OC - Fall 2018 (IIIT Sri City)

Practice Assignment 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

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29 (decimal)

# Convert from Binary to Decimal

(1001101)2 = ( **77** ) 10

# 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 no, 0

329-512 no, 0

329-256=73, 1

73-128 no, 0

73-64=9, 1

9-32 no, 0

9-16 no, 0

9-8=1, 1

1-4 no, 0

1-2 no, 0

1-1=0 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 = ( **11000000011** )2

1. Convert the following binary numbers to decimal:

a) 111112

b) 1011012

c) 11000112

d) 1012

e) 0.112

f) 101.112

g) 10102

h) 101002

i) 1010002

**31**

**45**

**99**

**5**

**0.75**

**5.75**

**10**

**20**

**30**

1. Looking at your working in 3g-h, in general, if B is some binary number (such as 10102), what number do you get when you attach a zero at the right end (such as 101002). 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?

**We will get 40 when we add two zeros at end of (1010)2 . The number will be Multiplied by ‘2’ for n number of times (multiplied by 2n). Provided the memory can hold the number.**

1. **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 |
| 0011 | 3 | 3 | 3 |
| 0100 | 4 | 4 | 4 |
| 0101 | 5 | 5 | 5 |
| 0110 | 6 | 6 | 6 |
| 0111 | 7 | 7 | 7 |
| 1000 | 10 | 8 | 8 |
| 1001 | 11 | 9 | 9 |
| 1010 | 12 | 10 | A |
| 1011 | 13 | 11 | B |
| 1100 | 14 | 12 | C |
| 1101 | 15 | 13 | D |
| 1110 | 16 | 14 | E |
| 1111 | 17 | 15 | F |
| 10000 | 20 | 16 | 10 |
| 10001 | 21 | 17 | 11 |
| 10010 | 22 | 18 | 12 |

# 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** | 4665 | 2485 | 9B5 |
| 011111011100 | **3734** | 2012 | 7DC |
| 001010110100 | 1264 | 692 | **2B4** |

1. **Write the code for the following ASCII characters**. Show binary, hex and decimal values. Hex C (43)16 c (63)16

Binary C (0100 0011)2 c (0110 0011)2

Decimal C 67 c 99

Hex Y (59)16 y (79)16

Binary Y (0101 1001)2 y (0111 1001)2

Decimal Y 89 y 121

1. **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 2n-1 | Number of values 2n |
| Bit | 1 | 1 | 2 |
| 2 Bit | 2 | 3 | 4 |
| Nibble | 4 | 15 | 16 |
| Byte | 8 | 255 | 256 |
| 1K | 10 | 1023 | 1024 |
| 2 bytes | 16 | 65535 | 65536 |
| 3 bytes | 24 | 1682751 | 1682752 |
| Full word \* (Signed Long) | 32 | 2147483647 | 4294967296 |

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

1. 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 1111

+6 0110

-2 1110

+5 0101

-3 1101

+4 0100

-4 1100

+3 0011

-5 1011

+2 0010

-6 1010

+1 0001

-7 1001

+0 0000

-8 1000

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

* 0.78125 = 0.5 \* **1** + 0.25 \* **1** + 0.125 \* **0** + 0.0625 \* **0** + 0.03125 \* **1** = (0.11001)2
* 1.25 = 1 \* **1** + 0.5 \* **0** + 0.25 \* **1** = (1.01)2
* 78.725 = (1001110.10111001)2

78 = 64 \* **1** + 32 \* **0** + 16 \* **0** + 8 \* **1** + 4 \* **1** + 2 \* **1** + 1 \* **0** = **(11001110)2**

0.725 \* 2 = 1.45 = 1

0.45 \* 2 = 0.90 = 0

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0.90 \* 2 = 1.80 = 1

0.80 \* 2 = 1.60 = 1

0.60 \* 2 = 1.20 = 1

0.20 \* 2 = 0.40 = 0

0.40 \* 2 = 0.80 = 0

0.80 \* 2 = 1.60 = 1