

Midterm

Conversion to NASA 4-Byte Float

- a) Convert the following 3 numbers to binary, octal and hex 49.1875, 3.07421875, 0.2. When done, convert the following to a float representation by the definition in class.
- b) Do the same given that they're negative.
- c) Convert the float representations of the following into the decimal number given the definition in class, 69999902, 69999903, 966667FF

a) 49.1875_{10}

$$49 \rightarrow 31_{16}$$

$$0.1875 \times 16 = 3.0$$

$$49.1875_{10} \rightarrow \boxed{31.3}_{16}$$

$$\begin{array}{ccccccc} & & & & & & \\ & 3 & & 1 & & . & 3 \\ & 0011 & & 0001 & & & 0011 \\ 49.1875_{10} \rightarrow & \boxed{00110001.0011_2} & & & & & \end{array}$$

$$\begin{array}{ccccccc} & & & & & & \\ & 0 & 0 & 1 & 1 & 0 & 0 \\ & 0 & 6 & 1 & 1 & 1 & 4 \\ \hline & 0 & 0 & 1 & 1 & 0 & 0 \end{array}$$

$$49.1875_{10} \rightarrow \boxed{61.148}$$

49.1875_{10} in NASA Format

$$49.1875_{10} \rightarrow 001100010011_2$$

$$0.1100010011 \times 2^6$$

$$0.110,0010 | 0110,0000 | 0000,0000 | 0000,0110$$

NASA Flat Representation

62600006

$$3.07421875_{10}$$

$$3 \rightarrow 3_{16}$$

$$.07421875 \times 16 = 1.1875$$

$$.1875 \times 16 = 3.0$$

$$3.07421875_{10} = \boxed{3.13}_{16}$$

$$\begin{array}{r} 3. \quad \quad \quad 3 \\ 0011 \quad 0001 \quad 0011 \\ \hline 3.07421875_{10} = \boxed{0011.00010011_2} \end{array}$$

$$\begin{array}{r} 000011,000100110 \\ \hline 3. \quad 0 \quad 4 \quad 5 \end{array}$$

$$3.07421875_{10} = \boxed{3.0458}$$

3.07421875_{10} in NASA Float

$$3.07421875_{10} = 0011,00010011_2$$

$$0.1100010011 \times 2^2$$

$$0.110,0001 | 0011,0000 | 0000,0000 | 0000,0010$$

NASA Representation: 61300002

$$0.2_{10}$$

$$0.2 \times 16 = 3.2$$

$$0.2_{10} = \boxed{0.\underline{33}_{16}}$$

$$\begin{array}{r} 0. \quad 3 \quad 3 \\ 0011 \quad 0011 \end{array}$$

$$0.2_{10} = \boxed{0.\underline{0011}_2}$$

$$\begin{array}{r} .001,100,10011,201,100,110,013 \\ .1 \quad 4 \quad 6 \quad 3 \quad 1 \quad 4 \quad 6 \quad 3 \end{array}$$

$$0.2_{10} = \boxed{0.\underline{1463}_8}$$

0.2_{10} in NASA Float

$$0.2_{10} = 0.\underline{33}_{16}$$

0.3 3 3 3 3 3
 $0.9_{10} 0110 0110 0110 0110 0110$

$$0.\underline{110011}_2 \times 2^{-1} \quad \begin{array}{r} 0000 \quad 0001 \\ 1111 \quad 1110 \\ 1111 \quad 1111 \end{array}$$

$0.110, 0110 | 0110, 0110 | 0110, 0110 | 1111, 1111$

[66666FF]

b) -49.1875_{10}

Given that $49.1875_{10} = 00110001.0011_2$

$$\begin{array}{r} 00110001 \\ 11001110 \\ +1 \\ \hline -49 = 11001111_2 \end{array} \quad \begin{array}{r} 0011 \\ 1100 \\ +1 \\ \hline 1101_2 = -1875_{10} \end{array}$$

$$-49.1875_{10} = [11001111.1101_2]$$

$$-49.1875_{10} = [C F. D16]$$

$$\begin{array}{r} 011001111.110100 \\ 3 \quad 1 \quad 7.64 \\ \hline \end{array}$$

$$-49.1875_{10} = [317.64]_8$$

- 49.1875 to NASA Float

$$-49.1875_{10} = 1100111.101_2$$

$$= 0.11001111101 \times 2^8$$

$$0.110,0111110,1000|0000,0000|0000,1000$$

67 E 80008

- 3.07421875₁₀

Given that $3.07421875_{10} = 3.13_{16}$

$$\begin{array}{r} -3 . \quad \quad \quad 3 \\ 0011 \quad \quad 0001 \quad 0010 \\ 1100 \quad \quad 1110 \quad 1101 \\ +1 \quad \quad \quad \quad \quad +1 \\ \hline -3_{10} = 1101_2 \quad \quad \quad 11101110_2 \end{array}$$

$$-3.07421875_{10} = [1101.11101110_2]$$

$$-3.07421875_{10} = [D.EE_{16}]$$

$$-3.07421875_{10} = \underbrace{001101}_{1\ 5}.\underbrace{111011100}_{7\ 3\ 4}_2$$

$$-3.07421875_{10} = [15.734_8]$$

- 3.07421875₁₀ to NASA Float

$$-3.07421875_{10} = \underline{1101_2} 11101110_2$$

$$0.11011101110 \times 2^4$$

$$0.110,111/011,0000/0000,0000/0000,0100$$

| 6 F 7 000 04 |

$$-0.2_{10}$$

Given that $0.2_{10} = 0.3_{16}$

$$-0.2_{10} = \underline{[0.3]_{16}}$$

$$-0.2_{10} = \underline{[0.\underline{1101}_2]}$$

$$-0.2_{10} = \underline{[0.\underline{64}]_8}$$

- 0.2_{10} in NASA Format

$$0.110,110/110,1110/1110,1110/0000\ 0000$$

| 6 EEEEE00 |

c) 69999902

0.110,1001/1001,1001/1001,1001/0000,0010

$$0.11010011001100110011001 \times 2^2$$

$$= 011.0100\underline{1100}1100,1100,1100,1_2$$

$$011_2 = 3_{10}$$

∴ 01001100 1100 1100 1100 1100 1000₂

3. 4CCCCC8₁₆