

### Vocab

Three MIPS steps: Fetch, Decode, Execute  
 C Compiler is preprocessor and translator  
 Linker assembles all functions and make final exe  
 Loader loads program into memory

### Memory Allocation

Int A = 200;	2000	A			
float B[2][2] = {{1.0,2.0}, {3.0,4.0}};	2004	B[0][0]			
float *p2 = &(B[1][1]);	2008	B[0][1]			
int *p1 = &A;	2012	B[1][0]			
char s[ ] = "foo";	2016	B[1][1]			
	2020				
	2024	p2			
	2028				
	2032	p1			
	2036				
	2040	s[0]	s[1]	s[2]	s[3]

### Swap

1. (7 pts) Write a MIPS code fragment that adds the value 0x4FA2C3 to register \$1 and puts the result in \$2. Modify only registers \$1 and \$2. (You may use hexadecimal immediate values.) For maximum credit, include comments.

Label	Instruction	Comment
	lui \$2, 0x4F	# load upper 16 bits
	ori \$2, \$2, 0xA2C3	# load rest of constant
	add \$2, \$2, \$1	# add it to \$1

### Values after

$x = 7, y = 7, \text{ and } z = 2$   
 if ( $z = x < y$ ) {  $x += 3; y -= 1;$  }  
 else  $x = y++;$   
 $x = 7, y = 8, z = 0$

### Constant Type

29LU = unsigned long integer  
 "t" = string  
 -39.54Lf = long double  
 7hd = short integer

### Values

$(p1 = 2000) * (p1 = 200) \& (p1 = 2032) (p2 = 2016)$   
 $'p2 = 4) \& (p2 = 2024) \& (s[1]) = 2041) ((s+3) = 0)$

### Loop Array C

`int A[]; int i = 0; do {p = p*A[i]; i++;} while (A[i]);`

### Swap MIPS

```

void swap(int *v1, int *v2)
{
    int temp = *v1;
    *v1 = *v2;
    *v2 = temp;
}
Parameters:
    $2 v1Address in $31
    $3 v2Address in $31
Return address in $31
    
```

Label	Instruction	Comment
Swap:	lwr \$4, \$3, 2	# \$4 = *v1
	add \$4, \$4, \$2	# \$4 = v1 + 4
	lwr \$5, \$2(\$4)	# \$5 = *v2
	lwr \$6, \$2(\$4)	# \$6 = *(v2+1)
	swr \$5, \$2(\$4)	# v2[0] = \$5
	swr \$6, \$2(\$4)	# v2[1] = \$6
	jr \$31	# return

### Loop C to Mips

```

Sum = 0;
while (N >= 1)
    Sum = Sum + N;
N = N - 1;
}
    
```

Label	Instruction	Comment
	addi \$2, \$0, 0	# Sum = 0
Loop	lwr \$1, \$0, \$ent	# load if N <= 0
	and \$1, \$1, 1	# \$1 = N <= 0
	addi \$2, \$2, \$1	# Sum = Sum + N
	addi \$1, \$1, -1	# N = N - 1
	j Loop	# continue looping
Exit:		

C

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 Page 1 of 1.

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