

Computer Organization Spring2023

HW1: MIPS Programming

Homework 1 Description

- 1-a: Factorial (0%)
- 1-b: Hourglass (30%)
- 1-c: GCD (30%)
- 1-d: Prime (40%)

1-a: Factorial

- The attached files factorial.c and factorial.s are modified from the example given in textbook for computing $n!$.
- In this part, please execute factorial.s on MIPS simulator MARS for practice.

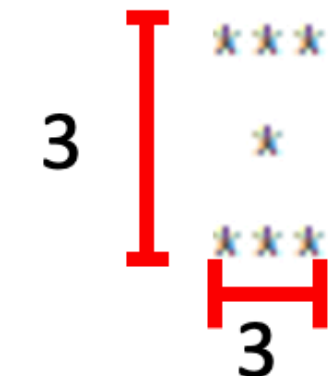
1-b: Hourglass

- Give an input number and draw a hourglass
- Please refer to *hourglass.cpp* for input and output formats and algorithm.
- Input number will be a non-negative number (3~100).

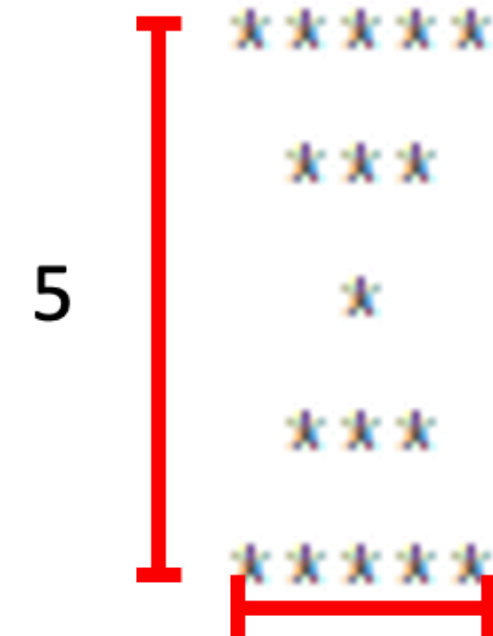
1-b: Hourglass

- Example

```
enter a number: 3
***
 *
***
3
3
-- program is finished running --
```

A red vertical bracket on the left of the star pattern is labeled with the number 3. A red horizontal bracket below the bottom row of stars is also labeled with the number 3.

```
enter a number: 5
*****
 ***
  *
 ***
*****
5
5
```

A red vertical bracket on the left of the star pattern is labeled with the number 5. A red horizontal bracket below the bottom row of stars is also labeled with the number 5.

```
Reset: reset completed.
```

```
enter a number: 4
****
 **
 **
****
-- program is finished running --
```

```
Reset: reset completed.
```

```
enter a number: 6
*****
 ****
  **
  **
 ****
*****
```

1-c: GCD

- Read two integers from standard input and output their greatest common divisor.
- Input range: positive integers within reasonable range(excluding 0).
- Please refer to *gcd.cpp* for input and output formats and algorithm.
- Note: separate the two input numbers by pressing **Enter**, and there should be a **space** before the numbers. The output **does not** need to end with a new line.

1-c: GCD

- Example

Input :

Enter first number: 56

Enter second number: 49

Output :

The GCD is: 7

1-d: Prime

- Please determine whether the input integer is a prime number, and output the result.
- If it is not a prime number, also output the closest prime number to the input number.
- if there are two prime numbers with the same distance, **both should be output**.
- Input range: non-negative integers within reasonable range(excluding 0 and 1).
- Please refer to *prime.cpp* for input and output formats and algorithm.
- Note : when outputting, there should be a **space** before each number, and the output **does not** need to end with a new line.

1-d: Prime

- Example 1

Input:

Enter the number n = 17

Output:

17 is a prime

- Example 2

Input:

Enter the number n = 22

Output:

22 is not a prime, the nearest prime is 23

- Example 3

Input:

Enter the number n = 30

Output:

30 is not a prime, the nearest prime is 29 31

Notes

- For every task, the corresponding implement in C is provided.
- There's no strict regulation of input and output format string, but try to be as clear as you can. You can follow the format in reference .c files.
- Late submission will have **20% penalty per day**.
- For all the tasks, test cases and results will not overflow 32-bit registers.
- Any assignment work by **fraud** will get a **zero point**.

Notes

- The files you should hand in include:
 1. hourglass.s
 2. GCD.s
 3. prime.s
- Please compress these files into one zip file, and name your zip file as **HW1_studentID.zip**.
- Due date: **2023/03/23(Thursday) 23:59:59**

Download and Using MARS


- Download and installation:
 - Download MARS from the page:
<http://courses.missouristate.edu/KenVollmar/MARS/>
 - Download the version chosen by yourself, and install it
- Steps for running a MIPS code on MARS:
 1. File -> New
 2. Write MIPS code
 3. Run -> Assemble (F3)
 4. Run -> Go (F5)

MARS

<http://courses.missouristate.edu/KenVollmar/mars/>

**Missouri State**
UNIVERSITY

abcdefghijklmnopqrstuvwxyz



[Home](#)
[Features](#)
[Download](#)
[License](#)
[Papers](#)
[Help & Info](#)
[Contact Us](#)



100% FREE
NO SPYWARE
NO ADWARE
NO VIRUSES
SOFTPEDIA™
certified by www.softpedia.com

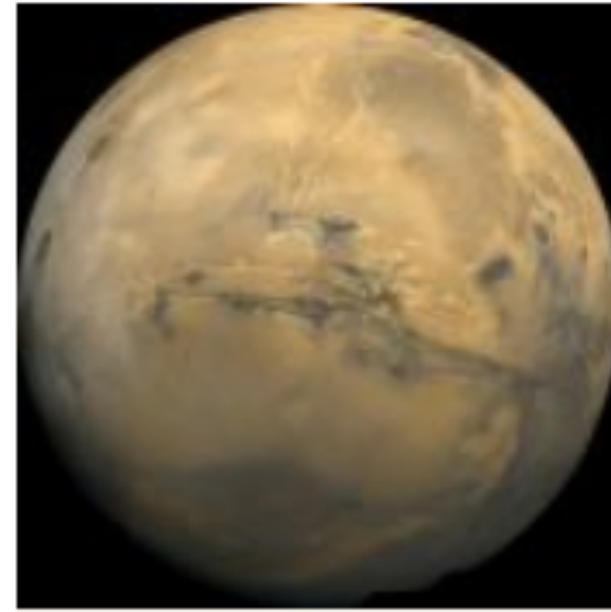
MARS (MIPS Assembler and Runtime Simulator)

An IDE for MIPS Assembly Language Programming

MARS is a lightweight interactive development environment (IDE) for programming in MIPS assembly language, intended for educational-level use with Patterson and Hennessy's *Computer Organization and Design*.

Feb. 2013: "MARS has been tested in the Softpedia labs using several industry-leading security solutions and found to be completely clean of adware/spyware components. ... Softpedia guarantees that MARS 4.3 is 100% FREE, which means it does not contain any form of malware, including spyware, viruses, trojans and backdoors."

[Download MARS from Softpedia](#) (version on Softpedia may lag behind the version on this page).



Home

Features

Download

License

Papers

Help & Info

Contact Us

2

Download MARS

V4.5, Aug. 2014 (jar archive including Java source code)

Note: Is your MARS text unreadably small? Download and use a new release **Java 9**, which contains a fix to automatically scale and size AWT and Swing components for High Dots Per Inch (HiDPI) displays on Windows and Linux. [Technical details.](#)

Previous MARS version: [MARS v4.4, Aug. 2013](#)



Feb. 2013: "MARS has been tested in the Softpedia labs using several industry-leading security solutions and found to be completely clean of malware/spyware components. ... Softpedia guarantees that MARS 4.3 is 100% FREE, which means it does not contain any form of malware, including spyware, viruses, trojans and backdoors."

[Download MARS from Softpedia](#) (version on Softpedia may lag behind the version on this page).

Java Platform, Standard Edition

Java SE 11.0.2(LTS)

Java SE 11.0.2 is the latest release for the Java SE 11 Platforms

[Learn more](#)

- [Installation Instructions](#)
- [Release Notes](#)
- [Oracle JDK License](#)
- [Java SE Licensing Information User Manual](#)
 - [Includes Third Party Licenses](#)
- [Certified System Configurations](#)
- [Readme](#)

Oracle JDK
DOWNLOAD

Java SE Development Kit 11.0.2

You must accept the [Oracle Technology Network License Agreement for Oracle Java SE](#) to download this software.

☒ Accept License Agreement ☐ Decline License Agreement


Product / File Description	File Size	Download
Linux	147.28 MB	jdk-11.0.2_linux-x64_bin.deb
Linux	154.01 MB	jdk-11.0.2_linux-x64_bin.rpm
Linux	171.32 MB	jdk-11.0.2_linux-x64_bin.tar.gz
macOS	166.13 MB	jdk-11.0.2_osx-x64_bin.dmg
macOS	166.49 MB	jdk-11.0.2_osx-x64_bin.tar.gz
Solaris SPARC	186.78 MB	jdk-11.0.2_solaris-sparcv9_bin.tar.gz
Windows	150.94 MB	jdk-11.0.2_windows-x64_bin.exe
Windows	170.96 MB	jdk-11.0.2_windows-x64_bin.zip


Java SE Development Kit 11.0.2

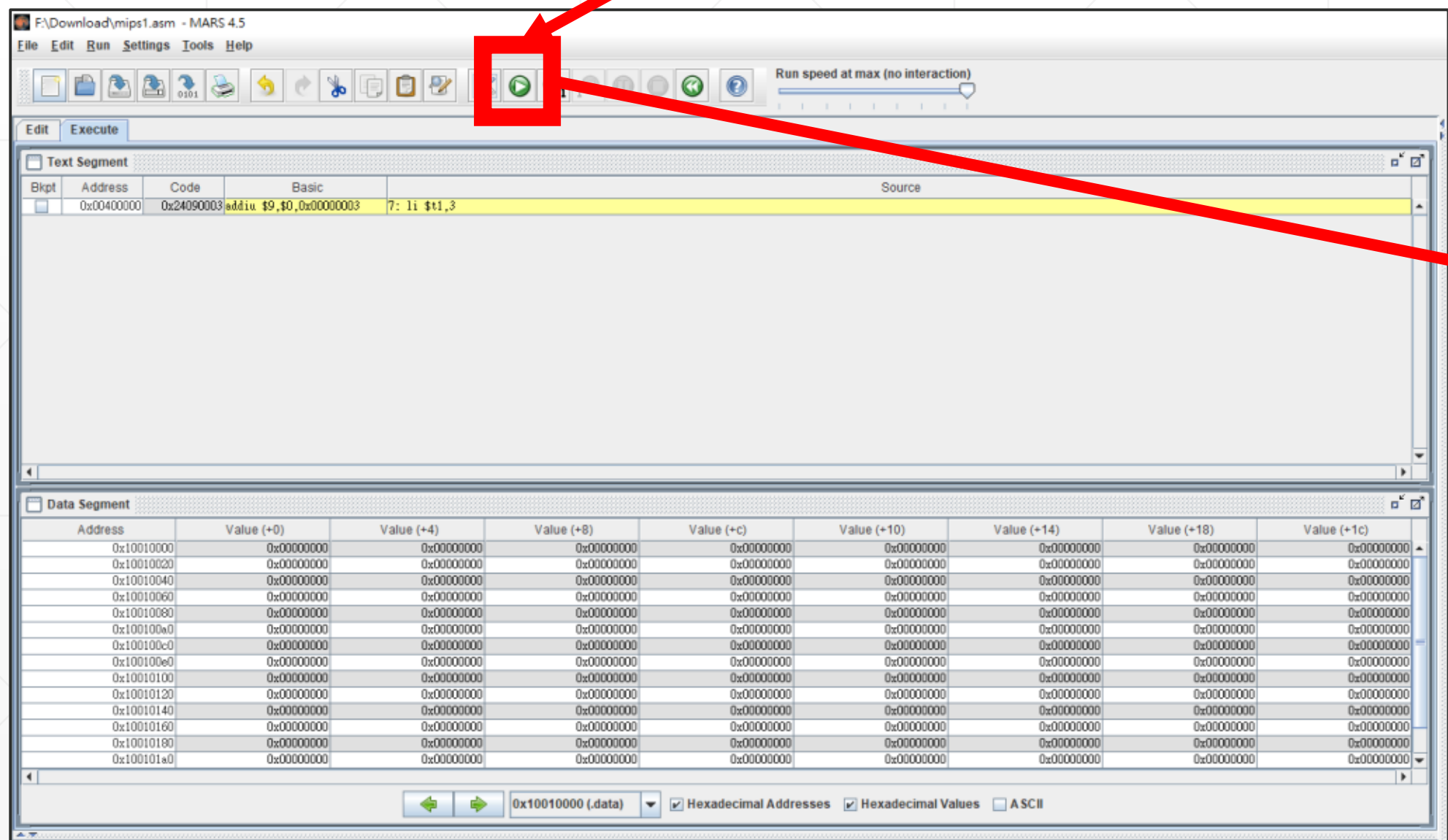
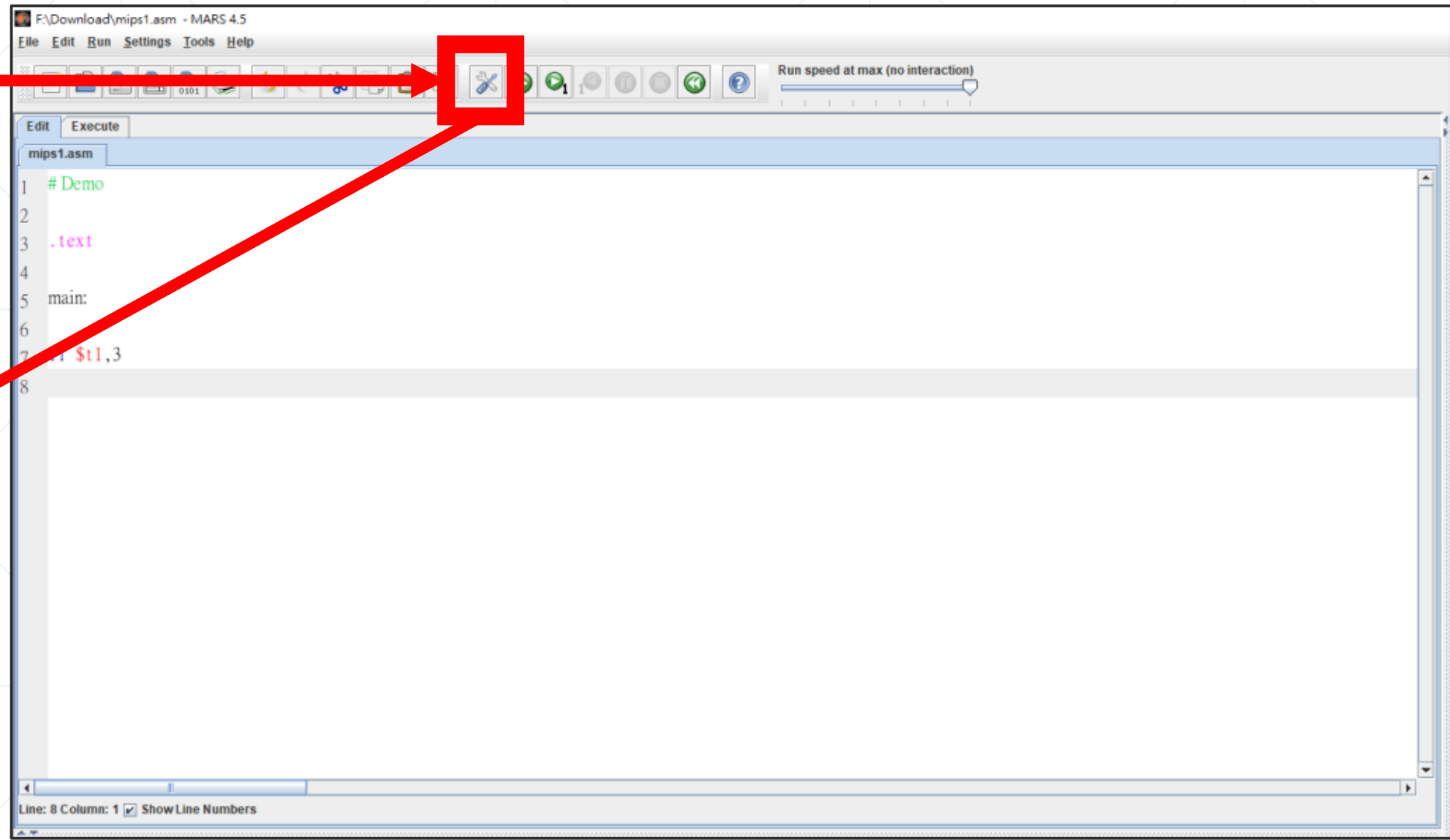
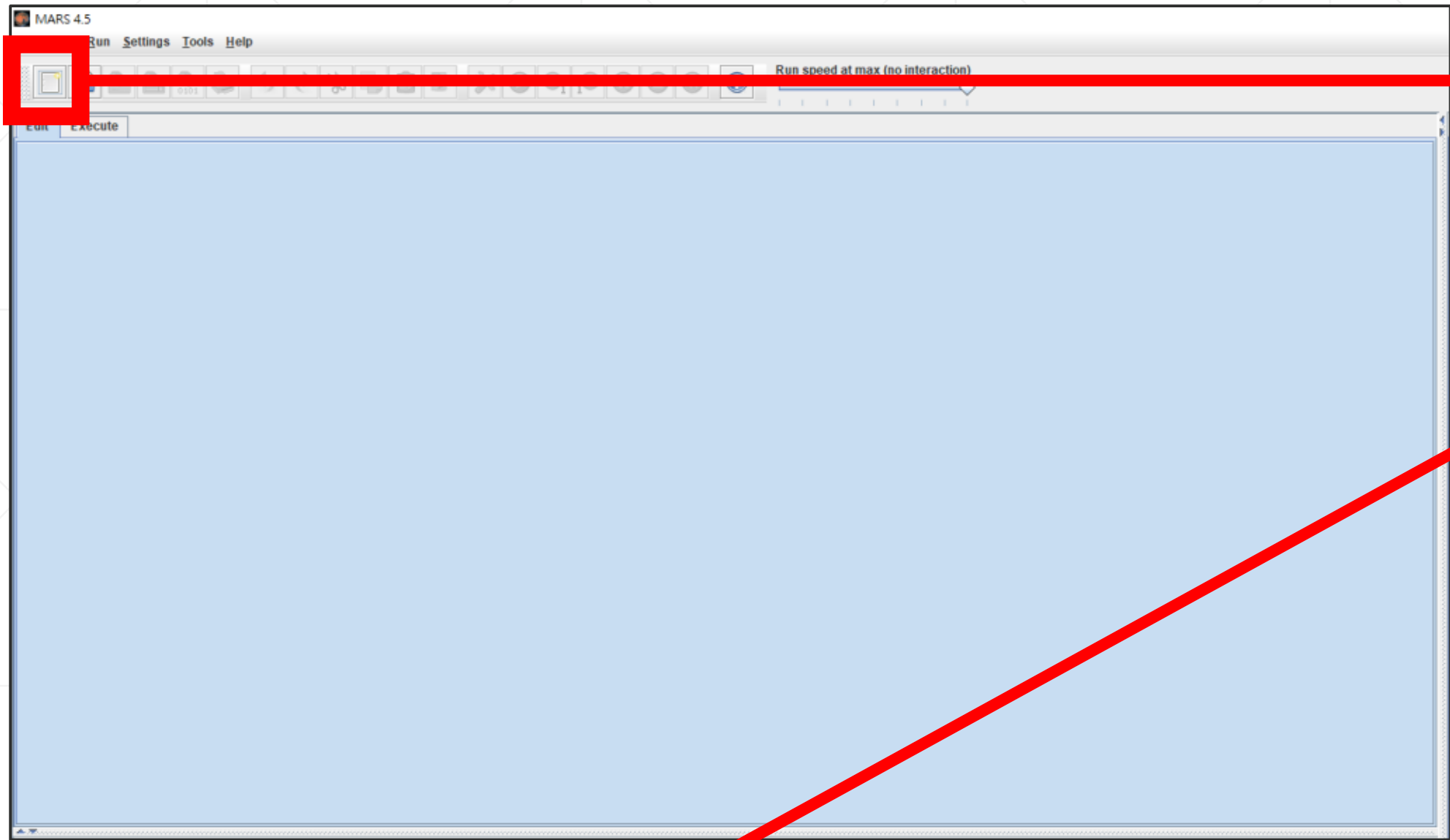
You must accept the [Oracle Technology Network License Agreement for Oracle Java SE](#) to download this software.

Thank you for accepting the Oracle Technology Network License Agreement for Oracle Java SE; you may now download this software.

Product / File Description	File Size	Download
Linux	147.28 MB	jdk-11.0.2_linux-x64_bin.deb
Linux	154.01 MB	jdk-11.0.2_linux-x64_bin.rpm
Linux	171.32 MB	jdk-11.0.2_linux-x64_bin.tar.gz
macOS	166.13 MB	jdk-11.0.2_osx-x64_bin.dmg
macOS	166.49 MB	jdk-11.0.2_osx-x64_bin.tar.gz
Windows	150.94 MB	jdk-11.0.2_windows-x64_bin.exe
Windows	170.96 MB	jdk-11.0.2_windows-x64_bin.zip

1

jdk-11.0.2_windows-x64_bin.exe

2

Mars4_5.jar



Registers			Coproc 1	Coproc 0
Name	Number	Value		
\$zero	0	0x00000000		
\$at	1	0x00000000		
\$v0	2	0x00000000		
\$v1	3	0x00000000		
\$a0	4	0x00000000		
\$a1	5	0x00000000		
\$a2	6	0x00000000		
\$a3	7	0x00000000		
\$t1	9	0x00000003		
\$t3	11	0x00000000		
\$t4	12	0x00000000		
\$t5	13	0x00000000		
\$t6	14	0x00000000		
\$t7	15	0x00000000		
\$s0	16	0x00000000		
\$s1	17	0x00000000		
\$s2	18	0x00000000		
\$s3	19	0x00000000		
\$s4	20	0x00000000		
\$s5	21	0x00000000		
\$s6	22	0x00000000		
\$s7	23	0x00000000		
\$t8	24	0x00000000		
\$t9	25	0x00000000		
\$k0	26	0x00000000		
\$k1	27	0x00000000		
\$gp	28	0x10008000		
\$sp	29	0x7ffffc		
\$fp	30	0x00000000		
\$ra	31	0x00000000		
pc		0x00400004		
hi		0x00000000		
lo		0x00000000		

Demo

.text

main:

li \$t1,3