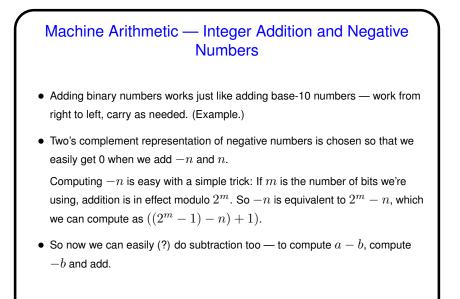


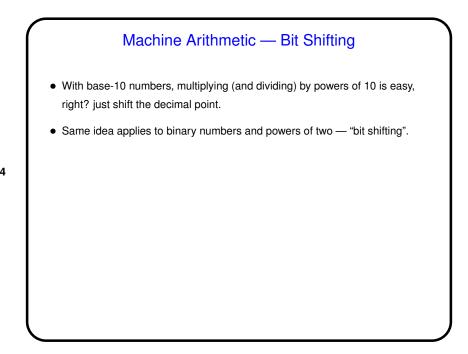
Slide 1

Computer Representation of Integers

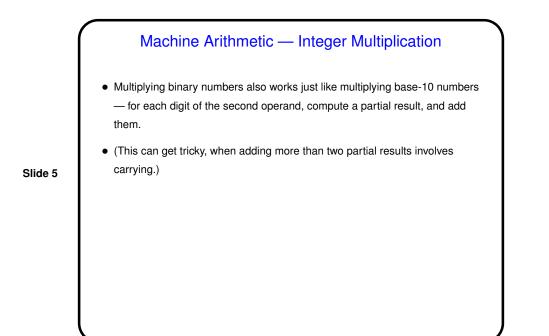
- Computers represent everything in terms of ones and zeros. For non-negative integers, you can probably guess how this works — number in binary. Fixed size (so we can only represent a limited range).
- Slide 2
- How about negative numbers, though? No way to directly represent plus/minus. Various schemes are possible. The one most used now is "two's complement": Motivated by the idea that it would be nice if the way we add numbers doesn't depend on their sign. So first let's talk about addition ...



Slide 3

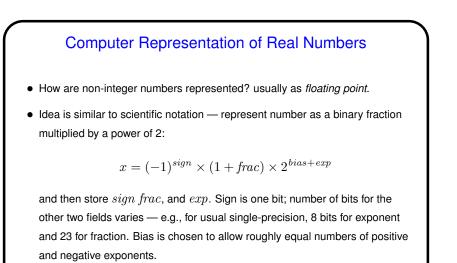


Slide 4



Binary Fractions
We talked about integer binary numbers. How would we represent fractions?
With base-10 numbers, the digits after the decimal point represent negative powers of 10. Same idea works in binary.

Slide 6



Slide 7

Numbers in Math Versus Numbers in Programming

- 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!)

Slide 8

