

CS 0447 Lab 03

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Part A Bit Manipulation

π Keep bits 15, 16 and 17

π How many lower bits we should eliminate?
14

```
srl    $t1, $t0, 14
```

π How many bits we should keep?
3

```
andi   $t1, $t1, 7
```

π Why 7?
 $7 = 111_2$



Part B Exponential Calc

π Multiplication? Nah~

π Any ideas from Part A?

π Think of $1 * 5$

$$1 * 5$$

$$= 1 * 101_2$$

$$= 1 * 2^2 + 1 * 2^0$$

$$= (1 \ll 2) + (1 \ll 0)$$

$$= 4 + 1$$

$$= 5$$

π What about 5^3 ?

$$5^3$$

$$= (((1 * 5) * 5) * 5)$$

Sample Code 57

```

addi    $t5, $0, 1
13:
beq     $t1, $0, output_and_exit
addi    $t1, $t1, -1
add     $t2, $0, $t0
add     $t4, $0, $t5
addi    $t5, $0, 0
12:
beq     $t2, $0, 13
andi    $t3, $t2, 1
beq     $t3, $0, 11
add     $t5, $t5, $t4
11:
srl     $t2, $t2, 1
sll     $t4, $t4, 1
j       12

```

1 * 5			
t0	5		
t1	7 -> 6 1 * 5 ⁷ -> 5 * 5 ⁶		
t2	101 ₂	10 ₂	1 ₂
t3	1	0	1
t4	1 1 << 0	2 1 << 1	4 1 << 2
t5	1	1	5

Sample Code 57

```
addi    $t5, $0, 1
13:
beq      $t1, $0, output_and_exit
addi     $t1, $t1, -1
add      $t2, $0, $t0
add      $t4, $0, $t5
addi     $t5, $0, 0
12:
beq      $t2, $0, 13
andi     $t3, $t2, 1
beq      $t3, $0, 11
add      $t5, $t5, $t4
11:
srl      $t2, $t2, 1
sll      $t4, $t4, 1
j        12
```

5 * 5			
t0	5		
t1	6 -> 5 5 * 5 ⁶ -> 25 * 5 ⁵		
t2	101 ₂	10 ₂	1 ₂
t3	1	0	1
t4	5 5 << 0	10 5 << 1	20 5 << 2
t5	5	5	25

Sample Code 57

```

addi    $t5, $0, 1
13:
beq     $t1, $0, output_and_exit
addi    $t1, $t1, -1
add     $t2, $0, $t0
add     $t4, $0, $t5
addi    $t5, $0, 0
12:
beq     $t2, $0, 13
andi    $t3, $t2, 1
beq     $t3, $0, 11
add     $t5, $t5, $t4
11:
srl     $t2, $t2, 1
sll     $t4, $t4, 1
j       12

```

25 * 5			
t0	5		
t1	5 -> 4 25 * 5 ⁵ -> 125 * 5 ⁴		
t2	101 ₂	10 ₂	1 ₂
t3	1	0	1
t4	25 25 << 0	50 25 << 1	100 25 << 2
t5	25	25	125

Sample Code 57

```
addi    $t5, $0, 1
13:
beq     $t1, $0, output_and_exit
addi    $t1, $t1, -1
add     $t2, $0, $t0
add     $t4, $0, $t5
addi    $t5, $0, 0
12:
beq     $t2, $0, 13
andi    $t3, $t2, 1
beq     $t3, $0, 11
add     $t5, $t5, $t4
11:
srl     $t2, $t2, 1
sll     $t4, $t4, 1
j       12
```

15625 * 5			
t0	5		
t1	1 -> 0 15625 * 5 ¹ -> 78125 * 5 ⁰		
t2	101 ₂	10 ₂	1 ₂
t3	1	0	1
t4	15625	31250	62500
t5	15625	15625	78125

Please print your name on sign-in sheet

Thank you!