

ITWS1 - Fall 2017 (IIIT Sricity)

Practice Assignment 1

1. Binary to Decimal Conversion

In order to convert a binary number to decimal we repeatedly add the product of digit value and the positional value.

Example: 11101 (binary)

Start at the right hand digit

$$1 * 1 = 1$$

$$0 * 2 = 0$$

$$1 * 4 = 4$$

$$1 * 8 = 8$$

$$1 * 16 = 16$$

29 (decimal)

Convert from Binary to Decimal

$$(1001101)_2 = (\rule{1.5cm}{0.4pt})_{10}$$

2. Decimal to Binary Conversion

In order to convert a decimal number to binary, we may repeatedly subtract the largest possible binary positional value from the number and place a 1 if a subtraction is possible and 0 if not.

Example: 329 (decimal)

$$329 - 1024 \text{ no,} \quad 0$$

$$329 - 512 \text{ no,} \quad 0$$

$$329 - 256 = 73, \quad 1$$

$$73 - 128 \text{ no,} \quad 0$$

$$73 - 64 = 9, \quad 1$$

$$9 - 32 \text{ no,} \quad 0$$

$$9 - 16 \text{ no,} \quad 0$$

$$9 - 8 = 1, \quad 1$$

$$1 - 4 \text{ no,} \quad 0$$

$$1 - 2 \text{ no,} \quad 0$$

$$1 - 1 = 0 \quad 1$$

Positional Values

1024	512	256	128	64	32	16	8	4	2	1
0	0	1	0	1	0	0	1	0	0	1

Therefore: 329 (decimal) = 101001001 (binary)

Convert from Decimal to Binary

$$(1539)_{10} = (\rule{1.5cm}{0.4pt})_2$$

3. Convert the following binary numbers to decimal:

- a) 11111_2
- b) 101101_2
- c) 1100011_2
- d) 101_2
- e) 0.11_2
- f) 101.11_2
- g) 1010_2
- h) 10100_2
- i) 101000_2

4. Looking at your working in 3g-h, in general, if B is some binary number (such as 1010_2), what number do you get when you attach a zero at the right end (such as 10100_2). What number do you get when you attach 2 zeros at the right end? In general, what number do you get when you attach n zeros at the right end?

5. Counting in different number systems. Complete a table of the decimal values from 0 through 18 written in the following bases: Binary, Octal, and Hex.

Binary	Octal	Decimal	Hex
0000	0	0	0
0001	1	1	1
0010	2	2	2
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
		11	
		12	
		13	
		14	
		15	
		16	
		17	
		18	

6. Complete the following table.

For octal - binary conversions, each octal digit is represented by 3 binary digits. For hexadecimal - binary conversions, each hexadecimal digit is represented by 4 binary digits.

BINARY	OCTAL	DECIMAL	HEX
100110110101			
	3734		
			2B4

7. Write the code for the following ASCII characters. Show binary, hex and decimal values.

Hex C _____ c _____

Binary C _____ c _____

Decimal C _____ c _____

Hex Y _____ y _____

Binary Y _____ y _____

Decimal Y _____ y _____

8. Fill in the following binary values table. This exercise is designed to help students understand the effect of the size of a number on both the magnitude of a number and the number of values which can be represented.

Unit	Number of Bits n	Largest Number $2^n - 1$	Number of values 2^n
Bit	1		
2 Bit	2		
Nibble	4		
Byte	8		
1K	10		
2 bytes	16		
3 bytes	24		
Full word * (Signed Long)	32		

* Just give the largest positive number and the number of positive values.

9. Write a table of all the possible values of a 4bit signed binary number. Start off with +7 at the top and continue down to -8.

Hint: To make sure that you are on track, calculate the complement of a positive number to verify that you have correctly calculated the value of the equivalent negative number.

Value	Signed binary	Value	Signed binary
+7	0111	-1	_____
+6	_____	-2	_____
+5	_____	-3	_____
+4	_____	-4	_____
+3	_____	-5	_____
+2	_____	-6	_____
+1	_____	-7	_____
+0	_____	-8	_____

10. Represent 0.78125, 1.25, and 78.725 in binary.