

DSA REPORT

Name: Anirban Das Roll: 001910501077 Class: BCSE -II Sem: First Session: 2020-21

Assignment Set: 1

Problem 7:

Problem Statement:

Take a four-digit prime number P. Generate a series of large integers L and for each member L(i), compute the remainder R(i), after dividing L(i) by P. Tabulate L(i) and R(i). Repeat for seven other four digit prime numbers keeping L(i) fixed.

Solution Approach:

Firstly a binary array is taken, which stores the prime status of a range of integers, i.e it stores 1 if the number is prime and 0 otherwise.

In the main, 20 large integers are generated using the rand() funtion on a very large integer (a.k.a 1e8), and stored in an integer array.

Using the binary array created earlier, the first eight, 4-digit prime numbers are found and stored in an array.

Finally, two nested loops are made with the outer one running 8 times and the inner 20 times. In eacch iteration of the outer loop, the 20 large integers are divided by a single prime number and the corresponding reminders are printed.

Structured Pseudocode:

FUNCTION SIEVE():

 N = LARGE INTEGER (1e8)

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FOR i=2 TO n DO:

IF(PRIME[i]!=0):

FOR j=2*i TO n DO:

PRIME[j]=1

j = j + 1

i = i+1

MAIN():

FOR i=0 TO 20 DO:

LARGE[i] = 1E8 + RAND() % 1E8

i = i + 1

COUNT = 0

ARRAY[8] = {0}

FOR i=1001 DO:

IF (COUNT<8)

IF (PRIME[i] == 1)

ARRAY[COUNT] = i

COUNT = COUNT +1

i = i+1

FOR i=0 TO 8 DO:

FOR j=0 TO 20 DO:

PRINT(ARRAY[i] % LARGE[j])

j = j+1

i = i + 1

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Results:

```
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE 1: bash
danir@ad:~/Desktop/SEM 3/DSA/assignment1$ gcc seven.c
danir@ad:~/Desktop/SEM 3/DSA/assignment1$ ./a.out
When mod = 1009:
104289383 % 1009 = 152
146930886 % 1009 = 306
181692777 % 1009 = 129
114636915 % 1009 = 389
157747793 % 1009 = 733
124238335 % 1009 = 165
119885386 % 1009 = 42
149760492 % 1009 = 676
196516649 % 1009 = 782
189641421 % 1009 = 880
125202362 % 1009 = 597
150490027 % 1009 = 704
183368690 % 1009 = 93
102520059 % 1009 = 614
144897763 % 1009 = 318
167513926 % 1009 = 755
165180540 % 1009 = 177
140383426 % 1009 = 247
104089172 % 1009 = 732
103455736 % 1009 = 948
When mod = 1013:
104289383 % 1013 = 20
146930886 % 1013 = 301
181692777 % 1013 = 84
114636915 % 1013 = 770
157747793 % 1013 = 394
124238335 % 1013 = 976
119885386 % 1013 = 888
149760492 % 1013 = 598
196516649 % 1013 = 727
189641421 % 1013 = 730
125202362 % 1013 = 627
150490027 % 1013 = 773
183368690 % 1013 = 495
102520059 % 1013 = 407
```

```
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE 1: bash
125202362 % 1021 = 195
150490027 % 1021 = 753
183368690 % 1021 = 153
102520059 % 1021 = 428
144897763 % 1021 = 506
167513926 % 1021 = 498
165180540 % 1021 = 97
140383426 % 1021 = 10
104089172 % 1021 = 264
103455736 % 1021 = 869
When mod = 1031:
104289383 % 1031 = 640
146930886 % 1031 = 1014
181692777 % 1031 = 678
114636915 % 1031 = 25
157747793 % 1031 = 669
124238335 % 1031 = 773
119885386 % 1031 = 706
149760492 % 1031 = 525
196516649 % 1031 = 832
189641421 % 1031 = 312
125202362 % 1031 = 815
150490027 % 1031 = 112
183368690 % 1031 = 185
102520059 % 1031 = 512
144897763 % 1031 = 1023
167513926 % 1031 = 139
165180540 % 1031 = 937
140383426 % 1031 = 404
104089172 % 1031 = 443
103455736 % 1031 = 41
When mod = 1033:
104289383 % 1033 = 802
146930886 % 1033 = 65
181692777 % 1033 = 473
114636915 % 1033 = 773
157747793 % 1033 = 429
124238335 % 1033 = 458
```

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```
PROBLEMS  OUTPUT  TERMINAL  DEBUG CONSOLE
124238335 % 1033 = 458
119885386 % 1033 = 571
149760492 % 1033 = 284
196516649 % 1033 = 795
189641421 % 1033 = 182
125202362 % 1033 = 696
150490027 % 1033 = 521
183368690 % 1033 = 860
102520059 % 1033 = 1007
144897763 % 1033 = 919
167513926 % 1033 = 580
165180540 % 1033 = 741
140383426 % 1033 = 792
104089172 % 1033 = 993
103455736 % 1033 = 786
When mod = 1039:
104289383 % 1039 = 797
146930886 % 1039 = 701
181692777 % 1039 = 769
114636915 % 1039 = 928
157747793 % 1039 = 579
124238335 % 1039 = 949
119885386 % 1039 = 371
149760492 % 1039 = 71
196516649 % 1039 = 189
189641421 % 1039 = 24
125202362 % 1039 = 784
150490027 % 1039 = 228
183368690 % 1039 = 775
102520059 % 1039 = 890
144897763 % 1039 = 901
167513926 % 1039 = 112
165180540 % 1039 = 320
140383426 % 1039 = 1019
104089172 % 1039 = 74
103455736 % 1039 = 428
When mod = 1049:
104289383 % 1049 = 950
```

```
PROBLEMS  OUTPUT  TERMINAL  DEBUG CONSOLE
157747793 % 1039 = 579
124238335 % 1039 = 949
119885386 % 1039 = 371
149760492 % 1039 = 71
196516649 % 1039 = 189
189641421 % 1039 = 24
125202362 % 1039 = 784
150490027 % 1039 = 228
183368690 % 1039 = 775
102520059 % 1039 = 890
144897763 % 1039 = 901
167513926 % 1039 = 112
165180540 % 1039 = 320
140383426 % 1039 = 1019
104089172 % 1039 = 74
103455736 % 1039 = 428
When mod = 1049:
104289383 % 1049 = 950
146930886 % 1049 = 603
181692777 % 1049 = 732
114636915 % 1049 = 97
157747793 % 1049 = 222
124238335 % 1049 = 20
119885386 % 1049 = 421
149760492 % 1049 = 7
196516649 % 1049 = 136
189641421 % 1049 = 54
125202362 % 1049 = 16
150490027 % 1049 = 487
183368690 % 1049 = 343
102520059 % 1049 = 240
144897763 % 1049 = 442
167513926 % 1049 = 165
165180540 % 1049 = 804
140383426 % 1049 = 1001
104089172 % 1049 = 49
103455736 % 1049 = 209
danir@ad:~/Desktop/SEM 3/DSA/assignment1$
```

Discussions:

$O(n \log(\log n))$ time complexity. The space complexity is $O(n)$.

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Source Code:

FILE NAME:

Code – “seven.c”

(can be found in the following link: [https://drive.google.com/drive/folders/1-](https://drive.google.com/drive/folders/1-nNb6aRleNLE1mcE58i85096fDmDUCvd?usp=sharing)

[nNb6aRleNLE1mcE58i85096fDmDUCvd?usp=sharing](https://drive.google.com/drive/folders/1-nNb6aRleNLE1mcE58i85096fDmDUCvd?usp=sharing))