Component C. Personalized Project Reference.

Procedure:

i.

```
86
87  void primeCheck(int number) {
88
89    bool isPrime { true };
90
91
92    for (int prime : primeSet) {
93      if (number % prime == 0) { isPrime = false; }
94    };
95
96
97    if (isPrime) { primeSet.push_back(number); }
98    return;
99
100 }
101
```

ii.

```
54
55  int main() {
56
57
58    std::cout << "How many prime numbers would you like?  ";
59    std::cin >> upperLimit;
60    std::cout << '\n' << "Generating primes..." << '\n';
61
62    Timer generationTimer;
63
64
65    for (int i = 2; primeSet.size() < upperLimit; ++i) {
66      primeCheck(i);
67    }
68
69    double generationTime = generationTimer.elapsed();
70    Timer printTimer;
71
72
73    printPrimes();
74
75    double printTime = printTimer.elapsed();
76    std::cout << '\n' << "Generation Time: " << generationTime << "s" << '\n';
77    std::cout << "Print Time: " << printTime << "s" << '\n';
78
79    indexingNth();
80
81  }
82
```

List:

i.

```
19
20    std::vector<int> primeSet;
21    int upperLimit;
```

```
64
65    for (int i = 2; primeSet.size() < upperLimit; ++i) {
66      primeCheck(i);
67    }
68
```

```
86
87  void primeCheck(int number) {
88
89    bool isPrime { true };
90
91
92    for (int prime : primeSet) {
93      if (number % prime == 0) { isPrime = false; }
94    };
95
96
97    if (isPrime) { primeSet.push_back(number); }
98    return;
99
100 }
101
```

ii.

```
117
118  int searchPrimeSet(int prime) {
119
120    int index { -1 };
121
122
123    for (int i = 0; i < upperLimit; ++i) {
124      if ( prime == primeSet[i] ) {
125
126        index = i + 1;
127      }
128    }
129
130
131    if (index == -1) { throw "Invalid input, not in generated prime set"; }
132
133    return index;
134
135  }
136
```

```
136
137  void indexingNth() {
138
139
140    int nthPrime;
141    std::cout << '\n' << "Which prime number would you like to index?  ";
142    std::cin >> nthPrime;
143
144
145    try {
146
147      Timer searchTimer;
148
149      int n { searchPrimeSet(nthPrime) };
150
151      double searchTime { searchTimer.elapsed() };
152      std::cout << "Search Time: " << searchTime << "s" << "\n\n";
153
154      std::cout << nthPrime << " is " << n << "th in the set of primes." << '\n';
155
156    } catch (const char* ) {
157
158      std::cout << "Invalid input, not in generated prime set" << '\n';
159      indexingNth();
160
161    }
162
163  }
```