

CPSC 31 Intro to Computer Systems

Assignment #2

Due at the beginning of class, Tuesday February 28

Please print this document single-sided to give yourself more space to write
Answer directly on the printout.

1. Translate the following C code snippet to IA32 assembly. Start by rewriting the C code to replace the while loop with `goto` statements.

```
int apple, orange, banana;
apple = -5;
orange = 11;
banana = apple >> 1;
while (orange >= banana) {
    banana = banana * 5;
    if ((apple & 1) == 0) {
        apple = banana + orange;
    }
}
```

You may assume that the variables are stored at the following memory locations:

```
apple:  RAM[%ebp - 12]
orange:  RAM[%ebp - 8]
banana:  RAM[%ebp - 4]
```

2. Translate the following IA32 assembly snippet into C code. Start by translating to C code with `goto`, then rewrite it to eliminate the `goto` statements.

```
movl    $5, -12(%ebp)
movl    $-3, -8(%ebp)
movl    -8(%ebp), %eax
subl    -12(%ebp), %eax
subl    -12(%ebp), %eax
movl    %eax, -4(%ebp)
cmpl    $0, -4(%ebp)
jle     .L2
movl    $1, %eax
subl    -8(%ebp), %eax
movl    %eax, -4(%ebp)
jmp     .L4
.L2:
cmpl    $0, -4(%ebp)
jns     .L4
subl    $2, -12(%ebp)
.L4:
# end
```

The C program has variables `x`, `y`, and `z`, stored at the following memory locations:

```
x:  RAM[%ebp - 12]
y:  RAM[%ebp - 8]
z:  RAM[%ebp - 4]
```