

Digital Representation

- Convert ANALOG to DIGITAL measurement by using a scale of units
- DIGITAL measurements
 - In units – a set of symbolic values – **digits**
 - Values larger than any symbol in the set use sequence of digits – **Units, Tens, Hundreds...**
 - Measured in discrete or whole units
 - Difficult to measure something that is not a multiple of units in size. **Eg Fractions**



Binary Number System

- Also called the “Base 2 system”
- The binary number system is used to model the series of electrical signals computers use to represent information
 - 0 represents the no voltage or an off state
 - 1 represents the presence of voltage or an on state



Division Algorithm

Convert 67 to its binary equivalent:

$$67_{10} = x_2$$

Step 1: $67 / 2 = 33 \text{ R } 1$ Divide 67 by 2. Record quotient in next row

Step 2: $33 / 2 = 16 \text{ R } 1$

Again divide by 2; record quotient in next row

Step 3: $16 / 2 = 8 \text{ R } 0$

Repeat again

Step 4: $8 / 2 = 4 \text{ R } 0$

Repeat again

Step 5: $4 / 2 = 2 \text{ R } 0$

Repeat again

Step 6: $2 / 2 = 1 \text{ R } 0$

Repeat again

Step 7: $1 / 2 = 0 \text{ R } 1$

STOP when quotient equals 0

1 0 0 0 0 1 1₂



Multiplication Algorithm

Convert (10101101)₂ to its decimal equivalent.

Binary

1 0 1 0 1 1 0 1

Positional Values

X **X** **X** **X** **X** **X** **X** **X**
 2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

Products

128 + 32 + 8 + 4 + 1

173₁₀



Octal to Binary Conversion

Each octal number converts to 3 binary digits

Preview from Notesale.co.uk
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Code
0 - 000
1 - 001
2 - 010
3 - 011
4 - 100
5 - 101
6 - 110
7 - 111

To convert 653_8 to binary, just substitute code.

6	5	3
↓	↓	↓
110	101	011



Alphanumeric Data

- Alphanumeric data such as names and addresses are represented by assigning a unique binary code or sequence of bits to represent each character.
- As each character is entered from a keyboard (or other input device) it is converted into a binary code.
- Character code sets contain two types of characters:
 - Printable (normal characters)
 - Non-printable. Characters used as control codes.
 - CTRL G (beep)
 - CTRL Z (end of file)

