- CPSC 275: Introduction to Computer Systems

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Fall 2025

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Homework 19

NOTE: You are not required to hand in the following exercises, but you are strongly encouraged to complete them to strengthen your understanding of the concepts covered in class.

1. For a C function having the general structure

```
int rfun(unsigned x) {
   if ( ____________ )
      return ____________;
   unsigned nx = ____________;
   int rv = rfun(nx);
   return ____________;
}
```

`gcc` generates the following assembly code (with the setup and completion code omitted):

```
1     movl   8(%ebp), %ebx
2     movl   $0, %eax
3     testl  %ebx, %ebx
4     je     .L3
5     movl   %ebx, %eax
6     shrl   %eax     # Shift right by 1
7     movl   %eax, (%esp)
8     call   rfun
9     movl   %ebx, %edx
10    andl   $1, %edx
11    leal   (%edx,%eax), %eax
12 .L3:
```

   A. What value does `rfun` store in the callee-save register `%ebx`?
   B. Fill in the missing expressions in the C code shown above.
   C. Describe in English what function this code computes.

2. The *Fibonacci sequence* is a mathematical definition that expresses each term in the sequence as the sum of the two preceding ones. It can be recursively defined as follows:
   1. **fib**(0) = 0, **fib**(1) = 1.
   2. **fib**(*n*) = **fib**(*n*-1) + **fib**(*n*-2).

   Write a recursive function `fib` that returns the Fibonacci number of an integer *n* passed to the function. Using this function, write an IA-32 assembly program that prompts the user to enter a number and prints the Fibonacci number of the number.

- **Welcome: Sean**
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