

# COSC 221 Lab 2

9-13-22

Evan Meyer

A. a. 34

Signed magnitude

$$34 = \underline{01000106}$$

1's complement

$$34 = \underline{10111016}$$

2's complement

$$34 = \underline{10111106}$$

Excess notation

$$34 = \underline{11000106}$$

$$34/2 = 17(0)$$

$$17/2 = 8(1)$$

$$8/2 = 4(0)$$

$$4/2 = 2(0)$$

$$2/2 = 1(0)$$

$$1/2 = 0(1)$$

b. -29

Signed magnitude

$$-29 = \underline{11101016}$$

1's complement

$$-29 = \underline{00111016}$$

2's complement

$$-29 = \underline{1110101 + 1 = 111000116}$$

Excess notation

$$-29 = \underline{01101016}$$

$$29/2 = 14(1)$$

$$14/2 = 7(0)$$

$$7/2 = 3(1)$$

$$3/2 = 1(1)$$

$$1/2 = 0(1)$$

B.

S

EXP

Mantissa

$$1. -0.025 =$$

$$\boxed{1011001001}$$

$$-0.025 = S = 1$$

$$e = -6 \quad (-0.025 \cdot 2^{-6}) = 1.6$$

$$0.025 \cdot 2 = 0.5 \quad \text{Exp} = e + 127 = 121 = (0111001)$$

$$0.05 \cdot 2 = 0.1$$

$$0.1 \cdot 2 = 0.2$$

$$0.2 \cdot 2 = 0.4$$

$$0.4 \cdot 2 = 0.8$$

$$0.8 \cdot 2 = 1.6$$

$$0.6 \cdot 2 = 1.2$$

$$0.2 \cdot 2 = 0.4$$

$$0.4 \cdot 2 = 0.8$$

$$0.8 \cdot 2 = 1.6$$

Repeat

$$2.1010 = \overset{S}{[0]} \overset{\text{Exp}}{[100100]} \overset{\text{Mantissa}}{[111110010...]}$$

$$101012 = 505 \quad 0 \quad S = 0$$

$$505 / 2 = 252 \quad 1 \quad \text{Exp} = 136 [100100]$$

$$252 / 2 = 126 \quad 0 \quad 136 / 2 = 68 \quad 0$$

$$126 / 2 = 63 \quad 0 \quad 68 / 2 = 34 \quad 0$$

$$63 / 2 = 31 \quad 1 \quad 34 / 2 = 17 \quad 0$$

$$31 / 2 = 15 \quad 1 \quad 17 / 2 = 8 \quad 1$$

$$15 / 2 = 7 \quad 1 \quad 8 / 2 = 4 \quad 0$$

$$7 / 2 = 3 \quad 1 \quad 4 / 2 = 2 \quad 0$$

$$3 / 2 = 1 \quad 1 \quad 2 / 2 = 1 \quad 0$$

$$1 / 2 = 0 \quad 1 \quad 1 / 2 = 0 \quad 1$$

$$C. 44 + 9 = 01101016$$

$$1. 44 / 2 = 22 \quad 0$$

$$22/2 = 110$$

$$11/2 = 51$$

$$5/2 = 21$$

$$2/2 = 10$$

$$1/2 = 01$$

$$9/2 = 41$$

$$4/2 = 20$$

$$2/2 = 10$$

$$1/2 = 01$$

$$\begin{array}{r} 101100 \\ + \quad 1001 \\ \hline 01101016 \end{array}$$

$$2. -33 + 33 = \underline{00000006}$$

$$-33/2 = -161$$

$$-16/2 = -80$$

$$-8/2 = -40$$

$$-4/2 = -20$$

$$-2/2 = -10$$

$$-1/2 = 01$$

$$\begin{array}{r} 33 \quad 0100001 \\ -33 \quad \underline{1011111} \\ 0000000 \end{array}$$

$$3. -6 - 60 = \underline{01111106}$$

$$-6/2 = -30 \quad 60/2 = 300$$

$$-3/2 = -11 \quad 30/2 = 150$$

$$-1/2 = 01 \quad 15/2 = 71$$

$$7/2 = 31$$

$$3/2 = 11$$

$$1/2 = 01$$

$$-60^{(2's)} = 1111010$$

$$-6(2's) = \underline{1000100} \\ 1011110$$

D.

$$1. 0.333$$

$$0.333 = \underline{0.010101016}$$

$$0.333 \cdot 2^8 = 85$$

$$85/2 = 42 (1)$$

$$42/2 = 21 (0)$$

$$21/2 = 10 (1)$$

$$10/2 = 5 (0)$$

$$5/2 = 2 (1)$$

$$2/2 = 1 (0)$$

$$1/2 = 0 (1)$$

$$2. 0.845 = \underline{0.110110006}$$

$$0.845 \cdot 2^8 = 216$$

$$216/2 = 108 (0)$$

$$108/2 = 54 (0)$$

$$54/2 = 27 (0)$$

$$27/2 = 13 (1)$$

$$13/2 = 6 (1)$$

$$6/2 = 3 (0)$$

$$3/2 = 1 (1)$$

$$1/2 = 0 (1)$$

E. Binary  $\rightarrow$  Fractional Decimal

$$1. 1.010101 = \underline{1.328125}$$

$$(1 \times 2^0) = 1$$

$$(1 \times 2^{-2}) = 0.25$$

$$(1 \times 2^{-4}) = 0.0625 +$$

$$(1 \times 2^{-6}) = 0.015625 +$$

$$\underline{1.328125}$$

$$2. 0.101001 = 0.6875$$

$$2.01011006 = 0.6875$$

$$(0 \times 2^0) = 0 +$$

$$(1 \times 2^{-1}) = 0.5 +$$

$$(1 \times 2^{-3}) = 0.125 +$$

$$(1 \times 2^{-4}) = 0.0625$$

$$\underline{0.6875}$$