Chapter 4 Homework

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Problem 4.1. If $r0$ initially contains 1, what will it contain after the third instruction in the sequence below?

```
add     r0, r0, #1          @r0=2
mov     r1, r0              @r1=2
add     r0, r1, r0 lsl #1   @r0=6
```

$r0 = 6$

Problem 4.2. What will r0 and r1 contain after each of the following instructions? Give your answers in base 10.

```
mov     r0, #1      @r0=1
mov     r1, #0x20   @r1=32
orr     r1, r1, r0  @r1=33
lsl     r1, #0x2    @r1=132
orr     r1, r1, r0  @r1=133
eor     r0, r0, r1  @r0=132
lsr     r1, r0, #3  @r1=1056
```

$r0$ =132
$r1$ =1056

Problem 4.3. What is the difference between *lsr* and *asr*?

The *lsr* and *asr* operations do similar things. They both shifts each bit n bits to the right, losing the least significant n bits.

With the *lsr* operation, zero is shifted into the n most significant bits. However, with the *asr* operation, the n most significant bits become copies of the sign bit (bit 31).

Problem 4.4. Write the ARM assembly code to load the numbers stored in $num1$ and $num2$, add them together, and store the result in $numsum$. Use only $r0$ and $r1$.

```
ldr     r0, =num1
ldr     r1, =num2
ldr     r0, [r0]
ldr     r1, [r1]
add     r0, r0, r1

ldr     r1, =numsum
str     r0, [r1]
```

Problem 4.5. Given the following variable definitions:

```
num1:   .word x
num2:   .word y
```

where you do not know the values of x and y, write a short sequence of ARM assembly instructions to load the two numbers, compare them, and move the largest number into register r0.

```
ldr     r1, =num1
ldr     r2, =num2
ldr     r0, [r1]    @assume x>=y
ldr     r2, [r2]
cmp     r0, r2      @change r0=y if x<y

bge     done
mov     r0, r2

done:
```

Problem 4.6. What will r0 and r1 contain after each of the following instructions? Give your answers in base 10.

```
mov     r0, #1      %r0=1
mov     r1, #0x20   %r1=32
orr     r1, r1, r0  %r1=33
lsl     r1, #0x2    %r1=132
orr     r1, r1, r0  %r1=133
eor     r0, r0, r1  %r0=132
lsr     r1, r0, #3  %r1=1056
```

Solution

$$r0 = 132$$
$$r1 = 1056$$