

TITLE

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lw/sw Example:

```
add $4, $7, $0
addi $1, $0, 20
lw $3 0($4)
addi $1, $1, -1
sw $3, 0($5)
addi $4, $4, 4
addi $5, $5, 4
bne $1, $0, -6
add $8, $3, 0
```

Binary Refresh:

$$101 = 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$$

Jump:

$$28 \times 4 = 112$$

$$PC \leftarrow \text{offset} \times 4$$

Overwrite PC. Example: j 28 sets the PC to 28×4

jump and branch are I-format

```
beq \ $1, \ $2, 100
```

branch if equal

if $\$1 == \2 go to offset relative to PC, else continue to next instruction

We don't multiply by 4 so that we can get more space for the 16 bits we have for the value 100, ie going from 400, if we multiply by 4, it goes to 1600

$$PC \leftarrow 100 \times 4 + (PC + 4)$$

Slide 26:

$$\begin{aligned} PC &\leftarrow (-3) \times 4 + (PC + 4) \\ &= -12 + 120 \\ &= 108 \end{aligned}$$

Memory Access - I-Format

jump and branch are I-format

lw \$s1 , 100(\$s2)

100(\$s2) is computing an address

\$s1 \leftarrow [address]