Basic C Types

% C has few basic data types, which are:
- ¶ char a character
- ¶ int integer
- ¶ float floating point number
- ¶ double floating point number

% I also consider pointers to be a basic data type - a pointer is always the size of a machine address and is treated like an unsigned integer

% There are **three modifiers** that can be applied to most of the basic data types

% The **long** modifier specifies that the maximum number of bits is used to represent the value, for example on most machines a float is 32 bits and a double is 64 bits, in reality a **double** is a **long float**

% The **long** modifier is often used with the **int** type, a **long int** uses the maximum number of bits for an integer, on most machines an **int** and a **long int** are often the same data type, but this is not always the case

% The **short** modifier is used to specify that the minimum number of bits should be used, it is usually used with int's - a **short int** is **16 bits** on most machines

% The **unsigned** modifier can be used with character and integer data types, an unsigned value doesn't interpret the sign bit as a sign, it is used as part of the value, in other words unsigned values are always positive and use all the bits in the value - this is used in bit manipulation operations

- A variable declaration has the following format:
  type variable_name = initial_value ;

- The initial value part of the declaration is optional
- Several variables can be declared at the same time, the variable names are separated by commas

- A pointer is declared in the following way
  type *variable_name ;
- This type specifies <u>an item that is pointed to</u>

Constants

- Character constants are enclosed in single quotes, the \ is used as an escape character - for example '\037' is the character with octal value 37, '\n' is the end of line character
- An integer constant is a number without a decimal point, a long integer constant is an integer constant with L as a suffix - for example 123L is a long integer constant
- An integer that starts with the digit 0 is a non-decimal constant, if the 0 is followed by another digit it is an octal constant - for example 037 is an octal integer constant
- If the 0 is followed by an x or X, the constant is a hexadecimal constant - for example 0x1f is a hex constant (its decimal value is 1*16^1 + 15*16^0 = 31
- Double or floating point constants are numbers that have decimal points or exponents

Arrays

% Arrays and pointers are very closely related in C

% C basically supports one dimensional arrays, the first subscript value is always 0

% An array is declared in the following way:

```
type array_variable [ size ] ;
```

% The type is the type of the individual array elements and size is the length of the array

For example

```
int  a[100];
```

will produce an array that has 100 integers in it, the first element is a[0] and the last element is a[99]

% Arrays are initialized in the same way as basic data types, except a list of values must be specified

% For example

```
int a[10] = { 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 };
```

% A text string is a one dimensional array of char elements

% For example, a text string can be declared in the following way:

```
char  string[25];
```

% A character string constant is enclosed in double quotes ("), for example "this is a text string" - there is a major difference between single and double quotes

% In C and Unix a text string is terminated by a zero byte, this is written as '\0', an empty string requires one byte of storage, in general a string with n characters requires n+1 bytes of storage - be careful to allocate the extra byte