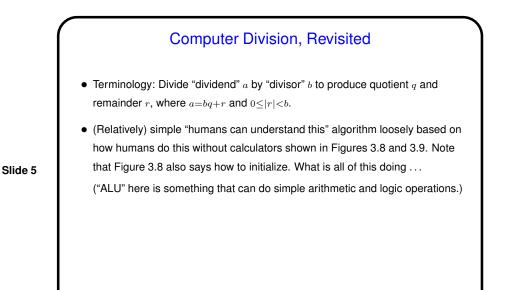
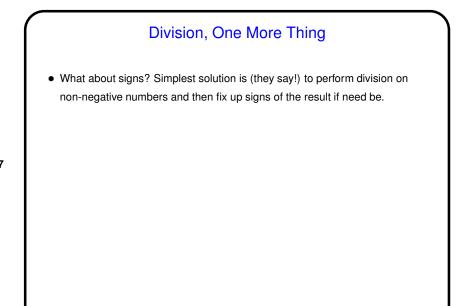


Multiplication, One More Thing • What about signs? Algorithm works, if we extend the sign bit when shifting right.

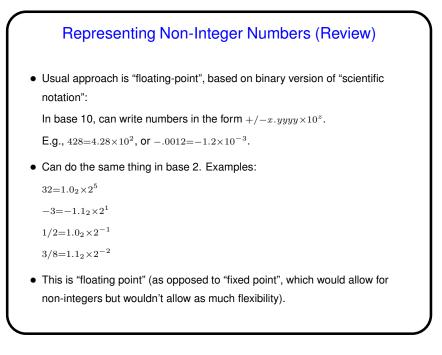


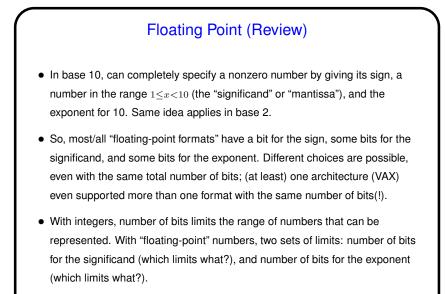
## Division — Big Picture(?)

- Keep a sort of running total that reflects part of dividend we haven't divided yet ("running remainder"?). Also keep a shifted copy of divisor, initially shifted to match high-order bits, and a work area to build the quotient in.
- Slide 6
- Repeatedly try subtracting shifted divisor from running remainder. If it "goes" into", record a bit in the quotient and keep the result of the subtraction. If it doesn't, undo the subtraction. Either way, then shift the divisor to the right and the quotient left and repeat (fixed number of times).
- (Work through example.)



Slide 8



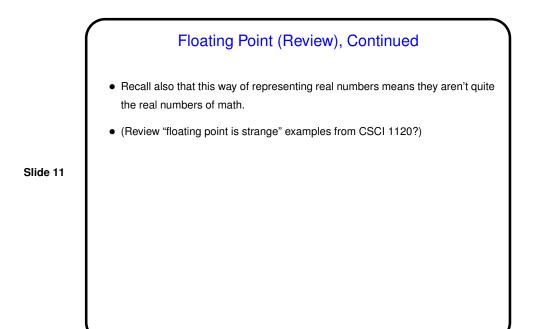


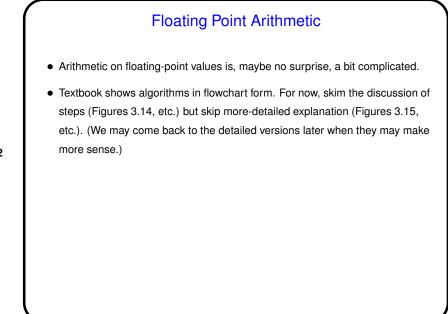
(Does this suggest why the VAX designers offered two formats?)



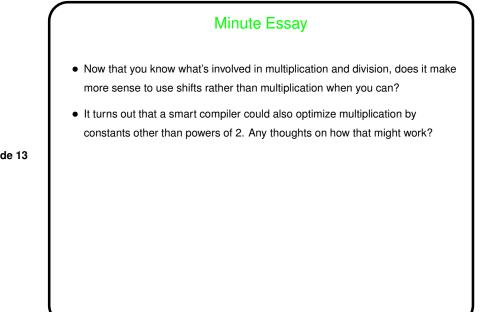
- Most architectures these days use one or more of the floating-point formats defined by the IEEE 754 standard. (Wikipedia article seems good. Many "who knew?" details!) Two things worth noting:
- Since first bit is (almost!) always 1, can omit it and get one extra bit. (Exception? special representation for that case.)
- Exponent is stored in "biased" form. Why? because then all exponents are non-negative, and comparisons are faster. (This speeds up sorting perhaps why it's done this way?)
- (Work through example of conversion; use sample program show-float.c to check result.)

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## $\mathbf{6}$



Slide

| Minute Essay Answer           |        |          |          |          |                     |        |  |
|-------------------------------|--------|----------|----------|----------|---------------------|--------|--|
| I hope :                      | so!    |          |          |          |                     |        |  |
| <ul> <li>If the co</li> </ul> | ompile | r is sma | rt enoug | gh, it c | ould for example co | ompile |  |
| n *=                          | 5;     |          |          |          |                     |        |  |
| as, e.g.                      | ,      |          |          |          |                     |        |  |
| sll S                         | \$t0,  | \$s0,    | 2        | #        | n*4                 |        |  |
| add S                         | \$s0,  | \$t0,    | \$s0     | #        | +n                  |        |  |
|                               |        |          |          |          |                     |        |  |
|                               |        |          |          |          |                     |        |  |
|                               |        |          |          |          |                     |        |  |
|                               |        |          |          |          |                     |        |  |
|                               |        |          |          |          |                     |        |  |
|                               |        |          |          |          |                     |        |  |

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