

Arithmetic Operations & Control Structures

Arithmetic Operations

- add R1, R2, R3 $\rightarrow R1 = R2 + R3$
 - if R2 / R3 is \$zero, used for copying content from the other register to R1
- addi R1, R2, immediate value $\rightarrow R1 = R2 + \text{immediate value}$
 - if R2 is \$zero, used for storing a constant value in R1
- sub R1, R2, R3 $\rightarrow R1 = R2 - R3$
- subi R1, R2, immediate value $\rightarrow R1 = R2 - \text{immediate value}$
- mul R1, R2, R3 $\rightarrow R1 = R2 * R3$
- div R1, R2, R3 $\rightarrow R1 = \text{quotient of } R2 / R3$
- div R1, R2 $\rightarrow \left. \begin{array}{l} \text{lo} = \text{quotient of } R1 / R2 \\ \text{hi} = \text{remainder of } R1 / R2 \end{array} \right\} \rightarrow$



Store in memory

.data

ans: .word 0

.text

addi \$t0, \$zero, 429412

addi \$t1, \$zero, 10

div \$t4, \$t0, \$t1

sw \$t4, ans

Control Structures

Basic Components

- Label
 - Branch instructions
 - Unconditional: **j** label
 - Conditional
 - beq R1, R2, label
 - bne R1, R2, label
 - slt/sgt/sle/sge R1, R2, R3
bne R1, \$zero, label

 - blt/bgt/ble/bge R1, R2, label
- ➔ R1 = 1 if R2 $\neq$ / $\leq$ / $\geq$ R3, R1 = 0 otherwise

If statement

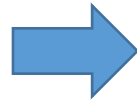
- if (condition 1)

-

-

// if

// later part



- Branch on **condition 1** to label1

- j later

- label1:

- # if

- later:

- # later part

If - Else

- if (condition 1)

-

// if

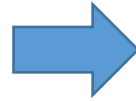
- else

-

// else

-

// later part



- Branch on **condition 1** to label1

- j later

- label1:

-

if

- j later

- label2:

-

else

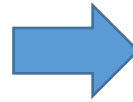
- later:

-

later part

If - Else if - Else

- if (condition 1)
 - // if
- else if (condition 2)
 - // else if
- else
 - // else
- // later part



- Branch on **condition 1** to label1
- Branch on **condition 2** to label2
- j later
- label1:
 - # if
 - j later
- label2:
 - # else if
 - j later
- label3:
 - # else
- later:
 - # later part

Assignments

- Handling overflow in integer arithmetic operations
- Floating point arithmetic operations
- Logical operations
- Comparing characters