CS 341 Spring 2000
Homework Set 4
Solutions

Maccabe

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Exercise 1

Slide 1

- $37.55 = 100101.10\overline{0011}_2 = 1.00101100\overline{0011}_2 \times 2^6$
  exponent: $127 + 6 = 133 = 10000101_2$
  representation: 0 10000101 0010110001
- $0.000565 = 0.00000000001001001000001_2 = 1.0010010000_2 \times 2^{-11}$
  exponent: $127 - 11 = 116 = 1110100_2$
  representation: 0 1110100 0010010000
- $0.6 = 0.1\overline{0011}_2 = 1.\overline{0011}_2 \times 2^{-1}$
  exponent: $127 - 1 = 126 = 1111110_2$
  representation: 0 1111110 0011001100
- $-432.78 = -110110000.110001110_2 = 1.1011000011 \times 2^8$
  exponent: $127 + 8 = 135 = 1000011_2$
  representation: 1 1000011 1011000011
- $5000000401 = 10010101000000\ldots1_2 = 1.0010101000 \times 2^32$
  exponent: $127 + 32 = 159 = 10011111_2$
  representation: 0 10011111 0010101000

Exercise 9

Slide 2

No.

All denormals have the form $(-1)^s 0.f \times 2^{-126}$ and so, no two denormals can have the same value

The denormal with the largest magnitude is $(1 - 2^{-23}) \times 2^{-126} < 1^{-126}$ and the smallest magnitude for a normal value is $1.0 \times 2^{1-127} = 1 \times 2^{-126}$.

Exercise 11

Slide 3

Let $a = 1 \times 2^{30}$ and $b = 1 \times 2^{1}$

Exercise 15

Slide 4

- ASCII: 'P', 'H', 'E', null
- integer: $2^{30} + 2^{28} + 2^{22} + 2^{19} + 2^{14} + 2^{10} + 2^{8}$
- program: MPY 16; SUB 4; SUB 1; MPY 0
- IEEE 754: $1.01001000010000101000000000_2 \times 2^{33}$