Computer Architecture Homework #02

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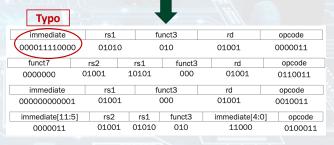

Example: Translation

```
lw      x9, 120(x10)
add     x9, x21, x9
addi    x9, x9, 1
sw      x9, 120(x10)
```

$$120_{10} = 0000\ 0111\ 1000_2$$

immediate		rs1	funct3	rd	opcode
120		10	2	9	3

funct7	rs2	rs1	funct3	rd	opcode
0	9	21	0	9	51

immediate	rs1	funct3	rd	opcode
1	9	0	9	19

immediate[11:5]	rs2	rs1	funct3	immediate[4:0]	opcode
3	9	10	2	24	35

Typo

immediate		rs1	funct3	rd	opcode
000011110000		01010	010	01001	0000011

funct7	rs2	rs1	funct3	rd	opcode
0000000	01001	10101	000	01001	0110011

immediate	rs1	funct3	rd	opcode
000000000001	01001	000	01001	0010011

immediate[11:5]	rs2	rs1	funct3	immediate[4:0]	opcode
0000011	01001	01010	010	11000	0100011

R-type Instructions	funct7	rs2	rs1	funct3	rd	opcode	Example
add (add)	0000000	00011	00010	000	00001	0110011	add x1, x2, x3
sub (sub)	0100000	00011	00010	000	00001	0110011	sub x1, x2, x3

I-type Instructions	immediate		rs1	funct3	rd	opcode	Example
addi (add immediate)	001111101000		00010	000	00001	0010011	addi x1, x2, 1000
lw (load word)	001111101000		00010	010	00001	0000011	lw x1, 1000 (x2)

S-type Instructions	immed-iate	rs2	rs1	funct3	immed-iate	opcode	Example
sw (store word)	0011111	00001	00010	010	01000	0100011	sw x1, 1000(x2)

Converting Binary Code to Assembly Code

$$120_{10} = 0000\ 0111\ 1000_2$$

Typo

immediate	rs1	funct3	rd	opcode
000011110000	01010	010	01001	0000011

funct7	rs2	rs1	funct3	rd	opcode
0000000	01001	10101	000	01001	0110011

immediate	rs1	funct3	rd	opcode
000000000001	01001	000	01001	0010011

immediate[11:5]	rs2	rs1	funct3	immediate[4:0]	opcode
0000011	01001	01010	010	11000	0100011

```
lw      x9, 120(x10)
add     x9, x21, x9
addi    x9, x9, 1
sw      x9, 120(x10)
```

Guide

- **Grading: 0% ~ 100%**
  - Based on the corrected number of answers
  - If the program doesn't run, you'll get 0 points (such as Segmentation Fault!!)
- **Due date: 2022-10-19 (11:59 PM)**
  - Late homework is not allowed
  - A compressed file must be uploaded to the cyber campus
  - Folder name must be studentID_YourName (Ex: 1234567_MyungKukYoon)
  - The compressed file name must be studentID_YourName.zip
    (Ex: 1234567_MyungKukYoon.zip)
- **Q/A**
  - I will be happy to answer your questions about homework #02 until **October 14th**.
    After October 14th, I will not answer your questions about homework #02
- **Execution time: less than 5 seconds**

Guide

```
/*
* ********** Please read the instructions below carefully **********
* Your name and student ID must be printed when this project is executed
* Do not print anything other than your name and student ID (Delete printf functions used for debugging when submitting this homework)
* - If not, there will be 20% penalty
* Run make clean command before submitting your homework
* Change this project folder name to studentID_yourname (EX: 1234567_myungkukyoon)
* You must compress this project folder (not the files in this folder)
* - If not, there will be 20% penalty
* - Use ZIP compression utility (DO NOT USE TAR COMMAND)
* The name of ZIP file must be studentID_yourname.zip (EX: 1234567_myungkukyoon.zip)
* All the tests must be done in 5 seconds
* - If not, you will get 0%
*/
```

```
/*
* Input instructions
* add, sub, addi, sw, lw, beg
*/
```
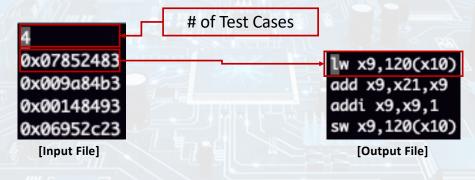

Input and Output Files

- **Input file: input.txt**
- **Output file: output.txt**
- **Your output file: hw02_output.txt**
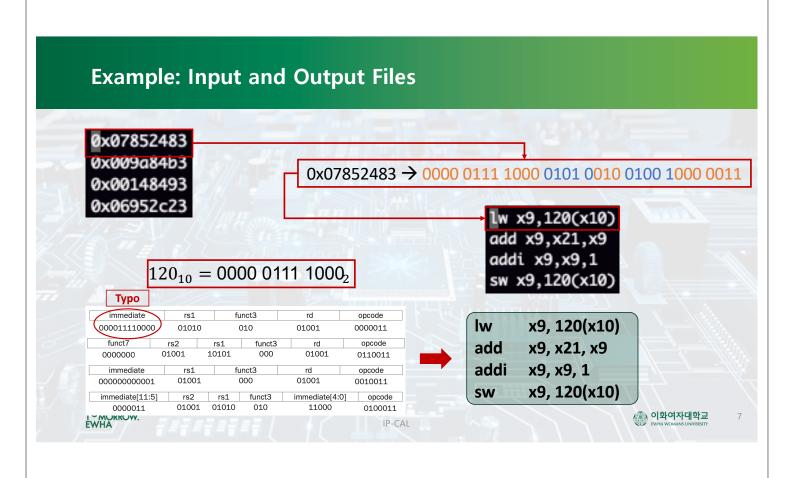
If you find a bug in the input and output files, please send me an email. Anyone who finds a bug and reports it for the first time will receive an additional 10% of this homework (1% of your total grade)

# of Test Cases

```
4
0x07852483
0x009a84b3
0x00148493
0x06952c23
```
[Input File]

```
lw x9,120(x10)
add x9,x21,x9
addi x9,x9,1
sw x9,120(x10)
```
[Output File]

Example: Input and Output Files

0x07852483
0x009a84b3
0x00148493
0x06952c23

0x07852483 → 0000 0111 1000 0101 0010 0100 1000 0011

```
lw x9,120(x10)
add x9,x21,x9
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```

$$120_{10} = 0000\ 0111\ 1000_2$$

Typo

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0000011	01001	01010	010	11000	0100011

```
lw    x9, 120(x10)
add   x9, x21, x9
addi  x9, x9, 1
sw    x9, 120(x10)
```

Additional information

- **Changing directory**
  - $cd FOLDER_NAME
  - $cd ..
- **Printing the path of the working directory**
  - $pwd
- **Listing files or directoris**
  - $ls

Additional information

- **Build/Clean/Run**
  - $make
  - $make clean
  - $./hw02
- **Diff (this command will be used to check your answer)**
  - $diff hw02_output.txt output.txt
- **ZIP & UNZIP**
  - $zip FILE_NAME.zip FOLDER_NAME/*
  - $unzip FILE_NAME.zip

Thank You!

- Questions?