MATH GURU 101

1000 Palindrome Tester

Software Manual

Version 1.0.1 as of 15.01.2017

About

MATH101.GURU is a non-profit educational project aimed at promoting mathematics and other "hard" sciences through the application of specific algorithms and computational methods to the unresolved or seemingly "unsolvable" problems.

All funds donated by site visitors or received for software licenses, will be spent on project expansion, new software development and testing solutions on expanded number of computers.

Introduction

"1000 Palindrome Tester" is a modern console application that "reverses and sums" any number until it becomes a palindrome. The palindrome is a number which is equally read from right to left and from left to right (for example, 232 or 5467645 are palindromes).

Numbers may be palindromes in their initial form or may become palindromes through iterative process consisting of reversion (reading initial number from right to left) and adding it back until the result becomes a palindrome or the number of steps set by the user is exceeded.

For example, let's begin with number 19. Number 19 is not a palindrome.

Step 1: 19 + 91 = 110 – not a palindrome

Step 2: 110 + 11 = 121 - palindrome

121 is a palindrome as it is equally read both sides. Thus, the process is finished.

Many numbers come to a palindrome in only a few steps.

For some numbers (e.g., 89 or 10911) tens or even hundreds of steps are required. The largest number of steps known today to turn a number into a palindrome is 261 for 19-digit number **1,186,060,307,891,929,990.** This number was discovered on November 30, 2005 by the international group of programmers and mathematicians after several years of calculations. After 261 iterations it turns into a 119-digit palindrome:

44,562,665,878,976,437,622,437,848,976,653,870,388,884,783,662,598,425,855,963,436,95 5,852,489,526,638,748,888,307,835,667,984,873,422,673,467,987,856,626,544.

In addition, there are numbers that never turn into palindromes regardless of how many steps in the "reverse and sum" calculations are run. The first such number is 196. Such numbers are called "Lychrel Numbers" (https://en.wikipedia.org/wiki/Lychrel_number).

It is still a mystery why some numbers eventually become palindromes and some "stay Lychrel" forever.

The overview of the "most delayed palindrome race" and the current status of all world records in this area can be found at http://jasondoucette.com/worldrecords.html .

"1000 Palindrome Tester" allows you to test numbers that are considerable larger than the current 19- digit champion (see above) and to use thousand times more iterations than 261.

Therefore, the user of the program always has a chance to repeat or beat the current world record and to enter his/her name to the record roster of the world science.

If you are lucky and, with the help of our program "1000 Palindrome Tester" or our other programs, manage to find a big and interesting palindrome (let's say, initial number in 20-digit plus range and taking over 261 steps to become a palindrome), we advise you to report us ASAP and we will help you to submit your discovery into The On-Line Encyclopedia of Integer Sequences® (OEIS®). Alternatively, you could always submit the application yourself on their website www.oeis.org .

To achieve such a huge success you need our program, enormous desire, just an ordinary computer, patience and time to run searches.

Requirements

You need Microsoft .NET 4.5 or above to run "1000 Palindrome Tester". If not installed already, you can always download it at the following link from the official Microsoft site:

- https://www.microsoft.com/ru-RU/download/details.aspx?   id=42643   (Russian version)
- https://www.microsoft.com/en-US/download/details.aspx? id=42643 (English version)

ATTENTION! Without Microsoft .NET 4.5 or above the program won't work and its performance isn't guaranteed!

The program works with the following operating systems:

- Windows 7 Service Pack 1
- Windows 8
- Windows 10.

Minimum hardware requirements:

- The processor with clock rate of 1 GHz or above
- RAM 1024 MB
- 4.5 GB of available hard disk space (x86)
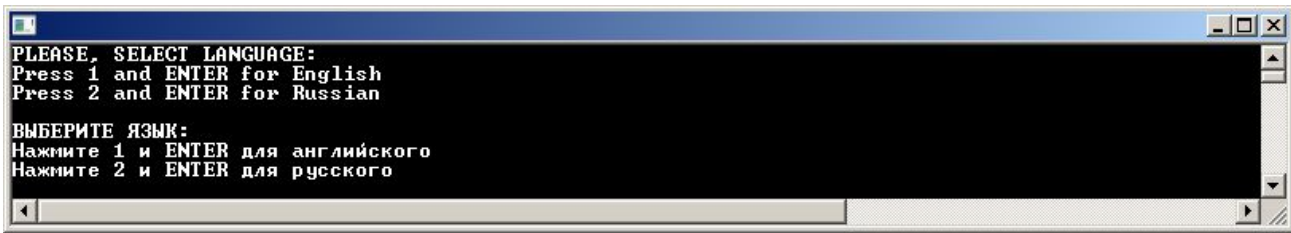- 4.5 GB of available hard disk space (x64).

Installation

Unzip the downloaded archive to any folder on your computer and launch the ***1000 Palindrome Tester.exe*** file.

Language

Right after starting the program you will see a console window that asks you to select the application language.

Please, press 1 for English and 2 for Russian. No other languages are available at the moment.
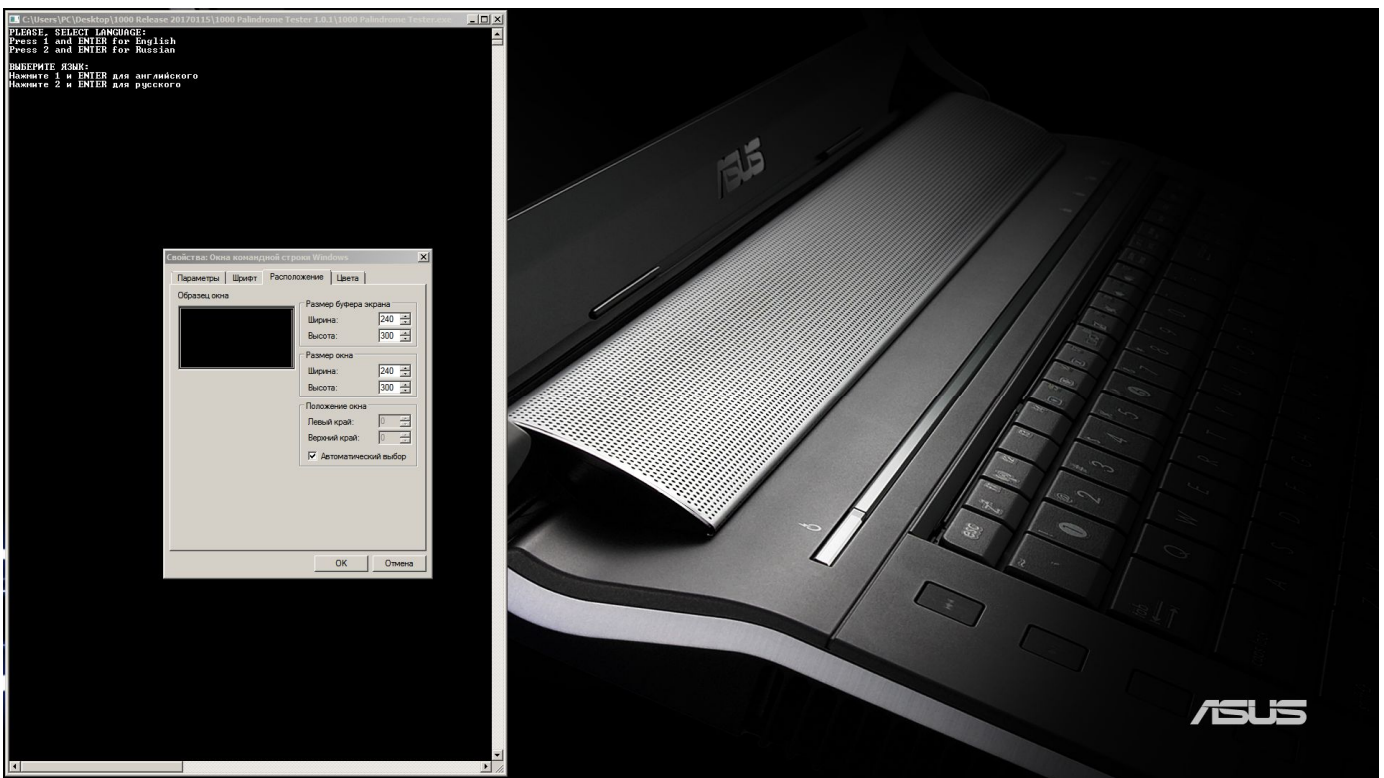

Further instructions presume that you selected English as your preferred language. Working in Russian-language environment is described in the Russian version of this manual.
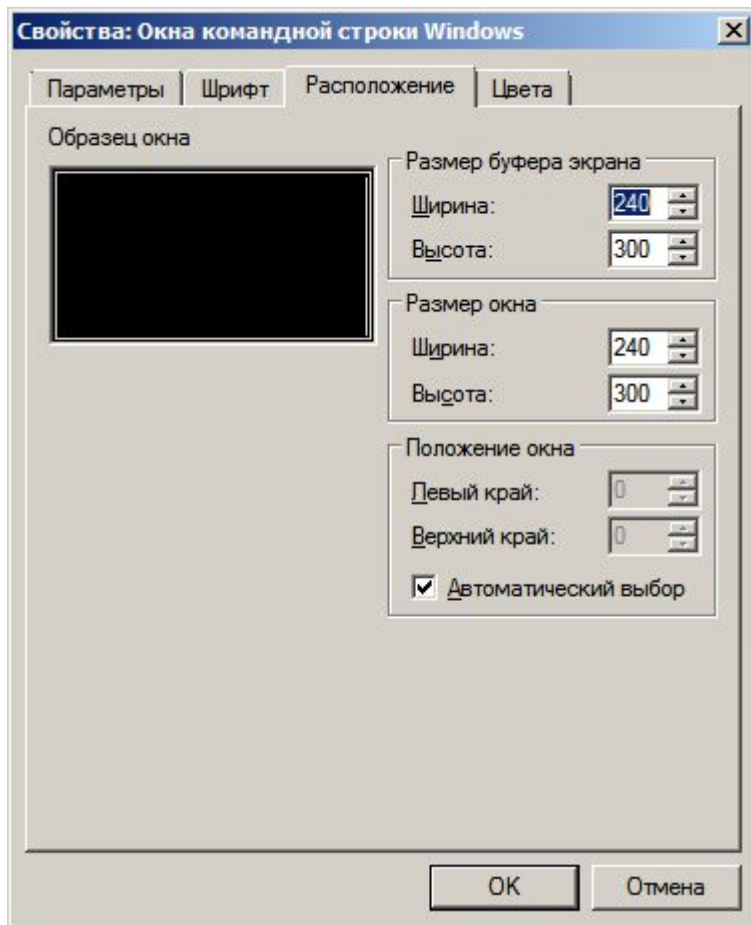
Console Window Setup

For your convenience, as you will be working with very long sequences of very large numbers, we recommend you to set up a console window in a way described below to increase its size and visibility as much as possible. You can always change this setup by closing the program and opening it again.

This can be done through a console menu that you could enter by clicking the right key of a mouse on the upper blue bar of a console window.

The maximum width of a console window could be calculated by dividing your monitor resolution width by 8 (for example, for 1080x1920 monitors the maximum width come to 1920/8=240). You should not exceed the maximum width. For other resolutions the calculations are the same.

The recommended values (1080x1920 monitor, width – 240 in both boxys, height – 300 in both boxes, left - 0, right – 0) are presented below. Automatic selection should be enabled.

ATTENTION! After the setup of a console window is done, in case the console window is not increased, please, close "1000 Palindrome Finder" and open it again. Only then the console view will change according to your settings. On some systems, setup changes will not be effective before closing and opening the program again!
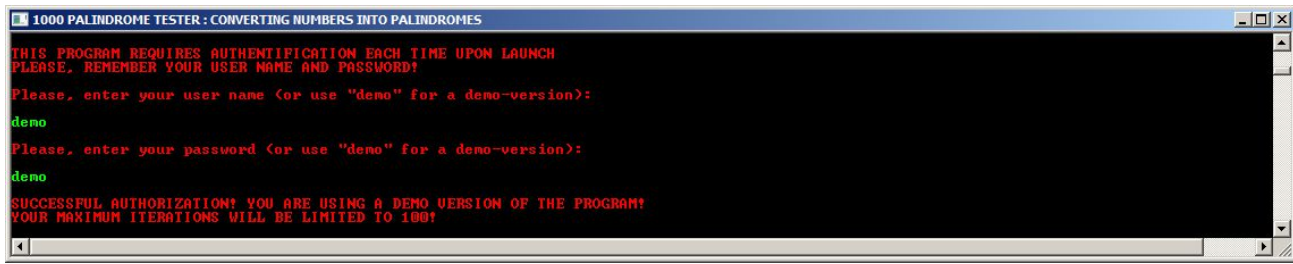
Authorization

After you selected your preferred language the program will ask you for the user name and the password. If you acquired the license on our website (www.math101.guru), then enter the login and password received by e-mail. Otherwise use a demo version.

ATTENTION! Remember or write down your login and password – the program requires authorization each time you launch it!

To use a demo version, please, enter:

- Login: **demo**
- Password: **demo**

The demo version differs from the fully functional one in the allowed number of iterations to run. The demo user is given only 100 iterations for finding a palindrome. After 100 steps the program stops and gives any result it managed to achieve. 100 iterations are enough for coming to palindromes for the majority of numbers not exceeding 1,000,000 (though you could try it for any 100-digit plus number as well).

The full version of "1000 Palindrome Tester" does not have this restriction – you can enter whatever number of iterations you want (for example, as large as 100,000 for 196 – the first known "Lychrel Number") and work with as large numbers as you need, for example:

134,567,654,897,653,278,907,634,216,754,129,876,579,329,948,726,727,184,162,990.

Output Folder Setup

The output folder *math101* should be created by the user before the first launch of "1000 Palindrome Tester".

The folder path should look as follows:

C:\math101

After that all out files will be automatically created and written to this folder – you do not need to worry about this anymore.

ATTENTION! If you do not create the output folder, the program will finish with the error!

Number Input

After that, the program prompt you to enter the number that you would like to test as well as the maximum iterations you give for the test.

In a demo version of the program the number of iteration is limited and equal to 100. In the full version of the program the number of iterations is not limited. In setting iterations, please, remember, that 261 iterations is a current world record – just try to find a palindrome with more than 261 iterations to come!

For example, if you enter number 167, the programs will show you the following screen with all 11 steps required for the 3-digit number 167 to turn into the 8-digit palindrome 88,555,588.

ATTENTION! Please, expand your console window as much as possible and scroll at the far right side of the screen as far as possible!

Data Output Files

After the program completed its work, you could find the following text files in the output folder (C:\math101\) created by you:

• 1000-01.txt
• 1000-02.txt
• 1000-03.txt

The first (***1000-01.txt***) file is the exact copy of a console window with all steps to transform the initial number into a palindrome. It is shown in a convenient for a human eye view mode.

```
                                                              # 1
                                                              167
                                                         +    761
                                                         =    928

                                                              # 2
                                                              928
                                                         +    829
                                                         =  1,757

                                                              # 3
                                                            1,757
                                                         +  7,571
                                                         =  9,328

                                                              # 4
                                                            9,328
                                                         +  8,239
                                                         = 17,567

                                                              # 5
                                                           17,567
                                                         + 76,571
                                                         = 94,138

                                                              # 6
                                                           94,138
                                                         + 83,149
                                                         =177,287

                                                              # 7
                                                          177,287
                                                         +782,771
                                                         =960,058

                                                              # 8
                                                          960,058
                                                         +850,069
                                                         =1,810,127

                                                              # 9
                                                        1,810,127
                                                         +7,210,181
                                                         =9,020,308

                                                              # 10
                                                        9,020,308
                                                         +8,030,209
                                                         =17,050,517

                                                              # 11
                                                       17,050,517
                                                         +71,505,071
                                                         =88,555,588

88,555,588 is a 8-digit palindrome derived from 167 after 11 iterations!
```

Attention! Please, expand your Notepad window as much as possible and scroll at the far right side of the screen as far as possible till you see the output numbers!
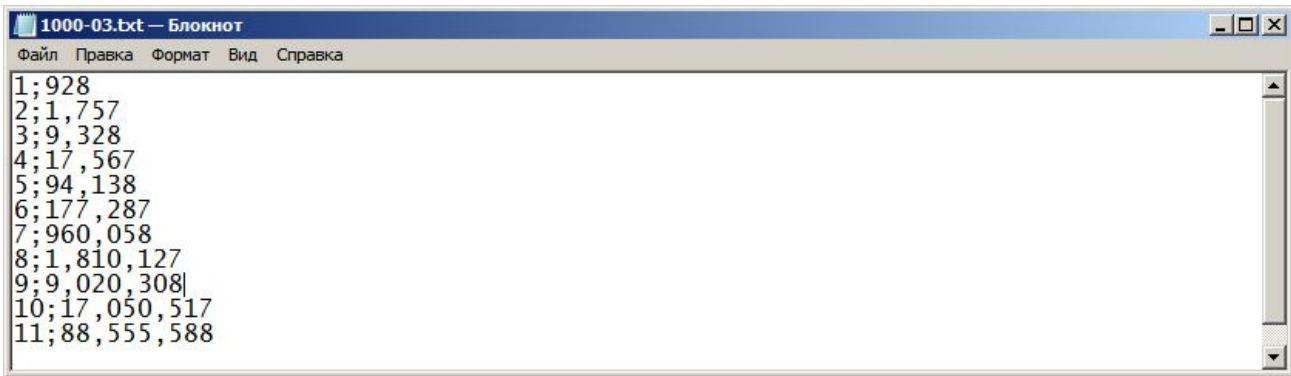
The second (***1000-02.txt***) file represents the same data, as in 1000-01.txt, but in "machine-like" .csv (comma separated value) format, more convenient for subsequent processing by a computer. You can easily read this file in other programs that allow the work with large integers, for example, R or Mathematica. Excel may be used for numbers up to 15 digits as rounding-off error for very large numbers begins to interfere after that (remember, that in striking difference to Excel and most other programs "1000 Palindrome Tester" may work with any numbers even having 1,000,000 digits or more!).


```
1;167;761;928
2;928;829;1,757
3;1,757;7,571;9,328
4;9,328;8,239;17,567
5;17,567;76,571;94,138
6;94,138;83,149;177,287
7;177,287;782,771;960,058
8;960,058;850,069;1,810,127
9;1,810,127;7,210,181;9,020,308
10;9,020,308;8,030,209;17,050,517|
11;17,050,517;71,505,071;88,555,588
```

The third (***1000-03.txt***) file is the simplified 1000-02.txt file in the same .csv format where only resulting values of the "reverse and sum" process are shown after each step (for example, for the first step 167 + 761 = 928, only number 928 is shown as a result).

```
1000-03.txt — Блокнот                                    _ □ ×
Файл  Правка  Формат  Вид  Справка
1;928
2;1,757
3;9,328
4;17,567
5;94,138
6;177,287
7;960,058
8;1,810,127
9;9,020,308
10;17,050,517
11;88,555,588
```

Saving You Work

ATTENTION! Output files of are deleted every time you test a new number.

If you want to save the results of your work, please, save output file in any other directory (e.g., in a new desktop folder *C:\Users\PC\math101res*) and under different names (e.g., *167-01.txt, 167-02.txt, 167-03.txt*).

Contacts

If you have any questions or encountered problems running our applications, you could always contact us via following e-mails:

sas@math101.guru

ssd@math101.guru

or, alternatively, through the contact form on our Web-site:

http://math101.guru/

Licenses

To pay for the unlimited license priced at 600 Russian rubles or $10 each or donations for further development of MATH101.GURU projects, you can use the following methods:

PayPal: paypal.me/math101

WebMoney: WMID 116106480382

Yandex.Money: 410011504838163

After or during payment, please, give us your e-mail address so we are able to send you your login and password promptly.

PLEASE, ENJOY OUR SOFTWARE AND GOOD LUCK WITH YOUR DISCOVERIES!