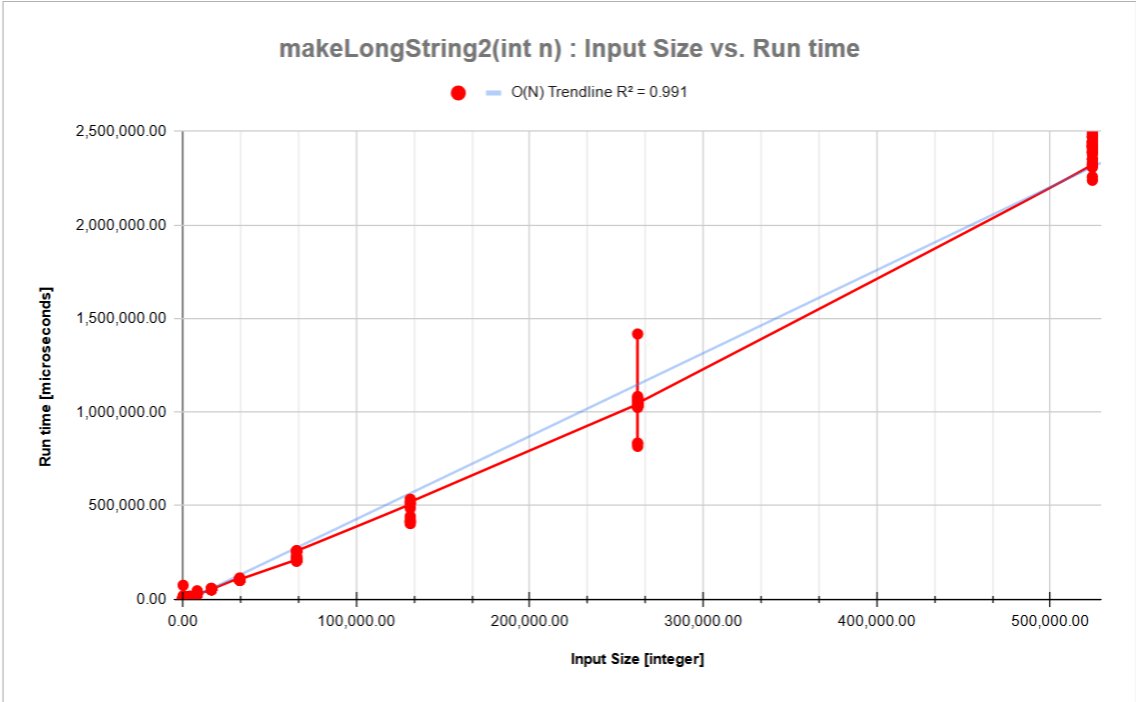
5.30 Main & Test Function

```java
 4      final static int NUM_TRIALS = 19;
 5      final static int NUM_SUB_TRIALS = 30;
 6
 7      final static int START_NUM = 2;
 8
        Run | Debug
 9      public static void main(String[] args)
10      {
11          // Use a Lambda function and the interface to run makeLongString1
12          testFunction((n) -> makeLongString1(n));
13          System.out.println();
14          System.out.println();
15          // Use a Lambda function and the interface to run makeLongString2
16          testFunction((n) -> makeLongString2(n));
17      }
18
19      public static void testFunction(Runner run)
20      {
21          // Do a test run
22          long startTime = System.nanoTime();
23          run.runThisFunction((int)Math.pow(a:2, NUM_TRIALS) / 2);
24          long endTime = System.nanoTime();
25
26          int trialNum = 1;
27          long[][] times = new long[NUM_TRIALS][NUM_SUB_TRIALS];
28
29          for (int input = START_NUM; input <= Math.pow(a:2, NUM_TRIALS); input *= 2)
30          {
31              for (int subTrial = 0; subTrial < NUM_SUB_TRIALS; subTrial++)
32              {
33                  startTime = System.nanoTime();
34                  run.runThisFunction(input);
35                  endTime = System.nanoTime();
36                  times[trialNum - 1][subTrial] = endTime - startTime;
37                  System.out.printf(format:"%d,%d,%d%n", trialNum, input, endTime - startTime);
38              }
39              // System.out.printf("Trial: %8d | Input: %8d |%n", trialNum, input);
40
41              trialNum++;
42          }
43      }
```

5.30 Analysis

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makeLongString2(int n) : Input Size vs. Run time

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5.41 Methods

```
15      public static long[] calculateNumbers()
16      {
17          long[] powers = new long[MAX - MIN + 2];
18          for (int number = MIN; number <= MAX; number++)
19          {
20              powers[number] = (long) Math.pow(number, b:5);
21          }
22          return powers;
23      }
```

```
26      public static void findSolution()
27      {
28          // Get powers and setup intial term values;
29          long[] powers = calculateNumbers();
30          int termA = 0;
31          int termB = 0;
32          int termC = 0;
33          int termD = 0;
34          int termE = 0;
35          int termF = 0;
36          int pairs = 0;
37          // This will be triggered upon finding the solution
38          boolean evaluatesTrue = false;
39
40          // Loop for each term
41          for (termA = MIN; termA < MAX; termA++)
42          {
43              for (termB = termA; termB < MAX; termB++)
44              {
45                  for (termC = termB; termC < MAX; termC++)
46                  {
47                      for (termD = termC; termD < MAX; termD++)
48                      {
49                          for (termE = termD; termE < MAX; termE++)
50                          {
51                              for (termF = termE; termF < MAX; termF++)
52                              {
53                                  // Test the terms
54                                  if (powers[termA] + powers[termB] + powers[termC] + powers[termD] + powers[termE] == powers[termF])
55                                  {
56                                      evaluatesTrue = true;
57                                  }
58                                  pairs++;
59                              }
60                              if (evaluatesTrue) break;
61                          }
62                          if (evaluatesTrue) break;
63                      }
64                      if (evaluatesTrue) break;
65                  }
66                  if (evaluatesTrue) break;
67              }
68              if (evaluatesTrue) break;
69          }
70
71          System.out.printf(WOAH_LONG_FORMAT, pairs,
72              MIN - 1, termA, termB, termC, termD, termE, termF, MAX,
73              termA, termB, termC, termD, termE, termF
74          );
75      }
```

5.41 Output

```
c:\Users\wes\github-repos\cs2420_summer2023\Chapter5 - VS Code Console
Found on loop 227539046:
(  0 <   19<=   43<=   46<=   47<=   67<=   75<=   75)
( 19^5 + 43^5 + 46^5 + 47^5 +   67^5 = 75^5)
Press any key to continue . . . _
```