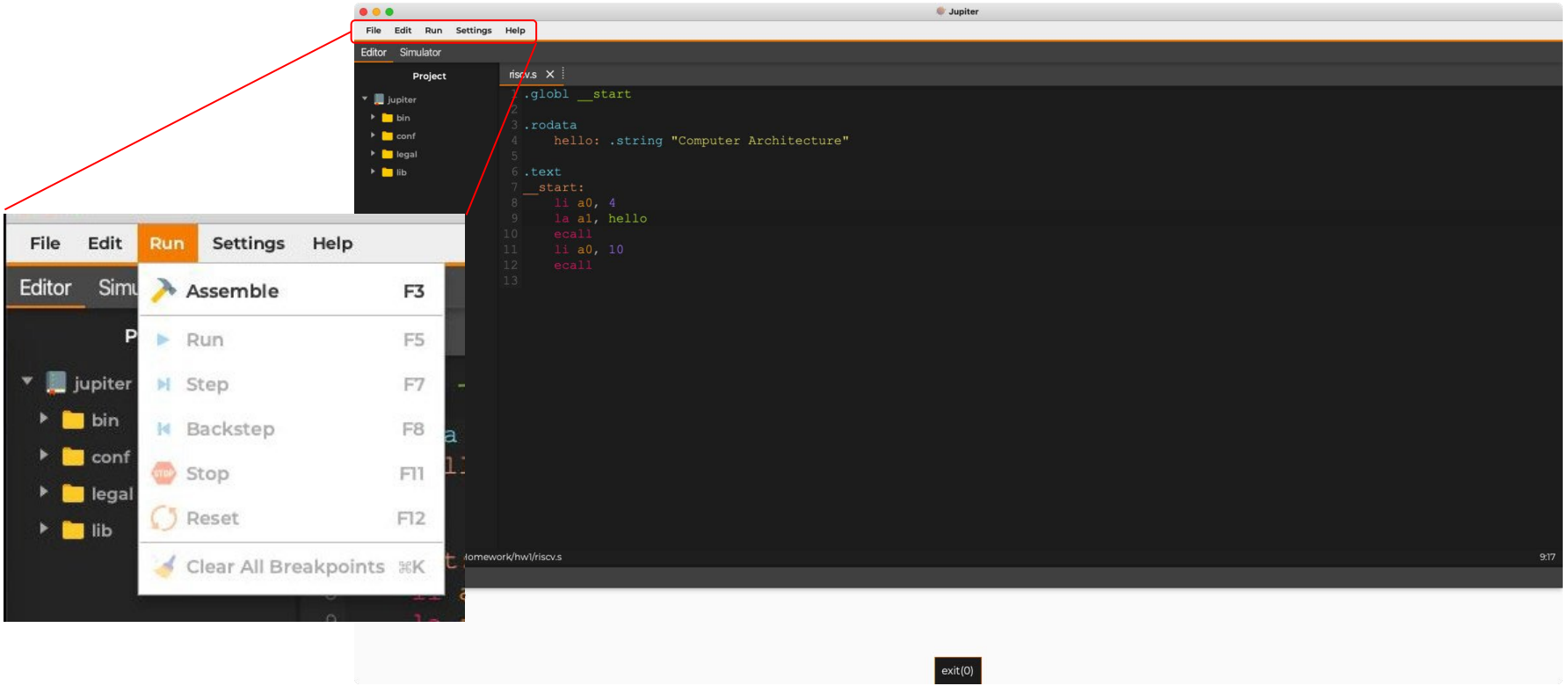
CA2023 Fall HW1

RISC-V Assembly Code

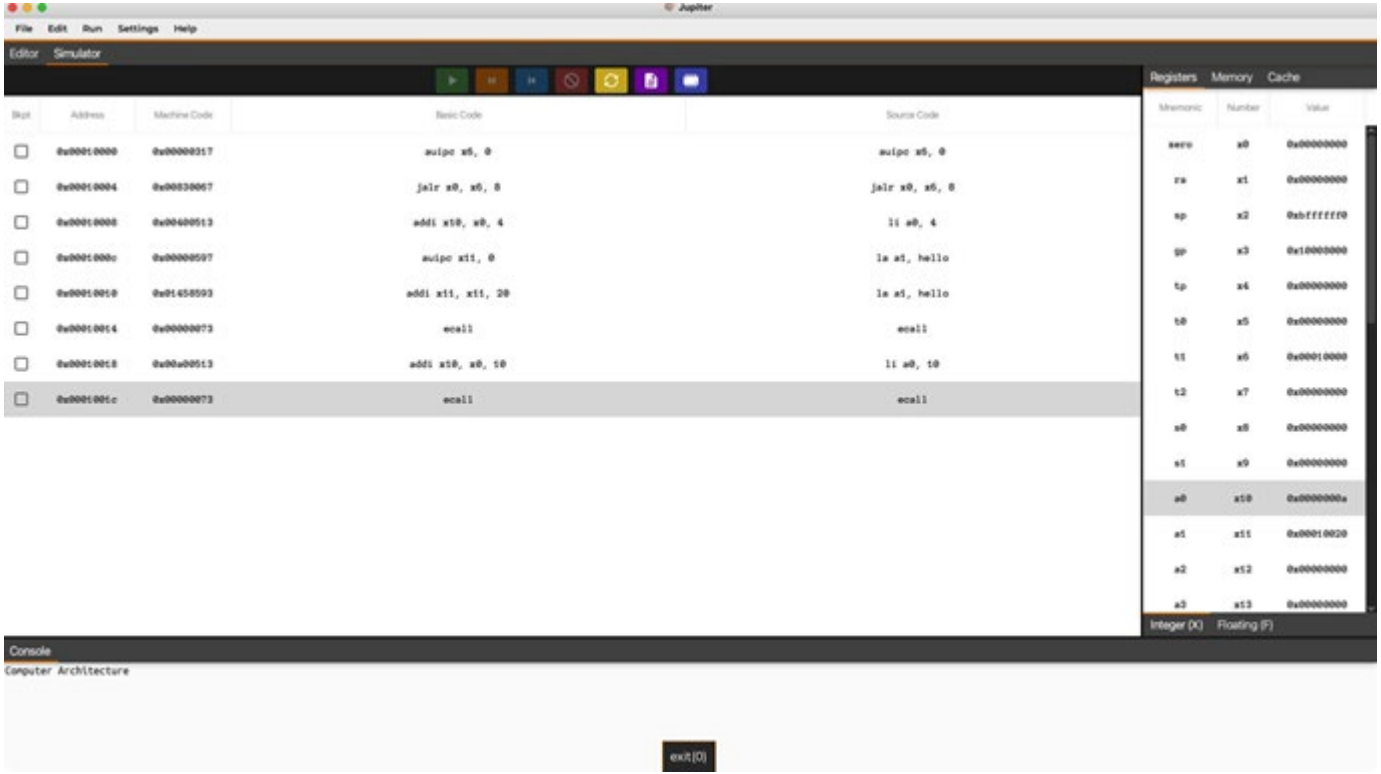
Description

- In this homework, you are going to use Jupiter RISC-V simulator to develop a simple calculator.
- After finishing this homework, you will be familiar with the usage of Jupiter RISC-V simulator, register definition, and some basic operations in RV32I Base Integer Instruction Set.

Jupiter GUI


Jupiter
File Edit Run Settings Help
Editor Simulator
Project
jupiter
bin
conf
legal
lib
riscv.s
.globl __start
.rodata
hello: .string "Computer Architecture"
.text
__start:
li a0, 4
la a1, hello
ecall
li a0, 10
ecall
homework/hw1/riscv.s
9:17
exit(0)
File Edit Run Settings Help
Assemble F3
Run F5
Step F7
Backstep F8
Stop F11
Reset F12
Clear All Breakpoints ⌘K

Jupiter GUI


Jupiter
File Edit Run Settings Help
Editor Simulator
Registers Memory Cache
Console
Computer Architecture
exit (0)

Jupiter CLI

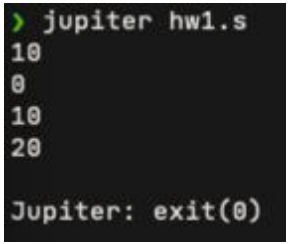
```
❯ jupiter riscv.s
Computer Architecture

Jupiter: exit(0)
```

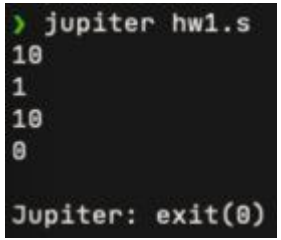
TODO

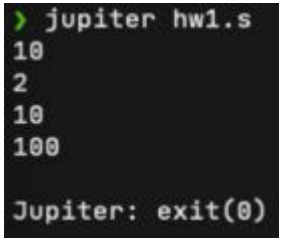
- You are going to develop a simple calculator, which supports seven operations.
- Addition(0), subtraction(1), multiplication(2), integer division(3), minimum(4), power(5), and factorial(6).

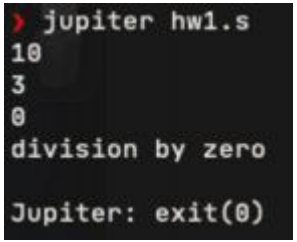
Sample I/O

- Input file contains 3 lines, operand A, operation op, operand B, respectively. ($0 \le A, B \le 1024$, op $\in \{0, 1, 2, 3, 4, 5, 6\}$)
- Your program should output the correct result (A op B).









Sample Code

- In the sample code, you don’t need to do I/O operations by yourself. A, op, B will be stored at register s0, s1, s2 registers.
- You need to store the result to register s3.

```
22 ##################################
23 #  TODO: Develop your calculator  #
24 #                                 #
25 ##################################
```

Sample Code

- If op=3 and B=0, just jump to **`division_by_zero_except`**

```
38 division_by_zero_except:
39     li a0, 4
40     la a1, division_by_zero
41     ecall
42     jal zero, exit
```

Grading Policy

- Total 100%
  - For operations +, -, x, / and min, each has 4 test cases, 3 points per test case.
  - For operations ^ and !, each has 5 test cases, 4 points per test case.
- We will judge the correctness of your program by running the following command:

```
$ jupiter [student_id].s < input_file
```

- Don’t worry about overflow and underflow.
- No need to handle 0^0.
- 10 points off per day for late submission.
- You will get 0 point for plagiarism.

Submission

- Due date: 10/02 23:59 (Monday)
- Please rename your program [student_id].s and upload it to NTU COOL.
  - For example, if your student id is b12345678, your program file name should be b12345678.s.