

Q1.

$$a) (735)_8 = (7 \times 8^2) + (3 \times 8^1) + (5 \times 8^0) = 448 + 24 + 5 = (477)_{10}$$

$$b) (525)_6 = (5 \times 6^2) + (2 \times 6^1) + (5 \times 6^0) = 180 + 12 + 5 = 197$$

Q2.

$$a) 1.10010$$

$$\Downarrow$$

$$\underbrace{0001.10010000}_{1 \quad 9} = (1.9)_{16}$$

$$1.10010 = 1 \times 2^0 + 1 \times 2^{-1} + 0 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4} + 0 \times 2^{-5}$$

$$= 1 + 1/2 + 1/16$$

$$= (1.5625)_{10}$$

$$b) 110.010$$

$$\Downarrow$$

$$\underbrace{0110.0100}_{6 \quad 4} = (6.4)_{16}$$

$$110.010 = (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) + (0 \times 2^{-1}) + (1 \times 2^{-2}) + (0 \times 2^{-3})$$

$$= 4 + 2 + 1/4 = (6.25)_{10}$$

$\Rightarrow 110.010$ is four times 1.10010 because we shifted the dot 2 digit right. So our number grows 2^2 times.

Q3.

$$a) \begin{array}{r} 10000000 \\ 1's \quad 01111111 \\ + \quad \quad \quad 1 \\ \hline 2's \quad 10000000 \end{array}$$

$$b) \begin{array}{r} 00000000 \\ 1's \quad 11111111 \\ + \quad \quad \quad 1 \\ \hline 2's \quad 10000000 \end{array}$$

$$c) \begin{array}{r} 11011010 \\ 1's \quad 00100101 \\ + \quad \quad \quad 1 \\ \hline 2's \quad 00100110 \end{array}$$

$$d) \begin{array}{r} 01110110 \\ 1's \quad 10001001 \\ + \quad \quad \quad 1 \\ \hline 2's \quad 10001010 \end{array}$$

Q4.

a) $10011 - 10001$

2's complement of $10001 \Rightarrow 01110 + 1 \Rightarrow 01111$

$$\begin{array}{r} 10011 \\ - 10001 \\ \hline \end{array} \equiv \begin{array}{r} 10011 \\ + 01111 \\ \hline 100010 \end{array}$$

b) $100010 - 100011$

2's complement of $100011 \Rightarrow 011100 + 1 \Rightarrow 011101$

$$\begin{array}{r} 100010 \\ - 100011 \\ \hline \end{array} \Rightarrow \begin{array}{r} 100010 \\ + 011101 \\ \hline 111111 \Rightarrow -000001 \end{array}$$

c) $1001 - 101000$

2's complement of $101000 \Rightarrow 010111 + 1 \Rightarrow 011000$

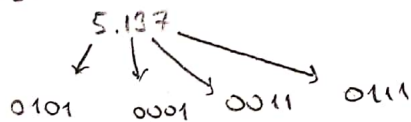
$$\begin{array}{r} 001001 \\ - 101000 \\ \hline \end{array} \equiv \begin{array}{r} 001001 \\ + 011000 \\ \hline 100001 \Rightarrow -011111 \end{array}$$

d) $110000 - 10101$

2's complement of $10101 \Rightarrow 101010 + 1 = 101011$

$$\begin{array}{r} 110000 \\ - 10101 \\ \hline \end{array} \equiv \begin{array}{r} 110000 \\ + 101011 \\ \hline 1011011 \end{array}$$

Q5.



$$(5.137)_{10} = (0101000100110111)_{BCD}$$

For excess-3 add 3 to BCD,

$$\begin{array}{r} 0101 \\ + 0011 \\ \hline 1000 \end{array} \quad \begin{array}{r} 0001 \\ + 0011 \\ \hline 0100 \end{array} \quad \begin{array}{r} 0011 \\ + 0011 \\ \hline 0110 \end{array} \quad \begin{array}{r} 0111 \\ + 0011 \\ \hline 1010 \end{array} \Rightarrow (5.137) = (1000.010001101010)_{XS3}$$