Numbering system

- **A system is defined as:**
  - A group of interdependent items that interact regularly to perform a task
- **Therefore a "numbering system" is a system that deals with numbers**

Decimal Numbering System

- Is a base-10 numbering system (i.e. is based on 10 separate elements)

- Possible elements {0,1,2,3,4,5,6,7,8,9}

- You can add, subtract, multiply and divide decimal numbers

Binary Numbering System

- Is a base-2 numbering system (i.e. is based on 2 separate elements)

- Possible elements {0,1}

- Why two (2) elements?

- You can add, subtract, multiply and divide binary numbers

Hexadecimal Numbering System

- Is a base-16 numbering system (i.e. is based on 16 separate elements)

Possible elements:
$$\{0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F\}$$

- Why base-16?
- Indicate a hexadecimal with the 0x prefix

Octal Numbering System

- Is a base-8 numbering system (i.e. is based on 8 separate elements)

Possible elements: {0,1,2,3,4,5,6,7}

- Why base-8? Same reason as hexadecimal

- Indicate an octal with the 0 prefix (though not necessary)

Uses of Numbering Systems

- Decimal:
  - Day-to-day use by humans
- Binary:
  - Computer at the bit level
- Hexadecimal:
  - Computer at the address (byte) level
  - RGB colours
- Octal:
  - Computers on UNIX for permissions