

CP 431/631 Assignment 1

By group 2 (Omer Tal, Elizabeth Gorbonos, Tianran Wang, Ryan Kazmerik)

1. Assignment description:

The PrimeGaps program ([appendix 1](#)) is responsible for finding the maximum gap between prime numbers from 0 up to a given number “range”.

This program is written using MPI library in C. It breaks the range of potential prime numbers into $\frac{n}{P}$ fractions using the following formula:

$$n_p = \left\lfloor \frac{n}{P} \right\rfloor + \begin{cases} 1 & \text{if } p < \text{mod}(n, P), \\ 0 & \text{else,} \end{cases}$$

Each processor computes the largest gap for the range from $i_{start,p}$ to $i_{start,p} + n_p$ where:

$$i_{start,p} = p \left\lfloor \frac{n}{P} \right\rfloor + \min(p, \text{mod}(n, P)).$$

The program is using `mpz_nextprime` function provided by the GMP library in order to find all the prime numbers in a “local range” and the smallest prime bigger than $i_{start,p} + n_p$ (the upper bound of a local range).

The program was tested on Sharcnet’s Orca cluster using 1 to 8 processors for an input of 10^9 .

We were able to scale the code up to an input of 10^{12} by increasing the number of processors to 32 and 64, and by replacing the variables from “int” data type to “unsigned long long”.

2. Results:

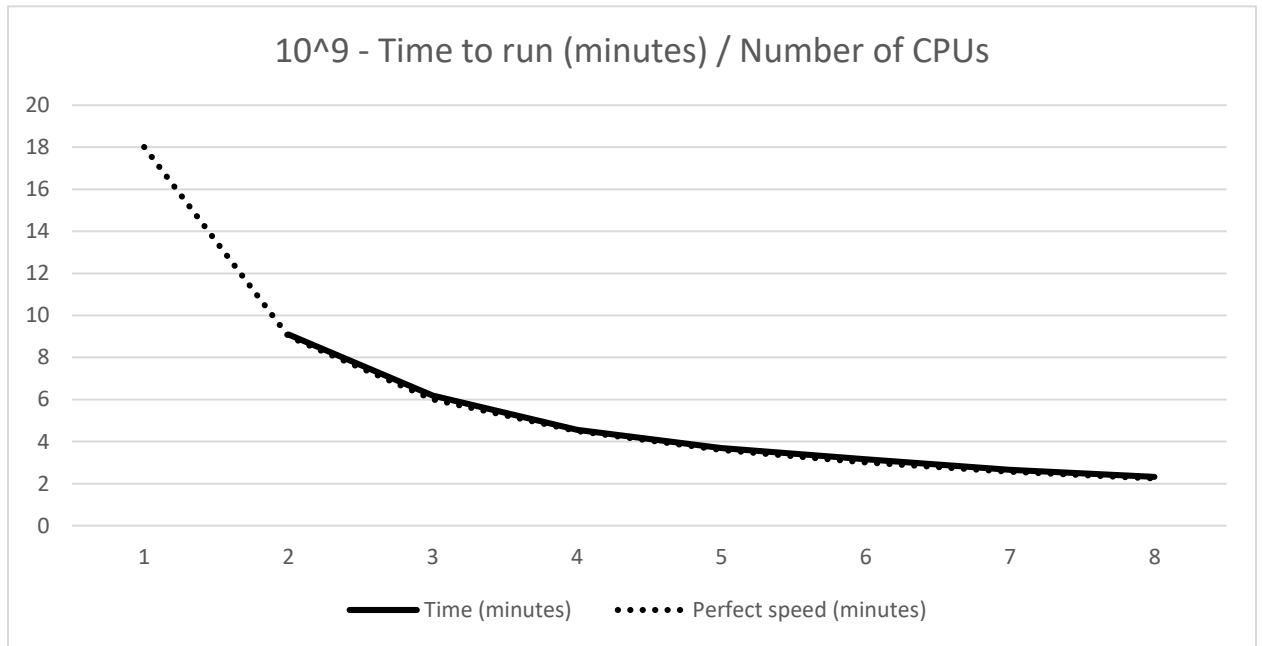
The program output for 10^9 is:

Largest gap found: 282, between 436273009 and 436273291 ([appendix 2](#)).

The program output for 10^{12} is:

Largest gap found: 540, between 738832927927 and 738832928467 ([appendix 3](#)).

3. Benchmarks:



Data size (n)	Number of CPUs	Time (seconds)	Time (minutes)	Perfect speed (minutes)
10^9	1	1080.357769	18.0	18.0
	2	545.334086	9.1	9.0
	3	371.728151	6.2	6.0
	4	273.814905	4.6	4.5
	5	221.334371	3.7	3.6
	6	189.839989	3.2	3.0
	7	159.134436	2.7	2.6
	8	139.303029	2.3	2.3
10^{12}	32	22961.8954	382.7	
	64	11632.86021	193.9	

Appendix 1 : Program code

```
/*
=====
Name      : PrimeGaps.h
Author    : Omer Tal, Elizabeth Gorbonos, Tianran Wang, Ryan Kazmerik
Version   : 1.1
Description : Finds the largest gap between consecutive primes using
              parallel approach
=====
*/

#include <stdio.h>
#include <stdlib.h>
#include <stdarg.h>
#include <string.h>
#include <time.h>
#include <mpi.h>
#include <gmp.h>

void setup();
void max_gap();
void reduce_gaps();
void p_printf(const char* msg, ...);
unsigned long long mpz_get_ull(mpz_t t);
void mpz_set_ull(mpz_t t, unsigned long long l);

const int MASTER_RANK    = 0;
const int DEFAULT_RANGE = 1000000000;

int                p_num, rank, p_max_gap;
unsigned long long p_prime;
mpz_t              range, p_range, p_start, p_end;
double             start_time, end_time;
time_t             t;
```

```
/*
```

```
=====
Name       : PrimeGaps.c
Author      : Omer Tal, Elizabeth Gorbonos, Tianran Wang, Ryan Kazmerik
Version     : 1.1
Description : Finds the largest gap between consecutive primes using
              parallel approach
=====
*/
```

```
#include "primegaps.h"
```

```
int main(int argc, char**argv) {
    MPI_Init(&argc, &argv);
    MPI_Comm_size(MPI_COMM_WORLD, &p_num);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);

    if( argc == 2 ) {
        mpz_set_ull(range, atoll(argv[1]));
    }
    else {
        mpz_set_ull(range, DEFAULT_RANGE); /* default is 10^9 */
    }

    MPI_Barrier(MPI_COMM_WORLD);
    if (rank == MASTER_RANK){
        start_time = MPI_Wtime();
        p_printf("Starting");
    }

    setup(); /* calculate the work-range */

    max_gap(); /* find max gap */

    reduce_gaps(); /* send all gaps to master and find the largest */

    if(rank == MASTER_RANK){
        p_printf("Largest gap found: %d, between %lli and %lli.", p_max_gap,
                p_prime, p_prime + p_max_gap);
    }
}
```

```

        end_time = MPI_Wtime();
        p_printf("Run time was %f seconds", end_time-start_time);
        p_printf("End");
    }

    MPI_Finalize();

    return EXIT_SUCCESS;
}

/*
 * Function: setup
 * -----
 * Calculate the range (start and end values) for the current process to work on
 * Using:  $n(p) = \text{floor}(n/P) \text{ (} +1 \text{ if } p < \text{mod}(n,P) \text{)} = p\_range$ 
 *  $\text{start}(p) = p * \text{floor}(n/P) + \text{min}(p, \text{mod}(n,P)) = p\_start$ 
 * where  $p$  is rank
 */
void setup(){
    mpz_t rem;

    mpz_init(p_start);
    mpz_init(p_end);
    mpz_init(p_range);
    mpz_init(rem);

    mpz_fdiv_q_ui(p_range, range, p_num); /*  $p\_range = \text{floor}(n/P)$  */
    mpz_fdiv_r_ui(rem, range, p_num); /*  $\text{rem} = \text{mod}(n,P)$  */

    mpz_mul_ui(p_start, p_range, rank); /*  $p\_start = p * \text{floor}(n/P)$  */

    if(mpz_cmp_ui(rem, rank) > 0){ /* if  $\text{mod}(n,P) > p$  */
        mpz_add_ui(p_start, p_start, rank); /*  $p\_start += p$  */
        mpz_add_ui(p_range, p_range, 1); /* increase  $p\_range$  by 1 */
    }
    else{
        mpz_add(p_start, p_start, rem); /*  $p\_start += \text{mod}(n,P)$  */
    }

    mpz_add(p_end, p_start, p_range); /*  $\text{end}(p) = \text{start}(p) + n(p)$  */

```

```

        mpz_printf("Working on range: %lli to %lli", mpz_get_ull(p_start),
                    mpz_get_ull(p_end));
    }

/*
 * Function: max_gap
 * -----
 * Finds and sets p_max_gap and p_prime for the process work-range
 */
void max_gap()
{
    mpz_t curr_prime, next_prime, gap, max_gap;
    mpz_init(curr_prime);
    mpz_init(next_prime);
    mpz_init(gap);
    mpz_init(max_gap);

    /* start from the first prime in the process work-range */
    mpz_nextprime(curr_prime, p_start);

    while(mpz_cmp(p_end, curr_prime) > 0){
        mpz_nextprime(next_prime, curr_prime);
        mpz_sub(gap, next_prime, curr_prime);

        /* if the gap is the largest so far and it's not outside our entire
           range */
        if (mpz_cmp(gap, max_gap) > 0 && mpz_cmp(next_prime, range) <= 0){
            mpz_set(max_gap, gap); /* update the max */
            p_prime = mpz_get_ull(curr_prime);
        }

        mpz_set(curr_prime, next_prime); /* move on to the next prime */
    }

    p_max_gap = mpz_get_ull(max_gap); /* set the max gap found */
}

/*
 * Function: reduce_gaps
 * -----
 * Sends all max gaps found by all non-MASTER processes to MASTER.
 * Stores the largest gap and it's first occurrence in the MASTER process.

```

```

*/
void reduce_gaps(){
    unsigned long long data[2];

    if (rank != MASTER_RANK)
    {
        data[0] = p_max_gap;
        data[1] = p_prime;
        MPI_Send(&data, 2, MPI_LONG_LONG, MASTER_RANK, 0, MPI_COMM_WORLD);
    }
    else{
        p_printf("Found gap - %d, low prime - %lli.", p_max_gap, p_prime);

        MPI_Status status;
        int i;
        for (i = 0; i < p_num - 1; i++){
            MPI_Recv(&data, 2, MPI_LONG_LONG, MPI_ANY_SOURCE, 0,
                    MPI_COMM_WORLD, &status);
            p_printf("Received from process %d: max gap - %d, low prime -
                    %lli.", status.MPI_SOURCE, data[0], data[1]);

            if( data[0] > p_max_gap){
                p_max_gap = data[0]; /* update max gap */
                p_prime = data[1];
            }
        }
    }
}

```

```

/*
 * Function: p_printf
 * -----
 * Similar to printf, adds the process identifier and a timestamp.
 */
void p_printf(const char* format, ...){
    t = time(NULL);
    printf("%s Process %d / %d: ", strtok(ctime(&t), "\n"), rank, p_num);

    va_list arg;
    va_start(arg, format);
    vfprintf (stdout, format, arg);
    va_end(arg);
}

```

```

        printf("\n");
    }

    /*
     * Function: mpz_get_ull
     * -----
     *   Converts the value of a mpz_t variable to unsigned long long
     *   t: the mpz_t variable
     *
     *   returns: the value of t as unsigned long long
     */
    unsigned long long mpz_get_ull(mpz_t t)
    {
        unsigned long long val = 0;
        mpz_export(&val, 0, -1, sizeof val, 0, 0, t);
        return val;
    }

    /*
     * Function: mpz_set_ull
     * -----
     *   Sets the value of a mpz_t variable from unsigned long long variable
     *   t: the mpz_t variable to set
     *   l: the value to set in t
     */
    void mpz_set_ull(mpz_t t, unsigned long long l)
    {
        mpz_import(t, 1, -1, sizeof l, 0, 0, &l);
    }

```


Appendix 2 : Program output for 10^9

Serial output (p = 1)

```
Mon Oct 2 12:57:35 2017 Process 0 / 1: Starting
Mon Oct 2 12:57:35 2017 Process 0 / 1: Working on range: 0 to 1000000000
Mon Oct 2 13:15:36 2017 Process 0 / 1: Found gap - 282, low prime - 436273009.
Mon Oct 2 13:15:36 2017 Process 0 / 1: Largest gap found: 282, between 436273009 and
436273291.
Mon Oct 2 13:15:36 2017 Process 0 / 1: Run time was 1080.357769 seconds
Mon Oct 2 13:15:36 2017 Process 0 / 1: End
--- SharcNET Job Epilogue ---
    job id: 10860608
    exit status: 0
    cpu time: 1080s / 3.0h (10 %)
    elapsed time: 1081s / 3.0h (10 %)
    virtual memory: 339.6M / 1.0G (33 %)

Job completed successfully
WARNING: Job only used 10 % of its requested walltime.
WARNING: Job only used 10 % of its requested cpu time.
WARNING: Job only used 33% of its requested memory.
```

2 processor output

Mon Oct 2 12:23:20 2017 Process 0 / 2: Starting

Mon Oct 2 12:23:20 2017 Process 0 / 2: Working on range: 0 to 500000000

Mon Oct 2 12:23:20 2017 Process 1 / 2: Working on range: 500000000 to 1000000000

Mon Oct 2 12:32:25 2017 Process 0 / 2: Found gap - 282, low prime - 436273009.

Mon Oct 2 12:32:25 2017 Process 0 / 2: Received from process 1: max gap - 276, low prime - 649580171.

Mon Oct 2 12:32:25 2017 Process 0 / 2: Largest gap found: 282, between 436273009 and 436273291.

Mon Oct 2 12:32:25 2017 Process 0 / 2: Run time was 545.334086 seconds

Mon Oct 2 12:32:25 2017 Process 0 / 2: End

--- SharcNET Job Epilogue ---

 job id: 10860531

 exit status: 0

 cpu time: 1078s / 2.0h (14 %)

 elapsed time: 579s / 1.0h (16 %)

 virtual memory: 320.2M / 1.0G (31 %)

Job completed successfully

WARNING: Job only used 16 % of its requested walltime.

WARNING: Job only used 14 % of its requested cpu time.

WARNING: Job only used 31% of its requested memory.

3 processor output

Mon Oct 2 12:23:49 2017 Process 1 / 3: Working on range: 333333334 to 666666667
Mon Oct 2 12:23:49 2017 Process 0 / 3: Starting
Mon Oct 2 12:23:49 2017 Process 0 / 3: Working on range: 0 to 333333334
Mon Oct 2 12:23:49 2017 Process 2 / 3: Working on range: 666666667 to 1000000000
Mon Oct 2 12:30:01 2017 Process 0 / 3: Found gap - 248, low prime - 191912783.
Mon Oct 2 12:30:01 2017 Process 0 / 3: Received from process 1: max gap - 282, low prime - 436273009.
Mon Oct 2 12:30:01 2017 Process 0 / 3: Received from process 2: max gap - 260, low prime - 944192807.
Mon Oct 2 12:30:01 2017 Process 0 / 3: Largest gap found: 282, between 436273009 and 436273291.
Mon Oct 2 12:30:01 2017 Process 0 / 3: Run time was 371.728151 seconds
Mon Oct 2 12:30:01 2017 Process 0 / 3: End
--- SharcNET Job Epilogue ---
 job id: 10860532
 exit status: 0
 cpu time: 1087s / 3.0h (10 %)
 elapsed time: 434s / 1.0h (12 %)
 virtual memory: 301.5M / 1.0G (29 %)

Job completed successfully

WARNING: Job only used 12 % of its requested walltime.

WARNING: Job only used 10 % of its requested cpu time.

WARNING: Job only used 29% of its requested memory.

4 processor output

Mon Oct 2 12:23:48 2017 Process 0 / 4: Starting
Mon Oct 2 12:23:48 2017 Process 0 / 4: Working on range: 0 to 250000000
Mon Oct 2 12:23:48 2017 Process 2 / 4: Working on range: 500000000 to 750000000
Mon Oct 2 12:23:48 2017 Process 3 / 4: Working on range: 750000000 to 1000000000
Mon Oct 2 12:23:48 2017 Process 1 / 4: Working on range: 250000000 to 500000000
Mon Oct 2 12:28:22 2017 Process 0 / 4: Found gap - 248, low prime - 191912783.
Mon Oct 2 12:28:22 2017 Process 0 / 4: Received from process 1: max gap - 282, low prime - 436273009.
Mon Oct 2 12:28:22 2017 Process 0 / 4: Received from process 3: max gap - 260, low prime - 944192807.
Mon Oct 2 12:28:22 2017 Process 0 / 4: Received from process 2: max gap - 276, low prime - 649580171.
Mon Oct 2 12:28:22 2017 Process 0 / 4: Largest gap found: 282, between 436273009 and 436273291.
Mon Oct 2 12:28:22 2017 Process 0 / 4: Run time was 273.814905 seconds
Mon Oct 2 12:28:22 2017 Process 0 / 4: End
--- SharcNET Job Epilogue ---
 job id: 10860533
 exit status: 0
 cpu time: 1088s / 4.0h (7 %)
 elapsed time: 335s / 1.0h (9 %)
 virtual memory: 262.0M / 1.0G (25 %)

Job completed successfully

WARNING: Job only used 9 % of its requested walltime.

WARNING: Job only used 7 % of its requested cpu time.

WARNING: Job only used 25% of its requested memory.

5 processor output

Mon Oct 2 12:23:49 2017 Process 3 / 5: Working on range: 600000000 to 800000000
Mon Oct 2 12:23:49 2017 Process 0 / 5: Starting
Mon Oct 2 12:23:49 2017 Process 0 / 5: Working on range: 0 to 200000000
Mon Oct 2 12:23:49 2017 Process 4 / 5: Working on range: 800000000 to 1000000000
Mon Oct 2 12:23:49 2017 Process 1 / 5: Working on range: 200000000 to 400000000
Mon Oct 2 12:23:49 2017 Process 2 / 5: Working on range: 400000000 to 600000000
Mon Oct 2 12:27:31 2017 Process 0 / 5: Found gap - 248, low prime - 191912783.
Mon Oct 2 12:27:31 2017 Process 0 / 5: Received from process 4: max gap - 260, low prime - 944192807.
Mon Oct 2 12:27:31 2017 Process 0 / 5: Received from process 1: max gap - 250, low prime - 387096133.
Mon Oct 2 12:27:31 2017 Process 0 / 5: Received from process 2: max gap - 282, low prime - 436273009.
Mon Oct 2 12:27:31 2017 Process 0 / 5: Received from process 3: max gap - 276, low prime - 649580171.
Mon Oct 2 12:27:31 2017 Process 0 / 5: Largest gap found: 282, between 436273009 and 436273291.
Mon Oct 2 12:27:31 2017 Process 0 / 5: Run time was 221.334371 seconds
Mon Oct 2 12:27:31 2017 Process 0 / 5: End
--- SharcNET Job Epilogue ---
 job id: 10860534
 exit status: 0
 cpu time: 1085s / 5.0h (6 %)
 elapsed time: 284s / 1.0h (7 %)
 virtual memory: 261.7M / 1.0G (25 %)

Job completed successfully
WARNING: Job only used 7 % of its requested walltime.
WARNING: Job only used 6 % of its requested cpu time.
WARNING: Job only used 76 % of allocated cpu time.
WARNING: Job only used 25% of its requested memory.

6 processor output

Mon Oct 2 12:23:17 2017 Process 0 / 6: Starting
Mon Oct 2 12:23:17 2017 Process 0 / 6: Working on range: 0 to 166666667
Mon Oct 2 12:23:17 2017 Process 2 / 6: Working on range: 333333334 to 500000001
Mon Oct 2 12:23:17 2017 Process 4 / 6: Working on range: 666666668 to 833333334
Mon Oct 2 12:23:17 2017 Process 5 / 6: Working on range: 833333334 to 1000000000
Mon Oct 2 12:23:17 2017 Process 3 / 6: Working on range: 500000001 to 666666668
Mon Oct 2 12:23:17 2017 Process 1 / 6: Working on range: 166666667 to 333333334
Mon Oct 2 12:26:27 2017 Process 0 / 6: Found gap - 222, low prime - 122164747.
Mon Oct 2 12:26:27 2017 Process 0 / 6: Received from process 5: max gap - 260, low prime - 944192807.
Mon Oct 2 12:26:27 2017 Process 0 / 6: Received from process 1: max gap - 248, low prime - 191912783.
Mon Oct 2 12:26:27 2017 Process 0 / 6: Received from process 2: max gap - 282, low prime - 436273009.
Mon Oct 2 12:26:27 2017 Process 0 / 6: Received from process 4: max gap - 250, low prime - 708730291.
Mon Oct 2 12:26:27 2017 Process 0 / 6: Received from process 3: max gap - 276, low prime - 649580171.
Mon Oct 2 12:26:27 2017 Process 0 / 6: Largest gap found: 282, between 436273009 and 436273291.
Mon Oct 2 12:26:27 2017 Process 0 / 6: Run time was 189.839989 seconds
Mon Oct 2 12:26:27 2017 Process 0 / 6: End
--- SharcNET Job Epilogue ---
 job id: 10860535
 exit status: 0
 cpu time: 1094s / 6.0h (5 %)
 elapsed time: 220s / 1.0h (6 %)
 virtual memory: 263.2M / 1.0G (25 %)

Job completed successfully
WARNING: Job only used 6 % of its requested walltime.
WARNING: Job only used 5 % of its requested cpu time.
WARNING: Job only used 25% of its requested memory.

7 processor output

Fri Sep 29 23:36:34 2017 Process 1 / 7: Working on range: 142857143 to 285714286
Fri Sep 29 23:36:34 2017 Process 0 / 7: Starting
Fri Sep 29 23:36:34 2017 Process 0 / 7: Working on range: 0 to 142857143
Fri Sep 29 23:36:34 2017 Process 5 / 7: Working on range: 714285715 to 857142858
Fri Sep 29 23:36:34 2017 Process 4 / 7: Working on range: 571428572 to 714285715
Fri Sep 29 23:36:34 2017 Process 3 / 7: Working on range: 428571429 to 571428572
Fri Sep 29 23:36:34 2017 Process 6 / 7: Working on range: 857142858 to 1000000000
Fri Sep 29 23:36:34 2017 Process 2 / 7: Working on range: 285714286 to 428571429
Fri Sep 29 23:39:13 2017 Process 0 / 7: Found gap - 222, low prime - 122164747.
Fri Sep 29 23:39:13 2017 Process 0 / 7: Received from process 6: max gap - 260, low prime - 944192807.
Fri Sep 29 23:39:13 2017 Process 0 / 7: Received from process 2: max gap - 250, low prime - 387096133.
Fri Sep 29 23:39:13 2017 Process 0 / 7: Received from process 3: max gap - 282, low prime - 436273009.
Fri Sep 29 23:39:13 2017 Process 0 / 7: Received from process 4: max gap - 276, low prime - 649580171.
Fri Sep 29 23:39:13 2017 Process 0 / 7: Received from process 5: max gap - 246, low prime - 848758531.
Fri Sep 29 23:39:13 2017 Process 0 / 7: Received from process 1: max gap - 248, low prime - 191912783.
Fri Sep 29 23:39:13 2017 Process 0 / 7: Largest gap found: 282, between 436273009 and 436273291.
Fri Sep 29 23:39:13 2017 Process 0 / 7: Run time was 159.134436 seconds
Fri Sep 29 23:39:13 2017 Process 0 / 7: End
--- SharcNET Job Epilogue ---
 job id: 10859727
 exit status: 0
 cpu time: 1086s / 7.0h (4 %)
 elapsed time: 190s / 1.0h (5 %)
 virtual memory: 246.7M / 1.0G (24 %)

Job completed successfully
WARNING: Job only used 5 % of its requested walltime.
WARNING: Job only used 4 % of its requested cpu time.
WARNING: Job only used 24% of its requested memory.

8 processor output

Fri Sep 29 23:36:35 2017 Process 0 / 8: Starting
Fri Sep 29 23:36:35 2017 Process 0 / 8: Working on range: 0 to 125000000
Fri Sep 29 23:36:35 2017 Process 4 / 8: Working on range: 500000000 to 625000000
Fri Sep 29 23:36:35 2017 Process 6 / 8: Working on range: 750000000 to 875000000
Fri Sep 29 23:36:35 2017 Process 5 / 8: Working on range: 625000000 to 750000000
Fri Sep 29 23:36:35 2017 Process 1 / 8: Working on range: 125000000 to 250000000
Fri Sep 29 23:36:35 2017 Process 3 / 8: Working on range: 375000000 to 500000000
Fri Sep 29 23:36:35 2017 Process 2 / 8: Working on range: 250000000 to 375000000
Fri Sep 29 23:36:35 2017 Process 7 / 8: Working on range: 875000000 to 1000000000
Fri Sep 29 23:38:54 2017 Process 0 / 8: Found gap - 222, low prime - 122164747.
Fri Sep 29 23:38:54 2017 Process 0 / 8: Received from process 1: max gap - 248, low prime - 191912783.
Fri Sep 29 23:38:54 2017 Process 0 / 8: Received from process 2: max gap - 242, low prime - 367876529.
Fri Sep 29 23:38:54 2017 Process 0 / 8: Received from process 3: max gap - 282, low prime - 436273009.
Fri Sep 29 23:38:54 2017 Process 0 / 8: Received from process 4: max gap - 250, low prime - 516540163.
Fri Sep 29 23:38:54 2017 Process 0 / 8: Received from process 6: max gap - 246, low prime - 848758531.
Fri Sep 29 23:38:54 2017 Process 0 / 8: Received from process 7: max gap - 260, low prime - 944192807.
Fri Sep 29 23:38:54 2017 Process 0 / 8: Received from process 5: max gap - 276, low prime - 649580171.
Fri Sep 29 23:38:54 2017 Process 0 / 8: Largest gap found: 282, between 436273009 and 436273291.
Fri Sep 29 23:38:54 2017 Process 0 / 8: Run time was 139.303029 seconds
Fri Sep 29 23:38:54 2017 Process 0 / 8: End
--- SharcNET Job Epilogue ---
 job id: 10859728
 exit status: 0
 cpu time: 1100s / 8.0h (3 %)
 elapsed time: 170s / 1.0h (4 %)
 virtual memory: 240.6M / 1.0G (23 %)

Job completed successfully
WARNING: Job only used 4 % of its requested walltime.
WARNING: Job only used 3 % of its requested cpu time.
WARNING: Job only used 23% of its requested memory.

Appendix 3 : Program output for 10^{12}

32 processor output

Tue Sep 26 13:35:35 2017 Process 12 / 32: Working on range: 37500000000 to 406250000000
Tue Sep 26 13:35:35 2017 Process 28 / 32: Working on range: 87500000000 to 906250000000
Tue Sep 26 13:35:35 2017 Process 10 / 32: Working on range: 31250000000 to 343750000000
Tue Sep 26 13:35:35 2017 Process 26 / 32: Working on range: 81250000000 to 843750000000
Tue Sep 26 13:35:35 2017 Process 1 / 32: Working on range: 31250000000 to 62500000000
Tue Sep 26 13:35:35 2017 Process 9 / 32: Working on range: 28125000000 to 312500000000
Tue Sep 26 13:35:35 2017 Process 25 / 32: Working on range: 78125000000 to 812500000000
Tue Sep 26 13:35:35 2017 Process 17 / 32: Working on range: 53125000000 to 562500000000
Tue Sep 26 13:35:35 2017 Process 20 / 32: Working on range: 62500000000 to 656250000000
Tue Sep 26 13:35:35 2017 Process 4 / 32: Working on range: 12500000000 to 156250000000
Tue Sep 26 13:35:35 2017 Process 7 / 32: Working on range: 21875000000 to 250000000000
Tue Sep 26 13:35:35 2017 Process 22 / 32: Working on range: 68750000000 to 718750000000
Tue Sep 26 13:35:35 2017 Process 23 / 32: Working on range: 71875000000 to 750000000000
Tue Sep 26 13:35:35 2017 Process 18 / 32: Working on range: 56250000000 to 593750000000
Tue Sep 26 13:35:35 2017 Process 8 / 32: Working on range: 25000000000 to 281250000000
Tue Sep 26 13:35:35 2017 Process 14 / 32: Working on range: 43750000000 to 468750000000
Tue Sep 26 13:35:35 2017 Process 2 / 32: Working on range: 62500000000 to 93750000000
Tue Sep 26 13:35:35 2017 Process 29 / 32: Working on range: 90625000000 to 937500000000
Tue Sep 26 13:35:35 2017 Process 30 / 32: Working on range: 93750000000 to 968750000000
Tue Sep 26 13:35:35 2017 Process 24 / 32: Working on range: 75000000000 to 781250000000
Tue Sep 26 13:35:35 2017 Process 13 / 32: Working on range: 40625000000 to 437500000000
Tue Sep 26 13:35:35 2017 Process 27 / 32: Working on range: 84375000000 to 875000000000
Tue Sep 26 13:35:35 2017 Process 31 / 32: Working on range: 96875000000 to 1000000000000
Tue Sep 26 13:35:35 2017 Process 5 / 32: Working on range: 15625000000 to 187500000000
Tue Sep 26 13:35:35 2017 Process 6 / 32: Working on range: 18750000000 to 218750000000
Tue Sep 26 13:35:35 2017 Process 15 / 32: Working on range: 46875000000 to 500000000000
Tue Sep 26 13:35:35 2017 Process 19 / 32: Working on range: 59375000000 to 625000000000
Tue Sep 26 13:35:35 2017 Process 21 / 32: Working on range: 65625000000 to 687500000000
Tue Sep 26 13:35:35 2017 Process 3 / 32: Working on range: 93750000000 to 125000000000
Tue Sep 26 13:35:35 2017 Process 11 / 32: Working on range: 34375000000 to 375000000000
Tue Sep 26 13:35:35 2017 Process 0 / 32: Starting
Tue Sep 26 13:35:35 2017 Process 0 / 32: Working on range: 0 to 31250000000
Tue Sep 26 13:35:35 2017 Process 16 / 32: Working on range: 50000000000 to 531250000000
Tue Sep 26 19:10:24 2017 Process 13 / 32: Sending: max gap - 516, low prime - 416608695821.
Tue Sep 26 19:20:20 2017 Process 16 / 32: Sending: max gap - 450, low prime - 531060842243.
Tue Sep 26 19:21:01 2017 Process 15 / 32: Sending: max gap - 500, low prime - 487286789723.
Tue Sep 26 19:25:10 2017 Process 14 / 32: Sending: max gap - 532, low prime - 461690510011.
Tue Sep 26 19:25:32 2017 Process 17 / 32: Sending: max gap - 462, low prime - 532857173801.
Tue Sep 26 19:27:14 2017 Process 31 / 32: Sending: max gap - 494, low prime - 993878218139.
Tue Sep 26 19:34:05 2017 Process 30 / 32: Sending: max gap - 484, low prime - 942509706043.
Tue Sep 26 19:35:00 2017 Process 26 / 32: Sending: max gap - 474, low prime - 813942473723.
Tue Sep 26 19:36:13 2017 Process 25 / 32: Sending: max gap - 504, low prime - 789448506659.
Tue Sep 26 19:41:43 2017 Process 22 / 32: Sending: max gap - 466, low prime - 703718206123.
Tue Sep 26 19:41:59 2017 Process 8 / 32: Sending: max gap - 444, low prime - 274905296293.
Tue Sep 26 19:42:04 2017 Process 11 / 32: Sending: max gap - 478, low prime - 367766547571.
Tue Sep 26 19:43:01 2017 Process 23 / 32: Sending: max gap - 540, low prime - 738832927927.
Tue Sep 26 19:44:05 2017 Process 24 / 32: Sending: max gap - 484, low prime - 767644374817.
Tue Sep 26 19:44:12 2017 Process 7 / 32: Sending: max gap - 486, low prime - 241160624143.
Tue Sep 26 19:44:30 2017 Process 27 / 32: Sending: max gap - 474, low prime - 846399952577.
Tue Sep 26 19:45:38 2017 Process 6 / 32: Sending: max gap - 454, low prime - 202530831163.
Tue Sep 26 19:45:43 2017 Process 3 / 32: Sending: max gap - 438, low prime - 101328529441.
Tue Sep 26 19:45:46 2017 Process 28 / 32: Sending: max gap - 516, low prime - 893531612273.
Tue Sep 26 19:47:29 2017 Process 12 / 32: Sending: max gap - 478, low prime - 389353209841.
Tue Sep 26 19:47:49 2017 Process 1 / 32: Sending: max gap - 464, low prime - 42652618343.

Tue Sep 26 19:49:11 2017 Process 5 / 32: Sending: max gap - 474, low prime - 182226896239.
Tue Sep 26 19:49:20 2017 Process 0 / 32: Received from process 1: max gap - 464, low prime - 42652618343.
Tue Sep 26 19:50:28 2017 Process 4 / 32: Sending: max gap - 468, low prime - 127976334671.
Tue Sep 26 19:50:50 2017 Process 29 / 32: Sending: max gap - 500, low prime - 929156727137.
Tue Sep 26 19:53:50 2017 Process 0 / 32: Received from process 2: max gap - 450, low prime - 63816175447.
Tue Sep 26 19:53:50 2017 Process 0 / 32: Received from process 3: max gap - 438, low prime - 101328529441.
Tue Sep 26 19:53:50 2017 Process 0 / 32: Received from process 4: max gap - 468, low prime - 127976334671.
Tue Sep 26 19:53:50 2017 Process 0 / 32: Received from process 5: max gap - 474, low prime - 182226896239.
Tue Sep 26 19:53:50 2017 Process 2 / 32: Sending: max gap - 450, low prime - 63816175447.
Tue Sep 26 19:53:50 2017 Process 0 / 32: Received from process 6: max gap - 454, low prime - 202530831163.
Tue Sep 26 19:53:50 2017 Process 0 / 32: Received from process 7: max gap - 486, low prime - 241160624143.
Tue Sep 26 19:53:50 2017 Process 0 / 32: Received from process 8: max gap - 444, low prime - 274905296293.
Tue Sep 26 19:55:54 2017 Process 21 / 32: Sending: max gap - 474, low prime - 673420121333.
Tue Sep 26 19:56:04 2017 Process 10 / 32: Sending: max gap - 454, low prime - 337737093847.
Tue Sep 26 19:56:10 2017 Process 20 / 32: Sending: max gap - 474, low prime - 634213178969.
Tue Sep 26 19:56:39 2017 Process 18 / 32: Sending: max gap - 480, low prime - 589097679491.
Tue Sep 26 19:57:39 2017 Process 19 / 32: Sending: max gap - 534, low prime - 614487453523.
Tue Sep 26 19:58:17 2017 Process 9 / 32: Sending: max gap - 514, low prime - 304599508537.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 9: max gap - 514, low prime - 304599508537.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 10: max gap - 454, low prime - 337737093847.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 11: max gap - 478, low prime - 367766547571.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 12: max gap - 478, low prime - 389353209841.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 13: max gap - 516, low prime - 416608695821.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 14: max gap - 532, low prime - 461690510011.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 15: max gap - 500, low prime - 487286789723.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 16: max gap - 450, low prime - 531060842243.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 17: max gap - 462, low prime - 532857173801.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 18: max gap - 480, low prime - 589097679491.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 19: max gap - 534, low prime - 614487453523.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 20: max gap - 474, low prime - 634213178969.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 21: max gap - 474, low prime - 673420121333.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 22: max gap - 466, low prime - 703718206123.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 23: max gap - 540, low prime - 738832927927.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 24: max gap - 484, low prime - 767644374817.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 25: max gap - 504, low prime - 789448506659.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 26: max gap - 474, low prime - 813942473723.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 27: max gap - 474, low prime - 846399952577.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 28: max gap - 516, low prime - 893531612273.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 29: max gap - 500, low prime - 929156727137.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 30: max gap - 484, low prime - 942509706043.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Received from process 31: max gap - 494, low prime - 993878218139.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Largest gap found: 540, between 738832927927 and 738832928467.
Tue Sep 26 19:58:17 2017 Process 0 / 32: Run time was 22961.895399 seconds
Tue Sep 26 19:58:17 2017 Process 0 / 32: End

--- SharcNET Job Epilogue ---

job id: 10844302
exit status: 0
cpu time: 8.3d / 16.0d (52 %)
elapsed time: 6.4h / 12.0h (53 %)
virtual memory: 230.3M / 1.0G (22 %)

Job completed successfully

WARNING: Job only used 53 % of its requested walltime.
WARNING: Job only used 52 % of its requested cpu time.
WARNING: Job only used 22% of its requested memory.

64 processor output

Mon Sep 25 21:20:25 2017 Process 23 / 64: Working on range: 359375000000 to 375000000000
Mon Sep 25 21:20:25 2017 Process 55 / 64: Working on range: 859375000000 to 875000000000
Mon Sep 25 21:20:25 2017 Process 7 / 64: Working on range: 109375000000 to 125000000000
Mon Sep 25 21:20:25 2017 Process 39 / 64: Working on range: 609375000000 to 625000000000
Mon Sep 25 21:20:25 2017 Process 5 / 64: Working on range: 78125000000 to 93750000000
Mon Sep 25 21:20:25 2017 Process 37 / 64: Working on range: 578125000000 to 593750000000
Mon Sep 25 21:20:25 2017 Process 53 / 64: Working on range: 828125000000 to 843750000000
Mon Sep 25 21:20:25 2017 Process 21 / 64: Working on range: 328125000000 to 343750000000
Mon Sep 25 21:20:25 2017 Process 25 / 64: Working on range: 390625000000 to 406250000000
Mon Sep 25 21:20:25 2017 Process 57 / 64: Working on range: 890625000000 to 906250000000
Mon Sep 25 21:20:25 2017 Process 47 / 64: Working on range: 734375000000 to 750000000000
Mon Sep 25 21:20:25 2017 Process 15 / 64: Working on range: 234375000000 to 250000000000
Mon Sep 25 21:20:25 2017 Process 63 / 64: Working on range: 984375000000 to 1000000000000
Mon Sep 25 21:20:25 2017 Process 41 / 64: Working on range: 640625000000 to 656250000000
Mon Sep 25 21:20:25 2017 Process 31 / 64: Working on range: 484375000000 to 500000000000
Mon Sep 25 21:20:25 2017 Process 9 / 64: Working on range: 140625000000 to 156250000000
Mon Sep 25 21:20:25 2017 Process 45 / 64: Working on range: 703125000000 to 718750000000
Mon Sep 25 21:20:25 2017 Process 13 / 64: Working on range: 203125000000 to 218750000000
Mon Sep 25 21:20:25 2017 Process 29 / 64: Working on range: 453125000000 to 468750000000
Mon Sep 25 21:20:25 2017 Process 61 / 64: Working on range: 953125000000 to 968750000000
Mon Sep 25 21:20:25 2017 Process 60 / 64: Working on range: 937500000000 to 953125000000
Mon Sep 25 21:20:25 2017 Process 22 / 64: Working on range: 343750000000 to 359375000000
Mon Sep 25 21:20:25 2017 Process 36 / 64: Working on range: 562500000000 to 578125000000
Mon Sep 25 21:20:25 2017 Process 38 / 64: Working on range: 593750000000 to 609375000000
Mon Sep 25 21:20:25 2017 Process 6 / 64: Working on range: 93750000000 to 109375000000
Mon Sep 25 21:20:25 2017 Process 44 / 64: Working on range: 687500000000 to 703125000000
Mon Sep 25 21:20:25 2017 Process 4 / 64: Working on range: 62500000000 to 78125000000
Mon Sep 25 21:20:25 2017 Process 28 / 64: Working on range: 437500000000 to 453125000000
Mon Sep 25 21:20:25 2017 Process 20 / 64: Working on range: 312500000000 to 328125000000
Mon Sep 25 21:20:25 2017 Process 52 / 64: Working on range: 812500000000 to 828125000000
Mon Sep 25 21:20:25 2017 Process 12 / 64: Working on range: 187500000000 to 203125000000
Mon Sep 25 21:20:25 2017 Process 54 / 64: Working on range: 843750000000 to 859375000000
Mon Sep 25 21:20:25 2017 Process 11 / 64: Working on range: 171875000000 to 187500000000
Mon Sep 25 21:20:25 2017 Process 43 / 64: Working on range: 671875000000 to 687500000000
Mon Sep 25 21:20:25 2017 Process 3 / 64: Working on range: 46875000000 to 62500000000
Mon Sep 25 21:20:25 2017 Process 27 / 64: Working on range: 421875000000 to 437500000000
Mon Sep 25 21:20:25 2017 Process 59 / 64: Working on range: 921875000000 to 937500000000
Mon Sep 25 21:20:25 2017 Process 35 / 64: Working on range: 546875000000 to 562500000000
Mon Sep 25 21:20:25 2017 Process 46 / 64: Working on range: 718750000000 to 734375000000
Mon Sep 25 21:20:25 2017 Process 51 / 64: Working on range: 796875000000 to 812500000000
Mon Sep 25 21:20:25 2017 Process 19 / 64: Working on range: 296875000000 to 312500000000
Mon Sep 25 21:20:25 2017 Process 33 / 64: Working on range: 515625000000 to 531250000000
Mon Sep 25 21:20:25 2017 Process 30 / 64: Working on range: 468750000000 to 484375000000
Mon Sep 25 21:20:25 2017 Process 49 / 64: Working on range: 765625000000 to 781250000000
Mon Sep 25 21:20:25 2017 Process 17 / 64: Working on range: 265625000000 to 281250000000
Mon Sep 25 21:20:25 2017 Process 14 / 64: Working on range: 218750000000 to 234375000000
Mon Sep 25 21:20:25 2017 Process 1 / 64: Working on range: 15625000000 to 31250000000
Mon Sep 25 21:20:25 2017 Process 2 / 64: Working on range: 31250000000 to 46875000000
Mon Sep 25 21:20:25 2017 Process 62 / 64: Working on range: 968750000000 to 984375000000
Mon Sep 25 21:20:25 2017 Process 42 / 64: Working on range: 656250000000 to 671875000000
Mon Sep 25 21:20:25 2017 Process 50 / 64: Working on range: 781250000000 to 796875000000
Mon Sep 25 21:20:25 2017 Process 18 / 64: Working on range: 281250000000 to 296875000000
Mon Sep 25 21:20:25 2017 Process 26 / 64: Working on range: 406250000000 to 421875000000
Mon Sep 25 21:20:25 2017 Process 10 / 64: Working on range: 156250000000 to 171875000000
Mon Sep 25 21:20:25 2017 Process 58 / 64: Working on range: 906250000000 to 921875000000
Mon Sep 25 21:20:25 2017 Process 34 / 64: Working on range: 531250000000 to 546875000000

Mon Sep 25 21:20:25 2017 Process 8 / 64: Working on range: 125000000000 to 140625000000
Mon Sep 25 21:20:25 2017 Process 0 / 64: Starting
Mon Sep 25 21:20:25 2017 Process 0 / 64: Working on range: 0 to 15625000000
Mon Sep 25 21:20:25 2017 Process 56 / 64: Working on range: 875000000000 to 890625000000
Mon Sep 25 21:20:25 2017 Process 32 / 64: Working on range: 500000000000 to 515625000000
Mon Sep 25 21:20:25 2017 Process 48 / 64: Working on range: 750000000000 to 765625000000
Mon Sep 25 21:20:25 2017 Process 16 / 64: Working on range: 250000000000 to 265625000000
Mon Sep 25 21:20:25 2017 Process 24 / 64: Working on range: 375000000000 to 390625000000
Mon Sep 25 21:20:25 2017 Process 40 / 64: Working on range: 625000000000 to 640625000000
Tue Sep 26 00:15:30 2017 Process 19 / 64: Sending: max gap - 514, low prime - 304599508537.
Tue Sep 26 00:17:37 2017 Process 32 / 64: Sending: max gap - 440, low prime - 502917163271.
Tue Sep 26 00:18:00 2017 Process 33 / 64: Sending: max gap - 450, low prime - 531060842243.
Tue Sep 26 00:18:03 2017 Process 34 / 64: Sending: max gap - 462, low prime - 532857173801.
Tue Sep 26 00:19:14 2017 Process 62 / 64: Sending: max gap - 470, low prime - 983150214251.
Tue Sep 26 00:20:37 2017 Process 63 / 64: Sending: max gap - 494, low prime - 993878218139.
Tue Sep 26 00:20:51 2017 Process 31 / 64: Sending: max gap - 500, low prime - 487286789723.
Tue Sep 26 00:21:07 2017 Process 61 / 64: Sending: max gap - 456, low prime - 960530371991.
Tue Sep 26 00:22:12 2017 Process 8 / 64: Sending: max gap - 468, low prime - 127976334671.
Tue Sep 26 00:22:39 2017 Process 26 / 64: Sending: max gap - 516, low prime - 416608695821.
Tue Sep 26 00:22:51 2017 Process 25 / 64: Sending: max gap - 462, low prime - 400729567081.
Tue Sep 26 00:23:02 2017 Process 24 / 64: Sending: max gap - 478, low prime - 389353209841.
Tue Sep 26 00:23:02 2017 Process 7 / 64: Sending: max gap - 438, low prime - 115954395943.
Tue Sep 26 00:23:04 2017 Process 16 / 64: Sending: max gap - 440, low prime - 256680893009.
Tue Sep 26 00:23:17 2017 Process 30 / 64: Sending: max gap - 480, low prime - 482423533897.
Tue Sep 26 00:23:19 2017 Process 15 / 64: Sending: max gap - 486, low prime - 241160624143.
Tue Sep 26 00:23:22 2017 Process 44 / 64: Sending: max gap - 452, low prime - 694169425889.
Tue Sep 26 00:23:36 2017 Process 1 / 64: Sending: max gap - 456, low prime - 25056082087.
Tue Sep 26 00:23:47 2017 Process 11 / 64: Sending: max gap - 474, low prime - 182226896239.
Tue Sep 26 00:23:50 2017 Process 60 / 64: Sending: max gap - 484, low prime - 942509706043.
Tue Sep 26 00:23:52 2017 Process 6 / 64: Sending: max gap - 438, low prime - 101328529441.
Tue Sep 26 00:23:53 2017 Process 12 / 64: Sending: max gap - 454, low prime - 202530831163.
Tue Sep 26 00:24:07 2017 Process 23 / 64: Sending: max gap - 478, low prime - 367766547571.
Tue Sep 26 00:24:12 2017 Process 13 / 64: Sending: max gap - 438, low prime - 218145699553.
Tue Sep 26 00:24:13 2017 Process 22 / 64: Sending: max gap - 420, low prime - 347899961347.
Tue Sep 26 00:24:19 2017 Process 52 / 64: Sending: max gap - 474, low prime - 813942473723.
Tue Sep 26 00:24:25 2017 Process 45 / 64: Sending: max gap - 466, low prime - 703718206123.
Tue Sep 26 00:24:42 2017 Process 0 / 64: Received from process 1: max gap - 456, low prime - 25056082087.
Tue Sep 26 00:24:44 2017 Process 28 / 64: Sending: max gap - 454, low prime - 451215196093.
Tue Sep 26 00:24:52 2017 Process 58 / 64: Sending: max gap - 492, low prime - 910361180689.
Tue Sep 26 00:24:58 2017 Process 51 / 64: Sending: max gap - 494, low prime - 804541404419.
Tue Sep 26 00:25:02 2017 Process 27 / 64: Sending: max gap - 498, low prime - 428315806823.
Tue Sep 26 00:25:17 2017 Process 53 / 64: Sending: max gap - 474, low prime - 835021343713.
Tue Sep 26 00:25:23 2017 Process 54 / 64: Sending: max gap - 474, low prime - 846399952577.
Tue Sep 26 00:25:25 2017 Process 59 / 64: Sending: max gap - 500, low prime - 929156727137.
Tue Sep 26 00:25:26 2017 Process 3 / 64: Sending: max gap - 414, low prime - 49914935177.
Tue Sep 26 00:25:28 2017 Process 47 / 64: Sending: max gap - 540, low prime - 738832927927.
Tue Sep 26 00:25:30 2017 Process 29 / 64: Sending: max gap - 532, low prime - 461690510011.
Tue Sep 26 00:25:32 2017 Process 17 / 64: Sending: max gap - 444, low prime - 274905296293.
Tue Sep 26 00:25:36 2017 Process 57 / 64: Sending: max gap - 516, low prime - 893531612273.
Tue Sep 26 00:25:39 2017 Process 55 / 64: Sending: max gap - 472, low prime - 865244709607.
Tue Sep 26 00:25:43 2017 Process 46 / 64: Sending: max gap - 480, low prime - 731674970641.
Tue Sep 26 00:25:54 2017 Process 50 / 64: Sending: max gap - 504, low prime - 789448506659.
Tue Sep 26 00:25:56 2017 Process 14 / 64: Sending: max gap - 432, low prime - 233688424001.
Tue Sep 26 00:25:57 2017 Process 56 / 64: Sending: max gap - 498, low prime - 878651274181.
Tue Sep 26 00:26:11 2017 Process 48 / 64: Sending: max gap - 444, low prime - 761267254453.
Tue Sep 26 00:26:19 2017 Process 49 / 64: Sending: max gap - 484, low prime - 767644374817.
Tue Sep 26 00:27:42 2017 Process 5 / 64: Sending: max gap - 432, low prime - 87241770619.
Tue Sep 26 00:27:57 2017 Process 4 / 64: Sending: max gap - 450, low prime - 63816175447.

Tue Sep 26 00:28:02 2017 Process 0 / 64: Received from process 2: max gap - 464, low prime - 42652618343.
Tue Sep 26 00:28:02 2017 Process 0 / 64: Received from process 3: max gap - 414, low prime - 49914935177.
Tue Sep 26 00:28:02 2017 Process 0 / 64: Received from process 4: max gap - 450, low prime - 63816175447.
Tue Sep 26 00:28:02 2017 Process 0 / 64: Received from process 5: max gap - 432, low prime - 87241770619.
Tue Sep 26 00:28:02 2017 Process 0 / 64: Received from process 6: max gap - 438, low prime - 101328529441.
Tue Sep 26 00:28:02 2017 Process 0 / 64: Received from process 7: max gap - 438, low prime - 115954395943.
Tue Sep 26 00:28:02 2017 Process 0 / 64: Received from process 8: max gap - 468, low prime - 127976334671.
Tue Sep 26 00:28:02 2017 Process 2 / 64: Sending: max gap - 464, low prime - 42652618343.
Tue Sep 26 00:28:23 2017 Process 35 / 64: Sending: max gap - 450, low prime - 549088570211.
Tue Sep 26 00:30:18 2017 Process 10 / 64: Sending: max gap - 444, low prime - 164739487597.
Tue Sep 26 00:30:30 2017 Process 43 / 64: Sending: max gap - 474, low prime - 673420121333.
Tue Sep 26 00:30:31 2017 Process 42 / 64: Sending: max gap - 462, low prime - 670161395489.
Tue Sep 26 00:30:38 2017 Process 41 / 64: Sending: max gap - 464, low prime - 645644546333.
Tue Sep 26 00:30:39 2017 Process 21 / 64: Sending: max gap - 454, low prime - 337737093847.
Tue Sep 26 00:31:07 2017 Process 39 / 64: Sending: max gap - 534, low prime - 614487453523.
Tue Sep 26 00:31:08 2017 Process 20 / 64: Sending: max gap - 444, low prime - 317747523557.
Tue Sep 26 00:31:12 2017 Process 38 / 64: Sending: max gap - 448, low prime - 604730989609.
Tue Sep 26 00:31:13 2017 Process 37 / 64: Sending: max gap - 480, low prime - 589097679491.
Tue Sep 26 00:31:19 2017 Process 36 / 64: Sending: max gap - 466, low prime - 565855695631.
Tue Sep 26 00:31:22 2017 Process 9 / 64: Sending: max gap - 460, low prime - 148473908887.
Tue Sep 26 00:31:22 2017 Process 0 / 64: Received from process 9: max gap - 460, low prime - 148473908887.
Tue Sep 26 00:31:22 2017 Process 0 / 64: Received from process 10: max gap - 444, low prime - 164739487597.
Tue Sep 26 00:31:22 2017 Process 0 / 64: Received from process 11: max gap - 474, low prime - 182226896239.
Tue Sep 26 00:31:22 2017 Process 0 / 64: Received from process 12: max gap - 454, low prime - 202530831163.
Tue Sep 26 00:31:22 2017 Process 0 / 64: Received from process 13: max gap - 438, low prime - 218145699553.
Tue Sep 26 00:31:22 2017 Process 0 / 64: Received from process 14: max gap - 432, low prime - 233688424001.
Tue Sep 26 00:31:22 2017 Process 0 / 64: Received from process 15: max gap - 486, low prime - 241160624143.
Tue Sep 26 00:31:22 2017 Process 0 / 64: Received from process 16: max gap - 440, low prime - 256680893009.
Tue Sep 26 00:31:22 2017 Process 0 / 64: Received from process 17: max gap - 444, low prime - 274905296293.
Tue Sep 26 00:32:03 2017 Process 18 / 64: Sending: max gap - 460, low prime - 292237633381.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 18: max gap - 460, low prime - 292237633381.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 19: max gap - 514, low prime - 304599508537.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 20: max gap - 444, low prime - 317747523557.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 21: max gap - 454, low prime - 337737093847.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 22: max gap - 420, low prime - 347899961347.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 23: max gap - 478, low prime - 367766547571.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 24: max gap - 478, low prime - 389353209841.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 25: max gap - 462, low prime - 400729567081.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 26: max gap - 516, low prime - 416608695821.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 27: max gap - 498, low prime - 428315806823.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 28: max gap - 454, low prime - 451215196093.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 29: max gap - 532, low prime - 461690510011.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 30: max gap - 480, low prime - 482423533897.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 31: max gap - 500, low prime - 487286789723.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 32: max gap - 440, low prime - 502917163271.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 33: max gap - 450, low prime - 531060842243.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 34: max gap - 462, low prime - 532857173801.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 35: max gap - 450, low prime - 549088570211.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 36: max gap - 466, low prime - 565855695631.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 37: max gap - 480, low prime - 589097679491.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 38: max gap - 448, low prime - 604730989609.
Tue Sep 26 00:32:03 2017 Process 0 / 64: Received from process 39: max gap - 534, low prime - 614487453523.
Tue Sep 26 00:34:18 2017 Process 40 / 64: Sending: max gap - 474, low prime - 634213178969.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 40: max gap - 474, low prime - 634213178969.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 41: max gap - 464, low prime - 645644546333.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 42: max gap - 462, low prime - 670161395489.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 43: max gap - 474, low prime - 673420121333.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 44: max gap - 452, low prime - 694169425889.

Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 45: max gap - 466, low prime - 703718206123.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 46: max gap - 480, low prime - 731674970641.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 47: max gap - 540, low prime - 738832927927.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 48: max gap - 444, low prime - 761267254453.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 49: max gap - 484, low prime - 767644374817.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 50: max gap - 504, low prime - 789448506659.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 51: max gap - 494, low prime - 804541404419.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 52: max gap - 474, low prime - 813942473723.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 53: max gap - 474, low prime - 835021343713.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 54: max gap - 474, low prime - 846399952577.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 55: max gap - 472, low prime - 865244709607.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 56: max gap - 498, low prime - 878651274181.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 57: max gap - 516, low prime - 893531612273.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 58: max gap - 492, low prime - 910361180689.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 59: max gap - 500, low prime - 929156727137.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 60: max gap - 484, low prime - 942509706043.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 61: max gap - 456, low prime - 960530371991.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 62: max gap - 470, low prime - 983150214251.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Received from process 63: max gap - 494, low prime - 993878218139.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Largest gap found: 540, between 738832927927 and 738832928467.
Tue Sep 26 00:34:18 2017 Process 0 / 64: Run time was 11632.860207 seconds
Tue Sep 26 00:34:18 2017 Process 0 / 64: End

--- SharcNET Job Epilogue ---

job id: 10843397
exit status: 0
cpu time: 8.3d / 32.0d (25 %)
elapsed time: 3.2h / 12.0h (26 %)
virtual memory: 218.7M / 1.0G (21 %)

Job completed successfully

WARNING: Job only used 26 % of its requested walltime.

WARNING: Job only used 25 % of its requested cpu time.

WARNING: Job only used 21% of its requested memory.