

Assignment 3

1. a. S-type: $M[12+4] \leftarrow x_{17}$

imm[11:5] rs2 rs1 func3 imm[4:0] opcode

↓ ↓ ↓ ↓ ↓

000000 10001 01100 010 00100 0100011

0 0 1 1 2 2 3

0x01162223

b. I-type: $x_{25} \leftarrow x_{20} + 0x9$

imm[11:0] rs2 func3 rd opcode

000000001001 10190 000 11001 0010011

0 0 9 A 0 C 9 3

0x009A0C93

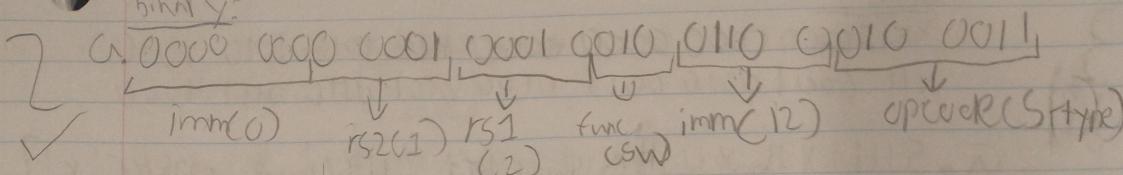
R-type $x_{10} \leftarrow x_{13} + x_{11}$

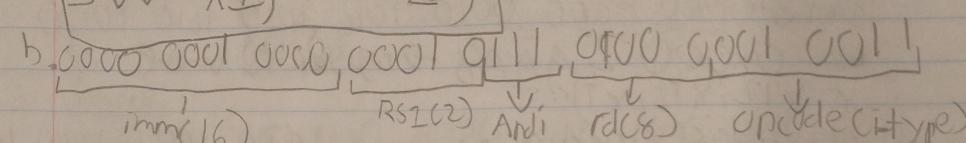
func7 rs2 rs1 func3 rd opcode

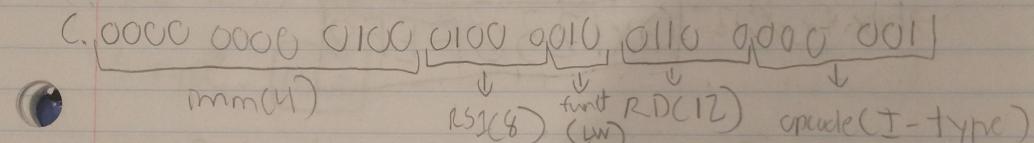
0000000 01011 01101 000 01010 0110011

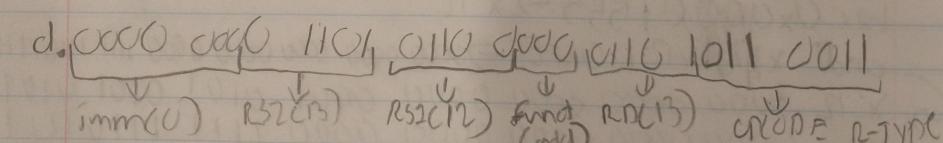
0 0 B 6 8 5 3 3

0x00B68533

- a. binary:


 ✓ **SW X1, 12(X2)**
- b. binary:


ANDI X8, X2, 16 16 represent? ANDI, rd, rs1, imm
- c. binary:


LW X12, 4(X8) LW rd, rs1, imm
- d. binary:


(ADD X13, X12, X13) ADD rd, rs1, rs2

3. binary
x10 = 0000 0000 0000 0000 1010 1010 1010 1010
x11 = 0001 0010 0011 0100 0101 0110 0111 1000

a. Slli x12, x10, 2 shift left 2 bits/move register x12
Shifted by 2:
0000 0000 0000 0010 1010 1010 1010 1000
hex: 0x0002 AAA8 → register 12 value
or x12, x10, x11
or x12 = 0000 0000 0000 0010 1010 1010 1010 1000
x11 = 0001 0010 0011 0100 0101 0110 0111 1000
0001 0010 0011 0110 1111 1110 1111 1000
→ hex for x12: 0x1236FEF8

b. Srli x12, x10, 3 store x10 shifted right 3 into x12
shifted right 3:
0000 0000 0000 0000 0001 0101 0101 0101
hex: 0x0000 1555 → x12
andi x12, x12, 0xFFE → 0000 0000 0000 0000 1111 1110 1111
x12 = 0000 0000 0000 0000 0001 0101 0101 0101
imrn 0000 0000 0000 0000 0000 1111 1110 1111
0000 0000 0000 0000 0000 0101 0100 0101
→ hex for x12: 0x000000545

4. a. use Load and Store

$$25\% + 10\% = \boxed{35\%}$$

b. I-type, S-type, SB-type

$$28\% + 25\% + 10\% + 13\% = \boxed{76\%}$$

C. binary:

0000 0000 1100 0110 1010 1010 0010 0011
min 12rs2 13rs2 SW imm 20 OPCODE
SW x 12, 20 x 11) S-type

S-type: $\boxed{10\%}$

5

a. addi \$0, \$0, 4

addi \$1, \$0, 5

addi \$2, \$0, 6

addi \$3, \$0, 7

addi \$3, \$2, 8

addi \$3, \$3, 10

int
var?

b. addi \$0, \$0, 5

addi \$1, \$0, 10

addi \$0, \$0, 50

bne \$0, \$1, ELSE

addi \$0, \$0, 0

beq \$0, \$0, EXIT

ELSE: addi \$1, \$0, -1

EXIT:

c. addi \$1, \$0, 1

addi \$0, \$0, 0

addi \$0, \$0, 30

L0: beq \$0, \$0, L1

addi \$0, \$0, 1

addi \$1, \$1, \$1

beq \$0, \$0, L0

L1:

n > 0 opposite $\rightarrow 0 \geq n$

d. addi \$1, \$0, 0

L0: bge \$0, \$0, L1

addi \$1, \$0, \$1

addi \$0, \$0, -1

beq \$0, \$0, L0

L1: