Slide 1

Administrivia

- Next homework to be on the Web soon (probably tomorrow). I will send mail.
- Next quiz in a week.

Slide 2

Floating-Point Revisited

- One of the exam questions asked you about representing 0.1 in (binary) floating point. Only one person got it right. Why is the answer “can’t be done exactly”?
- Well . . .

Slide 3

Numbers in Math Versus Numbers in Programming (Review)

- The integers and real numbers of the idealized world of math have some properties not completely shared by their computer representations.
- Math integers can be any size; computer integers can't.
- Math real numbers can be any size and precision; floating-point numbers can't. Also, some quantities that can be represented easily in decimal can't be represented in binary.
- Math operations on integers and reals have properties such as associativity that don't necessarily hold for the computer representations. (Yes, really!)
- (Two "floating point is strange" example programs.)

Slide 4

Pseudo-Random Number Generators

- Many situations in which it's useful or interesting to have "random" numbers. Why the quotation marks? Partly because exactly what random means is difficult to pin down, partly because the best we can do in deterministic code is a good fake — *pseudo-random*.
- Mathematically interesting topic, classic reference is in one of the volumes of Donald Knuth's *The Art of Computer Programming*.

  (Aside: Some of you also know Knuth as the inventor of the typesetting system TEẊIt's an extreme example of a "side project" that turned into something much more?)
- Uses in programming include simulating various things in the physical world. Textbook examples often involve simulating rolling dice, shuffling cards, etc.

Slide 5

Pseudo-Random Number Generators in C

- C library includes functions `srand()`, `rand`. `srand()` uses a "seed" to initialize some behind-the-scenes variables, after which you call `rand()` repeatedly to generate a sequence of "random" numbers. If you do this more than once with the same seed you get the same sequence; using different values of the seed gives different sequences.
- "Monte Carlo" algorithms are based on "random" numbers. An example is a program to estimate π by simulating throwing darts into a board containing a quarter circle. (More in program comments.)

Slide 6

Minute Essay

- Belatedly, my usual question about a homework assignment: Anything interesting to report about Homework 5? (That was the one about functions, recursion, and loops.)