

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;
float B[2][2] = {{1.0,2.0}, {3.0,4.0}};
float *p2 = &(B[1][1]);
int *p1 = &A;
char s[ ] = "foo";
    
```

2000	A			
2004	B[0][0]			
2008	B[0][1]			
2012	B[1][0]			
2016	B[1][1]			
2020				
2024	p2			
2028				
2032	p1			
2036				
2040	s[0]	s[1]	s[2]	s[3]

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 *x, int *y)
{
    int temp;
    temp = *x;
    *x = *y;
    *y = temp;
}
    
```

Label	Instruction	Comment
Swap:	add \$t, \$x, \$y	# \$t = x+y
	add \$x, \$x, \$y	# \$x = x+y-x = y
	add \$y, \$t, \$x	# \$y = (x+y) + (x+y) - x = x+y
	add \$t, \$x, \$y	# \$t = x+y
	add \$x, \$t, \$x	# \$x = x+y-x = y
	add \$y, \$t, \$y	# \$y = (x+y) + (x+y) - x = x+y
	jr \$t	# return

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 $x = y++;$
 $x = 7, y = 8, z = 0$

Loop C to Mips

```

Sum = 0;
while (sum <= 10)
    sum = sum + 1;
    
```

Label	Instruction	Comment
Loop:	add \$t, \$0, \$0	# Sum = 0
	beq \$t, \$0, Exit	# exit if N = 0
	add \$t, \$t, 1	# \$t = N+1
	add \$t, \$t, \$t	# Sum = N*N
	ori \$t, \$t, 1	# N = N+1
Exit:	li \$t, 10	# N = 10
	lt \$t, \$t, \$t	# continue looping

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