Prime numbers generator

Given that we have upper bound of n I decided to implement **Eratosthenes Sieve** primes finding algorithm. The basic idea of it's approach is to iteratively reject all multiples of each prime found so far.

Special cases regarding user input are following:

- input is not a number => *atoi* function from C++ language returns 0 in this cases, later such number is catch and exceptions is thrown,
- input is a negative number => in PrimesGenerator class constructor such case is catch and proper exception is thrown,
- input is too large for build in type used for limit handling (int32) in such cases during conversion negative values might appear due to overflow problem, it is handles the same way as negative number (exception message states about both events),
- floating point input numbers are casted to integer by *atoi* function,
- no command line argument is given => prints proper information and terminates program,
- int32 was chosen because for greater values memory problem would be more likely to appear, for n = 10^9 almost 1GB of memory is required

Time complexity of Eratosthenes Sieve is O(n · log(log(n))).
Memory complexity is O(n) since we have to allocate array of exactly this size.

The lower positive number user gives the better case for the program it is - it finishes faster (on my computer primes up to 10^8 are generated in less than a second ~ 0.75s). Worst case is when user inputs max size of int32, especially saving to file process is time consuming…

Atkin Sieve performs better than Eratostenes ones for larger numbers so it is good idea for program improvement in the future. It's time complexity is $n^{1/2}/\,log(n)$.

Test results:

My colleague-tester didn't manage to crash my program :-).