

Prob 6:

Conversion to NASA 4 byte format

a) 1)  $51.1875_{10} \rightarrow 33.3_{16} \rightarrow 00110011.0011_2 \rightarrow 63.14_8$

$$\begin{array}{r} 3 \\ 16 \overline{) 81} \\ -48 \\ \hline 3 \end{array} \quad .1875 \cdot \quad \begin{array}{l} \uparrow \\ \text{Hex} \end{array}$$

↑  
Binary

↑  
Octal

$$?110011.0011 = .1100110011 \times 2^6$$

$$6 = 0000\ 0110$$

$$51.1875_{10} = .1100110011_2 \times 2^6 = .\underline{\underline{11}}\underline{\underline{00}}\underline{\underline{11}}\underline{\underline{00}}|\underline{\underline{11}}\underline{\underline{00}}\underline{\underline{0000}}|\underline{\underline{0000}}\underline{\underline{0000}}|\underline{\underline{0000}}\underline{\underline{0110}}$$

C C C O O O O 6

a) 2)  $3.19921875_{10} \rightarrow 3.33_{16} \rightarrow 0011.00110011_2 \rightarrow 3.146_8$

$$.19921875 \times 16 = 3.1875$$

$$.1875 \times 16 = 3$$

Hex

Binary

Octal

$$\hookrightarrow ?11.00110011 = .1100110011 \times 2^2$$

$$2 = 0000\ 0010$$

$$3.19921875_{10} = .1100110011_2 \times 2^2 = .\underline{\underline{11}}\underline{\underline{00}}\underline{\underline{11}}\underline{\underline{00}}|\underline{\underline{11}}\underline{\underline{00}}\underline{\underline{0000}}|\underline{\underline{0000}}\underline{\underline{0000}}|\underline{\underline{0000}}\underline{\underline{0010}}$$

C C C O O O O 2

	Hex	Binary	Octal
a) 3)	$0.2_{10} \rightarrow 0.\overline{3}_{16} \rightarrow .\overline{0011}_2 \rightarrow 0.1463_8$		
		$\hookrightarrow .\overline{00110011} = .\overline{110011} \times 2^{-2}$	
	$0.2 \times 16 = 3.2$	$2 = 0000\ 0010$	
	$0.2 \times 16 = 3.2$	$\sim 2 = 1111\ 1101$ +1	
		$-2 = 1111\ 1110$	
			$C\ C\ C\ C\ C\ F\ E$
	$0.2_{10} \Rightarrow .\overline{110011} \times 2^{-2} = .\underline{\underline{1100}}\ \underline{\underline{1100}}\  \ \underline{\underline{1100}}\ \underline{\underline{1100}}\  \ \underline{\underline{1100}}\ \underline{\underline{1100}}\  \ \underline{\underline{1111}}\ \underline{\underline{1110}}$		

b) i)  $-51.1875_{10} = -.1100110011_2 \times 2^6$

$$= 1100\ 1100\ |\ 1100\ 0000\ |\ 0000\ 0000\ |\ 0000\ 0000\ |\ 0000\ 0110$$

$$\sim 0011\ 0011\ 0011\ 1111\ 1111\ 1111$$

$$\underline{\underline{0011}}\ \underline{\underline{0011}}\ |\ \underline{\underline{0100}}\ \underline{\underline{0000}}\ |\ \underline{\underline{0000}}\ \underline{\underline{0000}}\ |\ \underline{\underline{0000}}\ \underline{\underline{0110}}$$

$$3\ 3\ 4\ 0\ 0\ 0\ 0\ 6$$

b) ii)  $-3.19921875_{10} = .1100110011_2 \times 2^2 =$

$$= 1100\ 1100\ |\ 1100\ 0000\ |\ 0000\ 0000\ |\ 0000\ 0010$$

$$\sim 0011\ 0011\ 0011\ 1111\ 1111\ 1111\ 0\ 2$$

$$\underline{\underline{0011}}\ \underline{\underline{0011}}\ |\ \underline{\underline{0100}}\ \underline{\underline{0000}}\ |\ \underline{\underline{0000}}\ \underline{\underline{0000}}$$

$$3\ 3\ 4\ 0\ 0\ 0\ 0\ 2$$

$$\begin{aligned}
 b) 3) -0.2_{10} &= .1\overline{0011}_2 \times 2^2 \\
 &= 1100 \ 1100 \ | 1100 \ 1100 \ | 1100 \ 1100 \ | 1111 \ 1110 \\
 &\sim 0011 \ 0011 \ 0011 \ 0011 \ 0011 \ 0011 \quad F \ E \\
 &\underline{0011} \ \underline{0011} \ | \underline{0011} \ \underline{0011} \ | \underline{0011} \ \underline{0100} \\
 &\quad 3 \quad 3 \quad 3 \quad 3 \quad 3 \quad 4 \quad F \ E
 \end{aligned}$$

$$\begin{aligned}
 A) 169999902 &= .0110 \times 2^2 \\
 &= 0110 \ 1001 \ | 1001 \ 1001 \ | 1001 \ 1001 \ | 0000 \ 0010 \\
 &= 1.\overline{101001}_2 \text{ or } .0110\overline{1001} \times 2^2
 \end{aligned}$$

$$\begin{aligned}
 2) 69999903 &= .0110 \ 1001 \ | 1001 \ 1001 \ | 1001 \ 1001 \ | 0000 \ 0011 \\
 &= 11.\overline{01001} \text{ or } .0110\overline{1001} \times 2^3
 \end{aligned}$$

3) 966667 FF

$$\begin{aligned}
 &= 1001 \ 0110 \ | 0110 \ 0110 \ | 0110 \ 0110 \ | 1111 \ 1111 \\
 &.01001 \ 0110 \ 0110 \ 0110 \ 0110 \ 0110 \ 1111_2 \quad 1111 \ 1110 \\
 &\quad \text{or} \quad \sim 0000 \ 0001 = 1 \\
 &.1001 \ 0110 \ 0110 \ 0110 \ 0110 \ 0110 \ 0110 \ 0110 \ 0110 \ 0110 \ 0110 \ 0110 \ 1111_2 \quad 1111 \ 1110
 \end{aligned}$$