Base conversion exercises 2019/10/11

Conversions

Convert the following numbers to their representatives in base 2, 16, & 10.

0110 01002	
= 64 ₁₆	binary is hex
$= 6 \times 16 + 4 \times 1$	
= 100 ₁₀	
47 ₁₆	
$= \boxed{0100\ 0111_2}$	binary is hex
$= 4 \times 16 + 7 \times 1$	
$= \boxed{71_{10}}$	
47 ₁₀	

$$47 \div 16 = 2 R15$$

$$15 \div 1 = 15 R0$$

$$= |2F_{16}| = |0010 1111_2|$$

binary is hex

$$1010\ 1010\ 1010_{2}$$

$$= \boxed{AAA_{16}}$$
 binary is hex
$$= 2560 + 160 + 10$$

$$= \boxed{2730_{10}}$$

$$7E3_{16}$$

$$= 0111 1110 0011_{2}$$
binary is hex
$$= 7 \times 256 + 14 \times 16 + 3 \times 1$$

$$= 1792 + 224 + 3$$

$$= 2019_{10}$$

999₁₀

$$999 \div 256 = \boxed{3} R231 \\
231 \div 16 = \boxed{14} R7 \\
7 \div 1 = \boxed{7} R0$$

$$3E7_{16}$$

$$0011 1110 0111_{2}$$

1800₁₀

 708_{16}

0111 0000 10002

$$1800 \div 256 = \boxed{7} R8$$

$$8 \div 16 = \boxed{0} R8$$

$$8 \div 1 = \boxed{8} R0$$
binary is hex

$$1111 \ 1111 \ 1111 \ 1111 \ 1111 \ 1111 \ 1111 \ 1111$$

$$= 2^{32} - 1 = \boxed{4,294,967,295}$$

Bonus

Calculate the date that a fixed-point, 32-bit, 2's-complement number of seconds will not be enough to count the seconds from midnight 1970/01/01. (When is 2^{31} seconds from midlight 1970/01/01?)

$$2^{31} \div 60 \div 60 \div 24 \div 365.25 + 1970 \approx 2038.05$$

Since... $0.05 \times 365.25 \approx 18$

The fixed-point, 32-bit, 2's-complement number of seconds will overflow on 2038/01/19 (the so-called *Year 2038 Problem*).