

# Problem #6: Conversion:

a)  $2.875$  &  $0.1796875$  from base 10 to 2, 8, 16

Base 2

$$2.875_{10} \rightarrow ?_2 \rightarrow 2.875_{10} \rightarrow \boxed{10.111_2}$$

$\downarrow$

$$\begin{array}{l} 0010_2 \\ \swarrow \searrow \end{array} \left\{ \begin{array}{l} .875 \times 2 = 1.75 \rightarrow 1 \\ .75 \times 2 = 1.50 \rightarrow 1 \\ .50 \times 2 = 1.00 \rightarrow 1 \\ .0 \times 2 = 0 \rightarrow 0 \end{array} \right. \downarrow$$

$\rightarrow 10.111_2$

Base 8

$$2.875_{10} \rightarrow 10.111_2 \rightarrow \boxed{2.7_8}$$

$10_{10} = 2_8$   
 $.111_2 = .7_8$

Base 16

$$2.875_{10} \rightarrow 10.111_2 \rightarrow ?_{16} \rightarrow \boxed{2.E_{16}}$$

$00/0.1110$   
 $\downarrow \quad \downarrow$   
 $2 \quad , \quad E$

Base 2:

$$0.1796875_{10} \rightarrow ?_2 \rightarrow \boxed{0.00101110_2}$$

$\rightarrow 0_{10} = 0_2$

$.1796875 \times 2 = 0.359375$	$\rightarrow 0$
$.359375 \times 2 = 0.71875$	$\rightarrow 0$
$.71875 \times 2 = 1.4375$	$\rightarrow 1$
$.4375 \times 2 = 0.875$	$\rightarrow 0$
$.875 \times 2 = 1.75$	$\rightarrow 1$
$.75 \times 2 = 1.50$	$\rightarrow 1$
$.50 \times 2 = 1.00$	$\rightarrow 1$
$.00 \times 2 = 0$	$\rightarrow 0$

Base 8

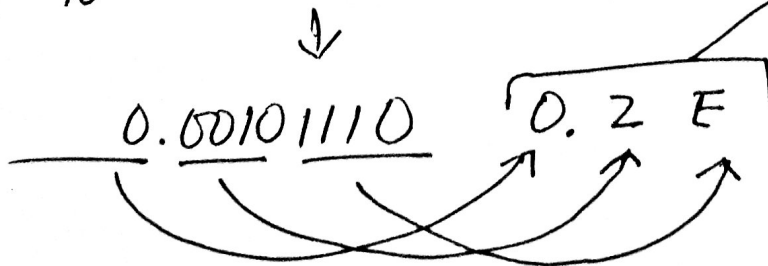
$$0.1796875_{10} \rightarrow 0.00101110_2 \rightarrow ?_8 \rightarrow \boxed{0.134_8}$$

\*a zero was added for triplet conversion.



Base 16

$$0.1796875_{10} \rightarrow 0.00101110_2 \rightarrow ?_{16} \rightarrow \boxed{0.2E_{16}}$$



59999901 NASA FORMAT HEX  $\rightarrow ?_{10}$

0.101							
1001	1001	1001	1001	1001	1001	0000	0001
5	9	9	9	9	9	0	1

↑  
positive

↑  
positive.

$$0.10110011001100110011001 \times 2^1$$

$$\begin{matrix} .1 & .2 & .3 & .6 & .7 & .10 & .11 & .14 & .15 & .18 & .19 & .22 \\ 1.0 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 1 \end{matrix}$$

integer part = 1.

fractional part =  $2^{-2} + 2^{-3} + 2^{-4} + 2^{-7} + 2^{-10} + 2^{-11} + 2^{-14} + 2^{-15} + 2^{-18} + 2^{-19} + 2^{-22}$

.25 +  
↓  
.375  
↓  
.390625

etcetera...  
add on calculator...

1.399997857<sub>10</sub>

59999702 NASA FORMAT Hex  $\rightarrow$  ?<sub>10</sub>

0.1011001 | 10011001 | 10011001 | 00000010

5      9      9      9      9      9      0      2

positive      positive

$0.10110011001100110011001 \cdot \cdot \cdot \times 2^2$   
 $\downarrow$   
 $10.110011001100110011001$

integer part = 2.

fractional part =  $2^{-1} + 2^{-2} + 2^{-5} + 2^{-6} + 2^{-9} + 2^{-10} + 2^{-13} + 2^{-14} + 2^{-17} + 2^{-18} + 2^{-21}$

Handwritten diagram illustrating the iterative calculation of  $2.799999714_{10}$ . The diagram shows a sequence of values being added, represented by arrows pointing downwards, labeled with values:  $0.5 +$ ,  $.75$ , and  $.78125$ . A curved arrow points from the box containing  $2.799999714_{10}$  to the first arrow. To the right, the text "etcetera... added on calculator." is written.

A66667FE NASA FORMAT Hex  $\rightarrow ?_{10}$

1 0 1 0 0 1 1 0	0 1 1 0 0 1 1 0	0 1 1 0 0 1 1 1	1 1 1 1 1 1 1 0
A 6	6 6	6 7	F E

negative

negative

$\times 2^{-2}$

-1.0100110011001100110011

-101.00110011001100110011

integer part = -5.

fractional part =  $2^{-3} + 2^{-4} + 2^{-7} + 2^{-8} + 2^{-11} + 2^{-12} + 2^{-15} + 2^{-16} + 2^{-19} + 2^{-20} + 2^{-21}$

-5.200000286<sub>10</sub>