CP 431/631 Assignment 1

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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 on 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 range from $i_{start,p}$ to $i_{start,p} + n_P$ where:

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

The program is using mpz_nextprime function provided by GMP library in order to find the prime numbers in the local range, in addition to the subsequent prime outside of it. The program was tested on Sharcnet's Orca cluster using 1 to 8 processors for an input of 10^9. For the input 10^{12} the program was tested with 32 and 64 processors.

2. ## Results:

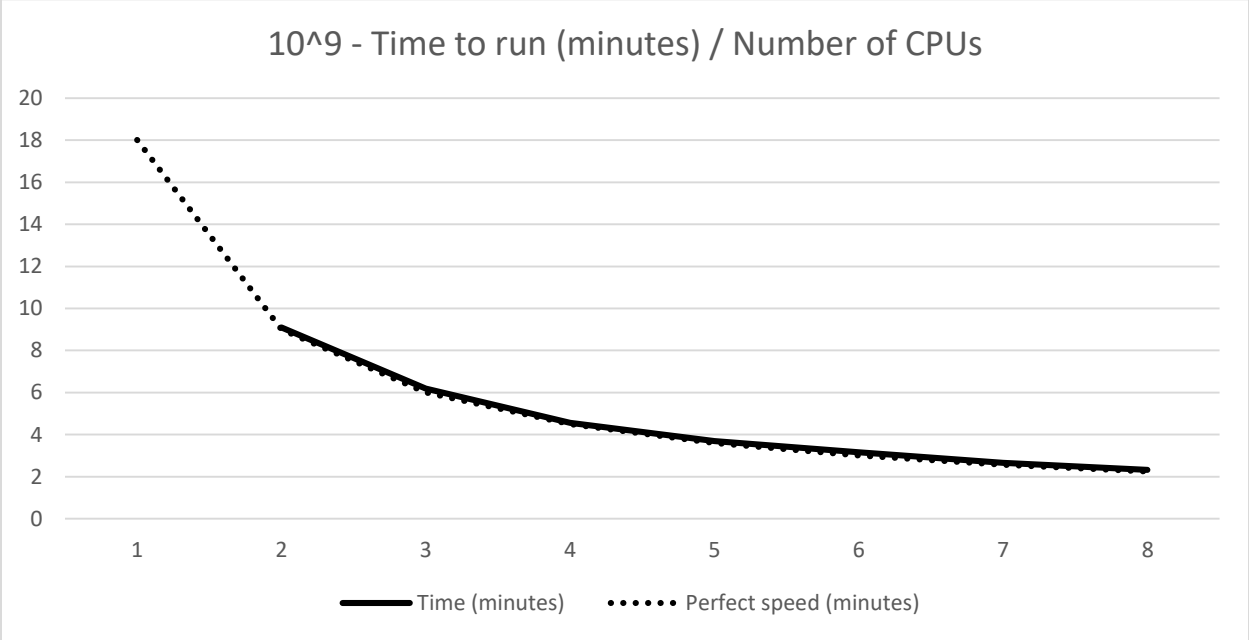
The program output for 10^9 is:

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)       = floor(n/P) ( +1 if p < mod(n,P)) = p_range
 *            start(p) = p*floor(n/P) + min(p, 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 = floor(n/P) */
        mpz_fdiv_r_ui(rem, range, p_num);           /* rem = mod(n,P) */

        mpz_mul_ui(p_start, p_range, rank);  /* p_start = p*floor(n/P) */

        if(mpz_cmp_ui(rem, rank) > 0){                    /* if 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 += mod(n,P) */
        }

        mpz_add(p_end, p_start, p_range);           /* end(p) = start(p) + n(p) */
```

```
        p_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: 375000000000 to 406250000000
Tue Sep 26 13:35:35 2017 Process 28 / 32: Working on range: 875000000000 to 906250000000
Tue Sep 26 13:35:35 2017 Process 10 / 32: Working on range: 312500000000 to 343750000000
Tue Sep 26 13:35:35 2017 Process 26 / 32: Working on range: 812500000000 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: 281250000000 to 312500000000
Tue Sep 26 13:35:35 2017 Process 25 / 32: Working on range: 781250000000 to 812500000000
Tue Sep 26 13:35:35 2017 Process 17 / 32: Working on range: 531250000000 to 562500000000
Tue Sep 26 13:35:35 2017 Process 20 / 32: Working on range: 625000000000 to 656250000000
Tue Sep 26 13:35:35 2017 Process 4 / 32: Working on range: 125000000000 to 156250000000
Tue Sep 26 13:35:35 2017 Process 7 / 32: Working on range: 218750000000 to 250000000000
Tue Sep 26 13:35:35 2017 Process 22 / 32: Working on range: 687500000000 to 718750000000
Tue Sep 26 13:35:35 2017 Process 23 / 32: Working on range: 718750000000 to 750000000000
Tue Sep 26 13:35:35 2017 Process 18 / 32: Working on range: 562500000000 to 593750000000
Tue Sep 26 13:35:35 2017 Process 8 / 32: Working on range: 250000000000 to 281250000000
Tue Sep 26 13:35:35 2017 Process 14 / 32: Working on range: 437500000000 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: 906250000000 to 937500000000
Tue Sep 26 13:35:35 2017 Process 30 / 32: Working on range: 937500000000 to 968750000000
Tue Sep 26 13:35:35 2017 Process 24 / 32: Working on range: 750000000000 to 781250000000
Tue Sep 26 13:35:35 2017 Process 13 / 32: Working on range: 406250000000 to 437500000000
Tue Sep 26 13:35:35 2017 Process 27 / 32: Working on range: 843750000000 to 875000000000
Tue Sep 26 13:35:35 2017 Process 31 / 32: Working on range: 968750000000 to 1000000000000
Tue Sep 26 13:35:35 2017 Process 5 / 32: Working on range: 156250000000 to 187500000000
Tue Sep 26 13:35:35 2017 Process 6 / 32: Working on range: 187500000000 to 218750000000
Tue Sep 26 13:35:35 2017 Process 15 / 32: Working on range: 468750000000 to 500000000000
Tue Sep 26 13:35:35 2017 Process 19 / 32: Working on range: 593750000000 to 625000000000
Tue Sep 26 13:35:35 2017 Process 21 / 32: Working on range: 656250000000 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: 343750000000 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: 500000000000 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.