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FUNCTIONS AND ARRAY IN C

Dr frank guan

INF1002 – Programming Fundamentals

Week 9

RECAP OF LAST WEEK

- C programs consist of modules called functions
- The main() function is the "starting point" fora C program
- The pre-processor (begins with #) executes before a program is compiled
  - definition of symbolic constants
  - the inclusion of other files in the file being compiled
- A variable is a location in memory where a value can be stored for use by a program
- printf(): the first argument, the format control string, describe the output format
- scanf(): The first argument, the format control string, indicates the type of data that should be input by the user
- control structures
  - if – else
  - switch
  - for
  - while
  - do - while

EXPERIENCE SHARING

- “Practice makes perfect”
- Truly common if you spend one week time on:
  - Debugging
  - Troubleshooting
  - Reference reading
  - Discussion
  - Self-learning
  - …

Agenda

1. Functions
2. Arrays
3. Characters and Strings

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FUNCTIONS IN C

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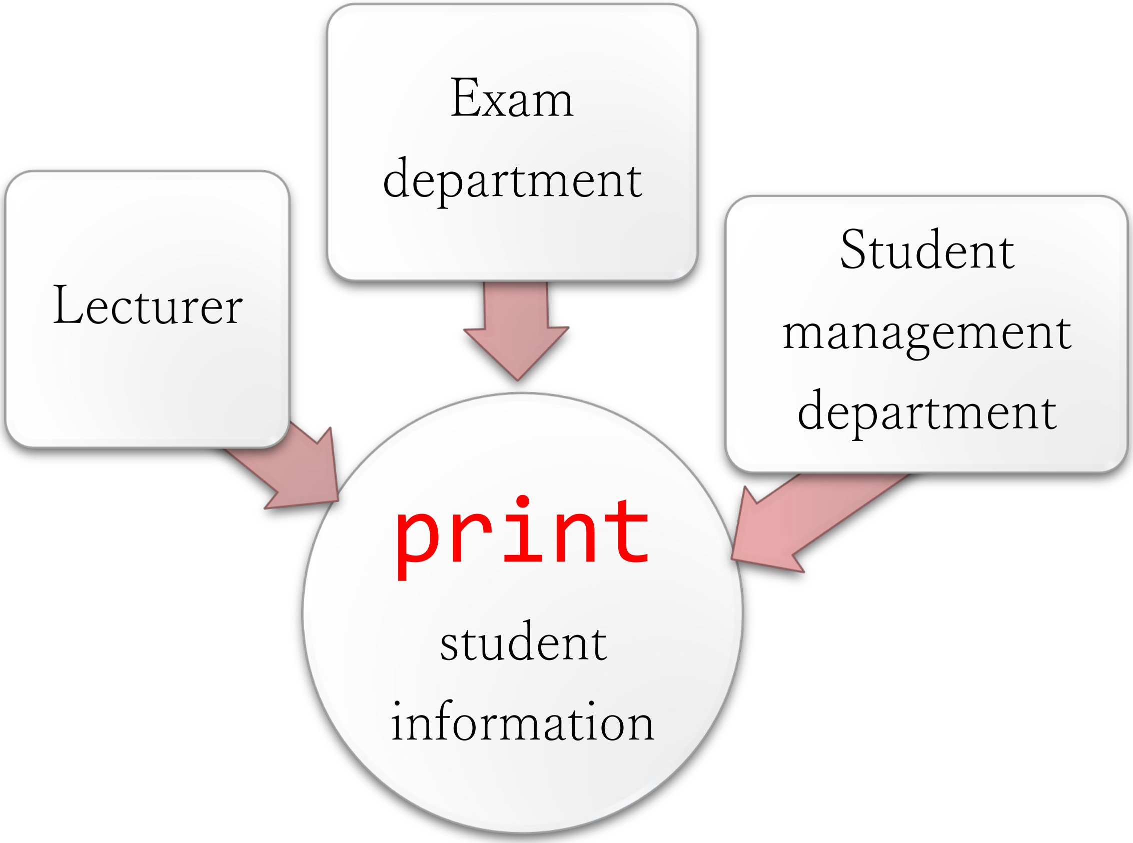
FUNCTIONS – C'S BUILDING BLOCK

Functions promote reusability.

Each function is written once.



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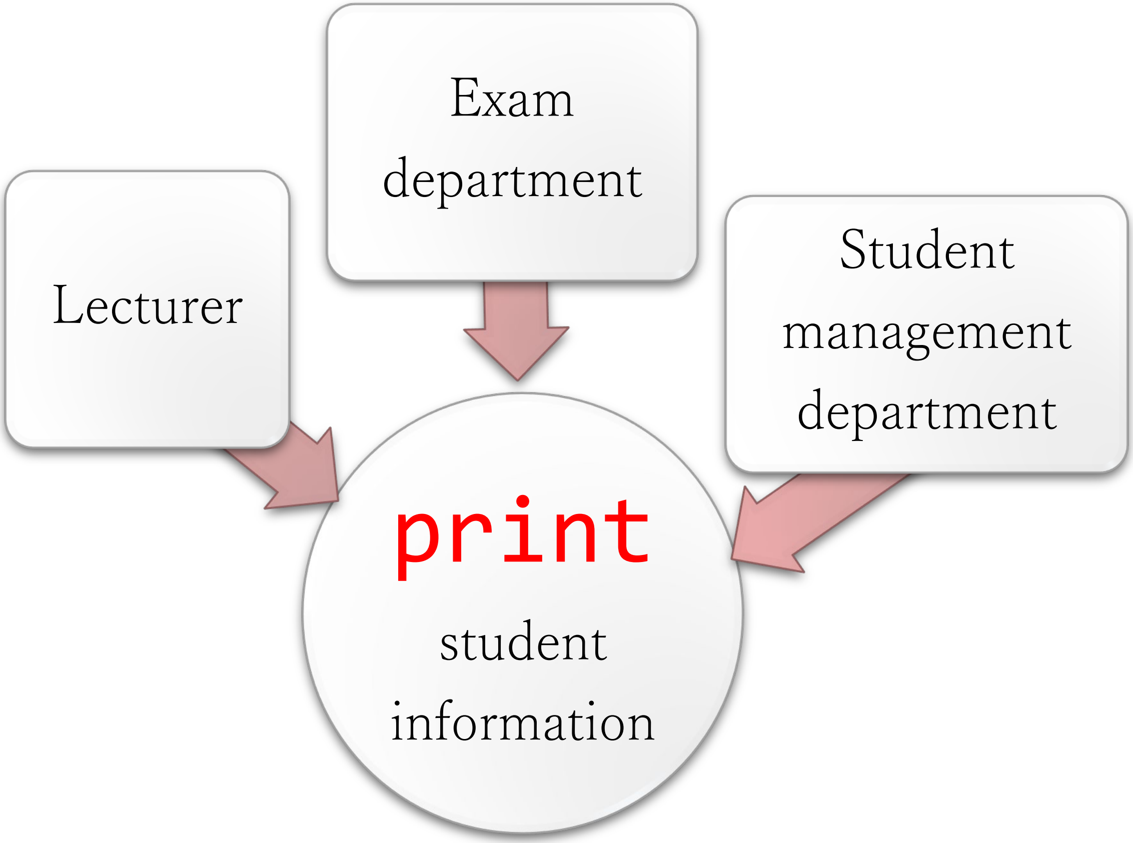
FUNCTIONS – C'S BUILDING BLOCK

The function can be used repeatedly by many other functions



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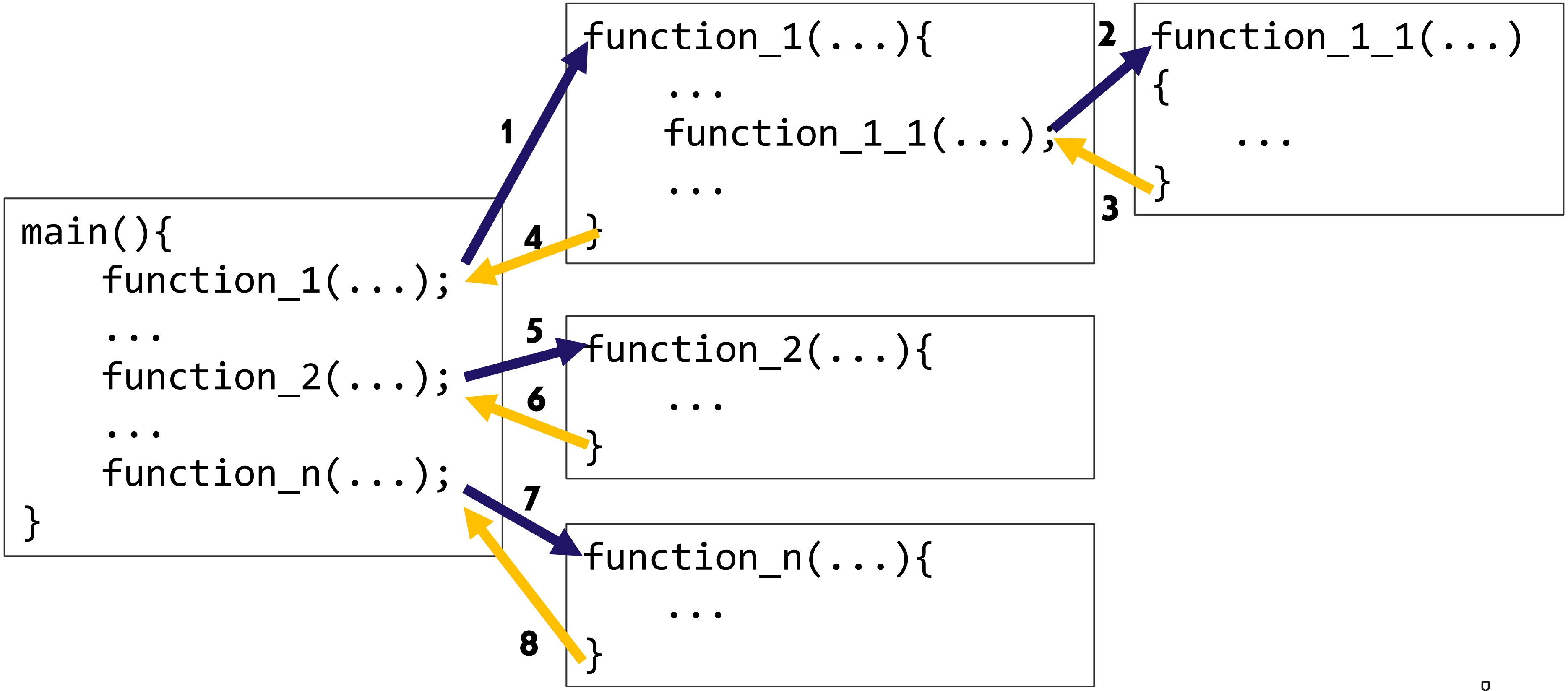
C FUNCTION CALLS

Functions are invoked by specifying their name and parameters (or arguments) without knowing the actual implementation of the function.



```
main(){
    function_1(...);
    ...
    function_2(...);
    ...
    function_n(...);
}
```

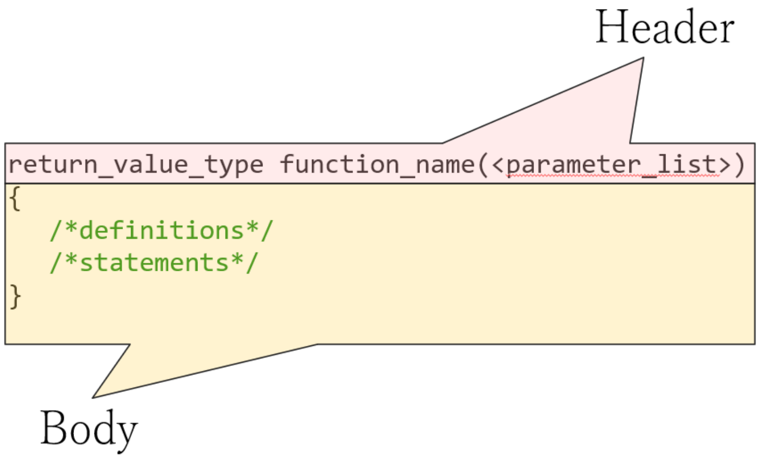
```
function_1(...){
    ...
    function_1_1(...);
    ...
}
```

```
function_1_1(...)
{
    ...
}
```

```
function_2(...){
    ...
}
```

```
function_n(...){
    ...
}
```

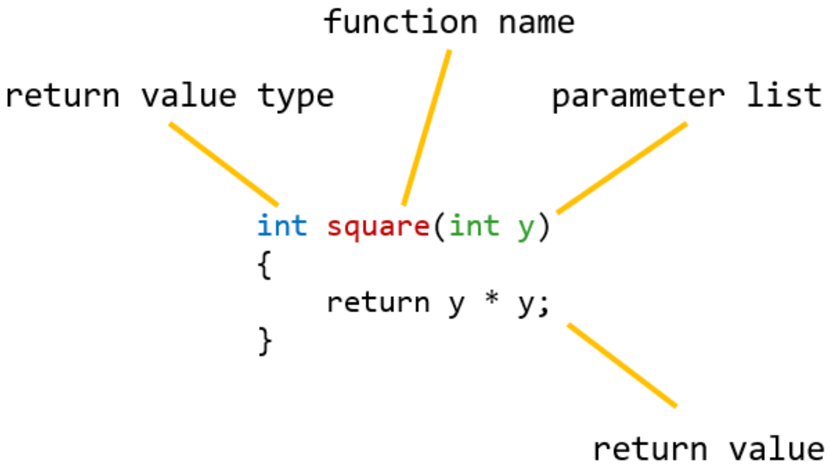
FUNCTION DEFINITIONS



Header

```
return_value_type function_name(<parameter_list>)
{
   /*definitions*/
   /*statements*/
}
```

Body



function name

return value type

parameter list

```
int square(int y)
{
    return y * y;
}
```

return value

The above function calculates the square of an integer **y**

FUNCTION DEFINITIONS

```
return_value_type
function_name(<parameter_list>)
{
   /*definitions*/
   /*statements*/
}
```

- A comma-separated list of parameters received by the function when it is called.
- A type must be listed explicitly for each parameter.
- E.g `int number, char grade`

FUNCTION PROTOTYPES

- A `function prototype` is a function definition without a body, e.g.

```
int square(int);
```

- Function prototypes are optional, but are used by the compiler to validate function calls
  - This prevents errors

- Prototypes are usually declared at the top of a source file, or in a header file

FUNCTION DEFINITION - EXAMPLE

```
/* http://www.programmingsimplified.com */
#include <stdio.h>

/* function prototype */
int addition(int, int);

int main() {

          int first, second, sum;

          /* read input */
          scanf("%d%d", &first, &second);

          /* invoke the addition function */
          sum = addition(first, second);
          printf("%d\n", sum);

          return 0;
}


/* function implementation */
int addition(int a, int b) {

          int result;
          result = a + b;

          return result;
}
```

The function prototype informs the compiler that addition() expects to receive two `integer` values and returns an `integer` result.

FUNCTION DEFINITION - EXAMPLE

```c
/* http://www.programmingsimplified.com */
#include <stdio.h>

/* function prototype */
int addition(int, int);

int main() {

         int first, second, sum;

         /* read input */
         scanf("%d%d", &first, &second);

         /* invoke the addition function */
         sum = addition(first, second);
         printf("%d\n", sum);

         return 0;
}

/* function implementation */
int addition(int a, int b) {

         int result;
         result = a + b;

         return result;
}
```

Whenever there's a function call, the compiler will check that call against the function prototype.

MULTIPLE RETURN STATEMENTS

```
#include <stdio.h>

#define POSITIVE 1
#define NEGATIVE -1
#define ZERO     0

int get_sign(int n);

int main() {

    int n;
    int sign;

    printf("Type an integer: ");
    scanf("%d", &n);

    sign = get_sign(n);

    if (sign == POSITIVE)
        printf("That is a positive number.\n");
    else if (sign == NEGATIVE)
        printf("That is a negative number.\n");
    else
        printf("That is zero.\n");

    return 0;
}
```

```
int get_sign(int n) {

    if (n < 0)
        return NEGATIVE;
    if (n > 0)
        return POSITIVE;

    return ZERO;
}
```

The function stops executing as soon as one `return` statement is executed.

CALLING FUNCTIONS BY VALUE

- Call-by-value
  - A copy of the argument's value is made and passed to the called function
  - Changes to the copy do not affect the original variable's value in the caller
  - By default, all calls in C are by value

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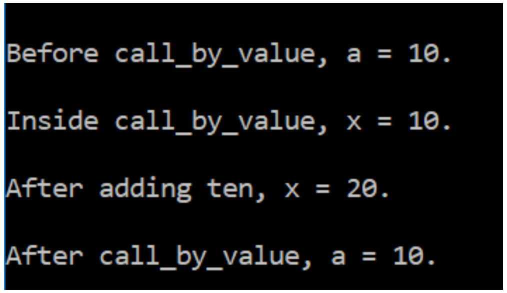
CALL-BY-VALUE – EXAMPLE

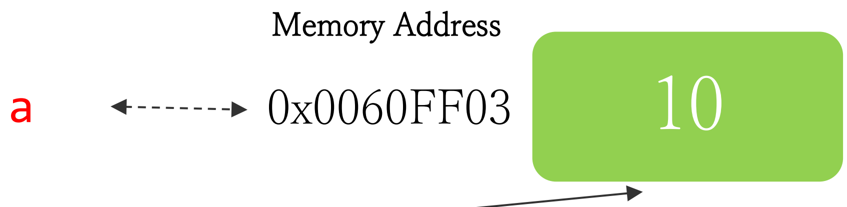
```
#include <stdio.h>

void call_by_value(int);

int main() {

         int a = 10;

         printf(“\nBefore call_by_value, a = %d.\n\n", a);

         call_by_value(a);

         printf("After call_by_value, a = %d.\n \n ", a);

         return 0;
}

/* this function will make a copy of a */
void call_by_value(int x) {

         printf("Inside call_by_value, x = %d.\n \n ", x);
         x += 10;
         printf("After adding ten, x = %d.\n \n ", x);
}
```

Output



```
Before call_by_value, a = 10.

Inside call_by_value, x = 10.

After adding ten, x = 20.

After call_by_value, a = 10.
```

CALL-BY-VALUE – EXAMPLE



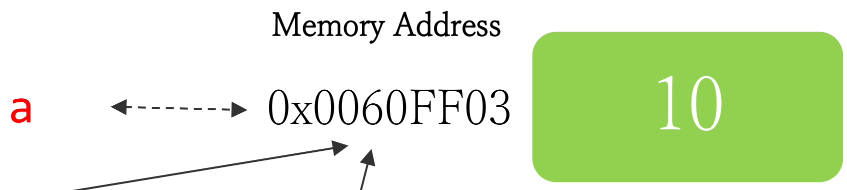
Memory Address

a ←-------→ 0x0060FF03 10

```
#include <stdio.h>

void call_by_value(int);

int main() {

         int a = 10;

         printf(“\nBefore call_by_value, a = %d.\n\n", a);

         call_by_value(a);

         printf("After call_by_value, a = %d.\n \n ", a);

         return 0;
}

/* this function will make a copy of a */
void call_by_value(int x) {

         printf("Inside call_by_value, x = %d.\n \n ", x);
         x += 10;
         printf("After adding ten, x = %d.\n \n ", x);
}
```

CALL-BY-VALUE – EXAMPLE

```
#include <stdio.h>

void call_by_value(int);

int main() {

        int a = 10;

        printf(“\nBefore call_by_value, a = %d.\n\n", a);

        call_by_value(a);

        printf("After call_by_value, a = %d.\n \n ", a);

        return 0;
}

/* this function will make a copy of a */
void call_by_value(int x) {

        printf("Inside call_by_value, x = %d.\n \n ", x);
        x += 10;
        printf("After adding ten, x = %d.\n \n ", x);
}
```



Memory Address

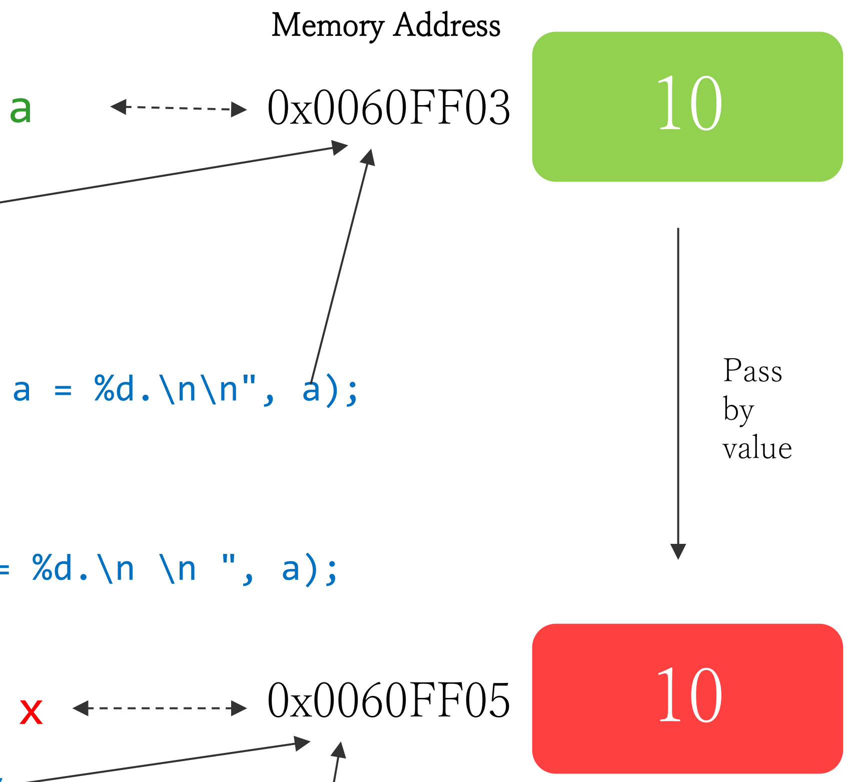
a

0x0060FF03

10

CALL-BY-VALUE – EXAMPLE

```c
#include <stdio.h>

void call_by_value(int);

int main() {

        int a = 10;

        printf(“\nBefore call_by_value, a = %d.\n\n", a);

        call_by_value(a);

        printf("After call_by_value, a = %d.\n \n ", a);

        return 0;
}

/* this function will make a copy of a */
void call_by_value(int x) {

        printf("Inside call_by_value, x = %d.\n \n ", x);
        x += 10;
        printf("After adding ten, x = %d.\n \n ", x);
}
```



Memory Address

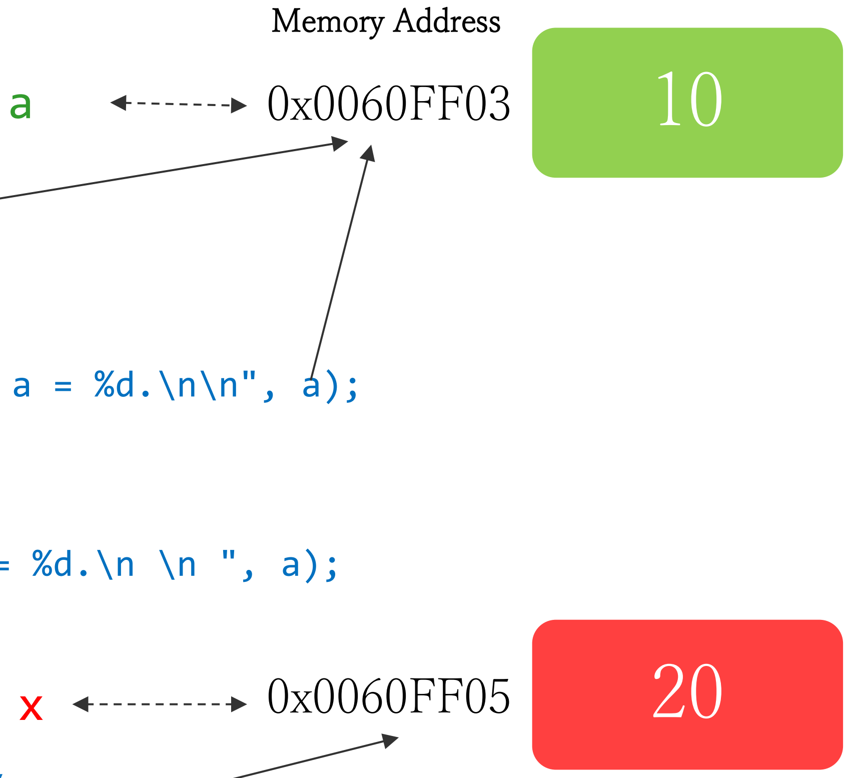
a 0x0060FF03 10

Pass by value

x 0x0060FF05 10

CALL-BY-VALUE – EXAMPLE

```
#include <stdio.h>

void call_by_value(int);

int main() {

        int a = 10;

        printf(“\nBefore call_by_value, a = %d.\n\n", a);

        call_by_value(a);

        printf("After call_by_value, a = %d.\n \n ", a);

        return 0;
}

/* this function will make a copy of a */
void call_by_value(int x) {

        printf("Inside call_by_value, x = %d.\n \n ", x);
        x += 10;
        printf("After adding ten, x = %d.\n \n ", x);
}
```



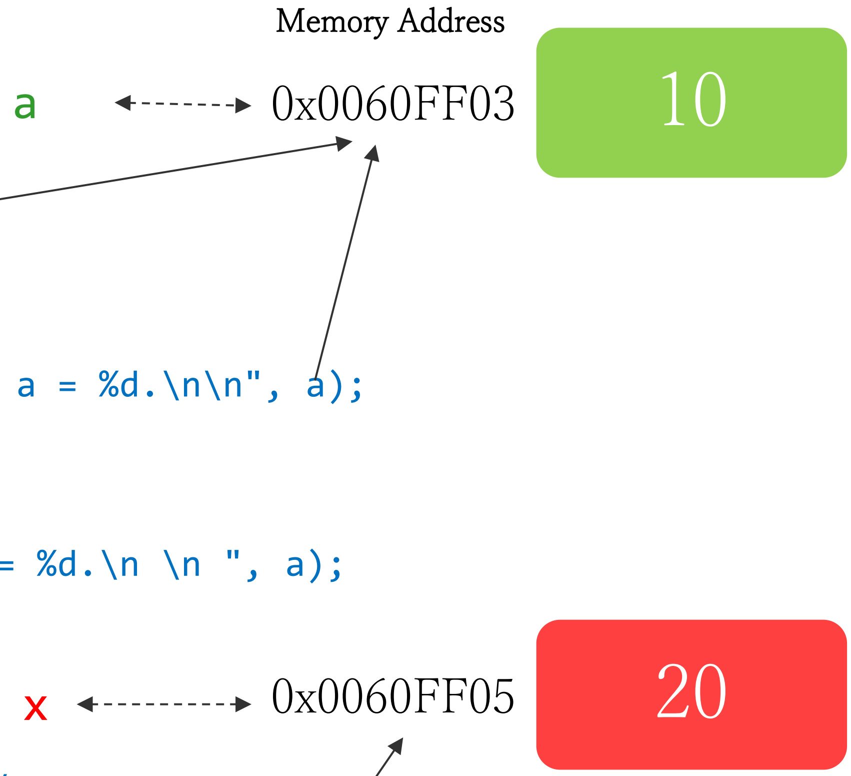
Memory Address

a ↔ 0x0060FF03 10

x ↔ 0x0060FF05 20

CALL-BY-VALUE – EXAMPLE

```
#include <stdio.h>

void call_by_value(int);

int main() {

        int a = 10;

        printf(“\nBefore call_by_value, a = %d.\n\n", a);

        call_by_value(a);

        printf("After call_by_value, a = %d.\n \n ", a);

        return 0;
}

/* this function will make a copy of a */
void call_by_value(int x) {

        printf("Inside call_by_value, x = %d.\n \n ", x);
        x += 10;
        printf("After adding ten, x = %d.\n \n ", x);
}
```



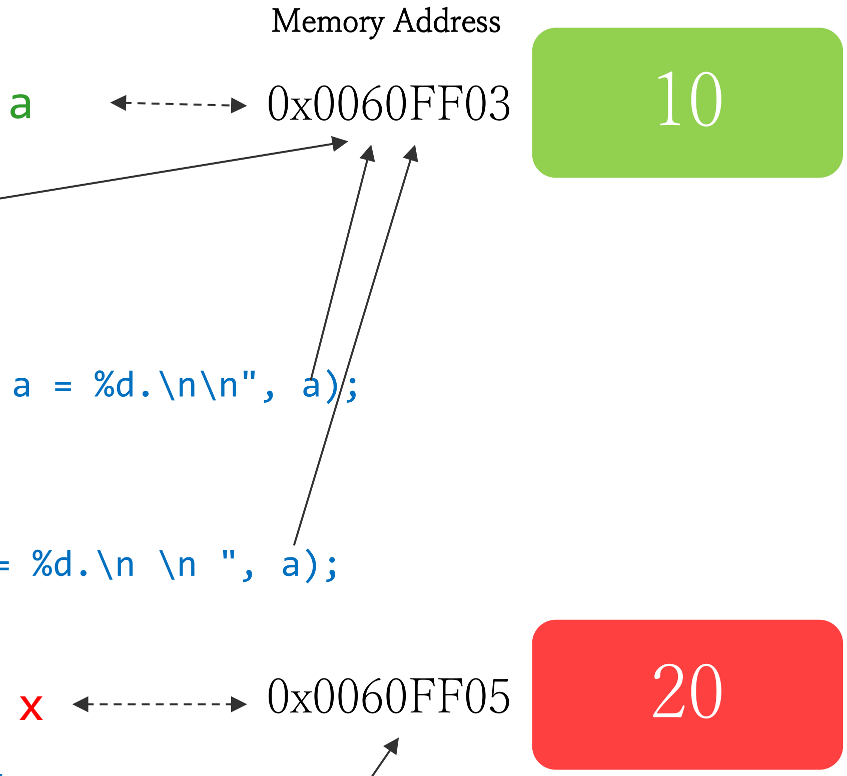
Memory Address

a ↔ 0x0060FF03 | 10

x ↔ 0x0060FF05 | 20

CALL-BY-VALUE – EXAMPLE

```
#include <stdio.h>

void call_by_value(int);

int main() {

        int a = 10;

        printf(“\nBefore call_by_value, a = %d.\n\n", a);

        call_by_value(a);

        printf("After call_by_value, a = %d.\n \n ", a);

        return 0;
}

/* this function will make a copy of a */
void call_by_value(int x) {

        printf("Inside call_by_value, x = %d.\n \n ", x);
        x += 10;
        printf("After adding ten, x = %d.\n \n ", x);
}
```

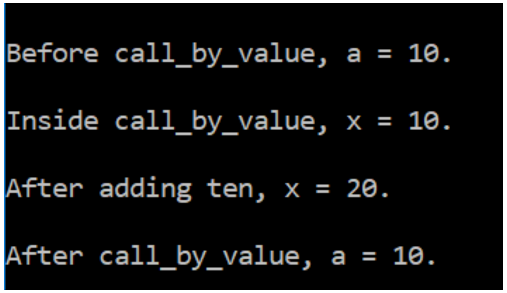


Value of “a” is not updated!

CALL-BY-VALUE – EXAMPLE

```
#include <stdio.h>

void call_by_value(int);

int main() {

         int a = 10;

         printf(“\nBefore call_by_value, a = %d.\n\n", a);

         call_by_value(a);

         printf("After call_by_value, a = %d.\n \n ", a);

         return 0;
}

/* this function will make a copy of a */
void call_by_value(int x) {

         printf("Inside call_by_value, x = %d.\n \n ", x);
         x += 10;
         printf("After adding ten, x = %d.\n \n ", x);
}
```

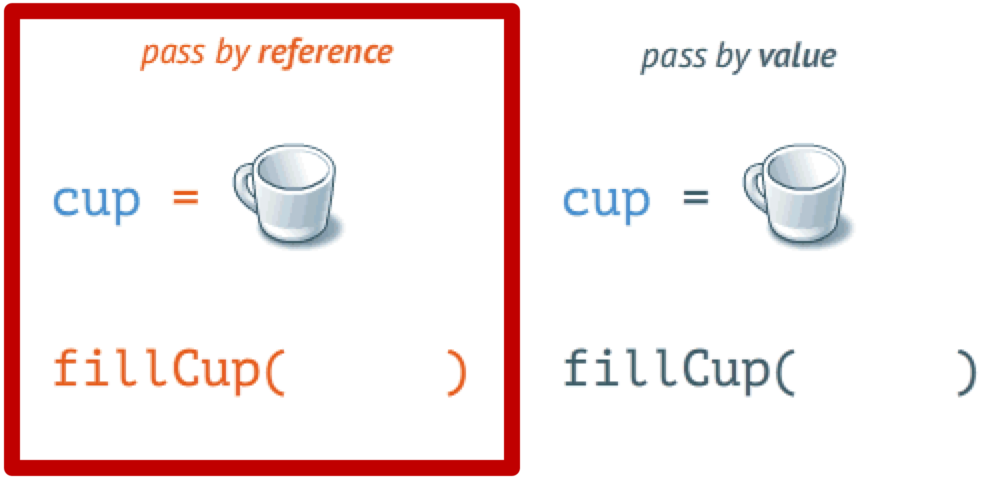
Output



```
Before call_by_value, a = 10.

Inside call_by_value, x = 10.

After adding ten, x = 20.

After call_by_value, a = 10.
```

CALLING FUNCTIONS BY REFERENCE

- Call-by-reference
  - The caller allows the called function to modify the original value
  - Call-by-reference can be simulated by using the address operator (&)
  - More will be covered later…



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FUNCTIONS FROM THE STANDARD C LIBRARY

The Standard C Library provides many commonly-used functions, e.g.

Header	Functions
<ctype.h>	Character functions: isalpha(), isdigit(), etc.
<math.h>	Mathematical functions: sqrt(), exp(), log(), sin(), cos(), tan(), etc.
<stdlib.h>	Miscellaneous functions: malloc(), free(), rand(), atoi(), etc.
<stdio.h>	Input/output: printf(), scanf(), fopen(), fread(), fwrite(), etc.
<string.h>	String functions: strcpy(), strcmp(), etc.

FUNCTIONS FROM THE STANDARD C LIBRARY

Visit `cplusplus.com` for a complete list:

- http://www.cplusplus.com/reference/clibrary/

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SCOPE RULES

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SCOPE RULES

The scope of an identifier is the portion of the program in which the identifier can be referenced.

- The same identifier can be re-used in different scopes.

- Tip: the scope of an identifier should be as small as possible.
  - Why?

SCOPE RULES – FILE SCOPE

- An identifier declared outside any function has `file scope`.

- A file-scope identifier is accessible from its declaration until the end of the file.

- Variables with file scope are often called `global variables`.

FILE SCOPE - EXAMPLE

```
#include <stdio.h>

int i = 1;

int main() {

    int x = 4;
    printf("add_i outputs %d\n", add_i(x));
    printf("i is %d\n", i);
    printf("x is %d\n", x);
    return 0;
}

int add_i(int n) {

    int x = n + i;
    i++;

    return x;
}
```

`i` is declared outside any function so `i` has file scope

This statement updates the global variable `i`

SCOPE RULES – BLOCK SCOPE

- Identifiers defined inside a block delimited by braces `{…}` have `block scope`.

- Any block may contain variable definitions.

- Variables with block scope are often called `local variables`.

BLOCK SCOPE - EXAMPLE

```c
#include <stdio.h>

int i = 1;

int main() {

    int x = 4;
    printf("add_i outputs %d\n", add_i(x));
    printf("i is %d\n", i);
    printf("x is %d\n", x);
    return 0;
}

int add_i(int n) {

    int x = n + i;
    i++;

    return x;
}
```

This x has block scope within main()

This x has block scope within add_i()

Output:

```
add_i outputs 5
i is 2
x is 4
```

NEED COFFEE!!

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ARRAYS

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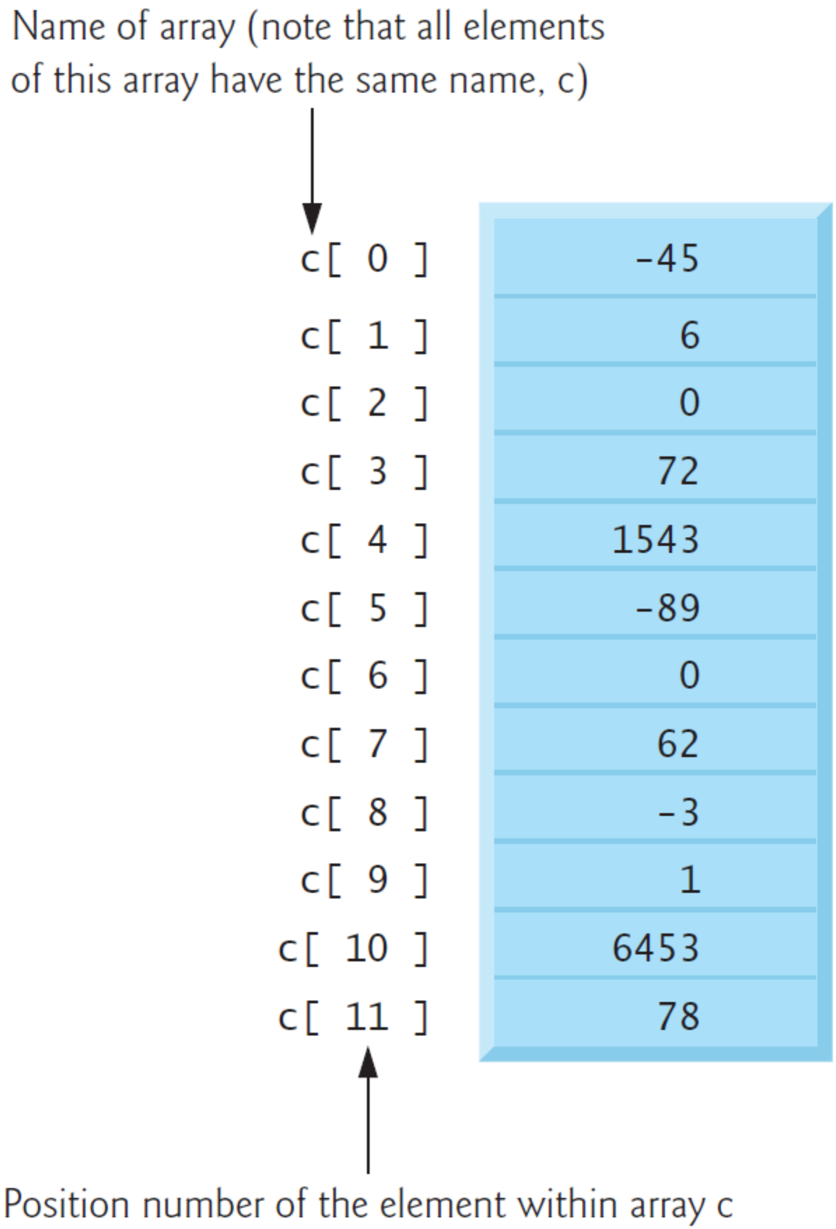
ARRAYS

An array is a group of memory locations that all have

- the same **name**
- the same **type**

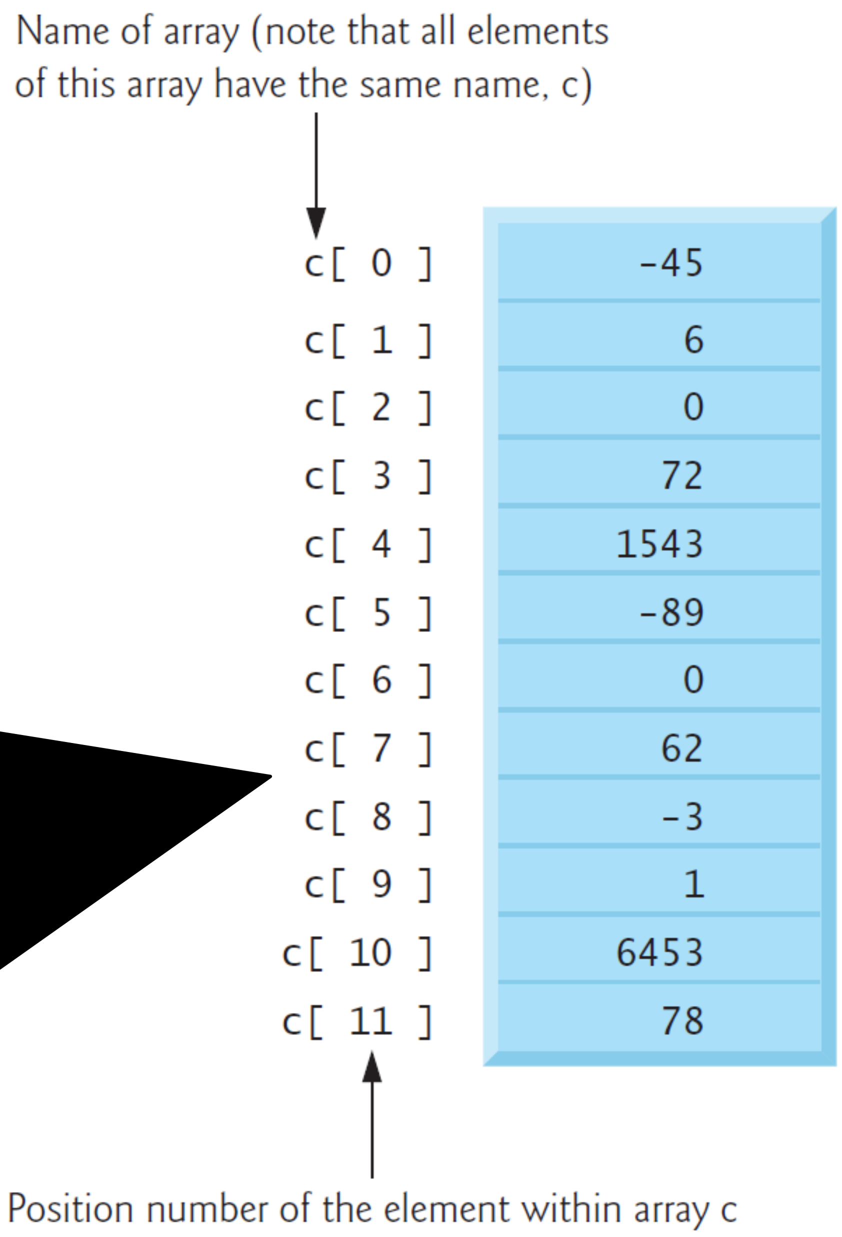


Name of array (note that all elements of this array have the same name, c)

c[0]	-45
c[1]	6
c[2]	0
c[3]	72
c[4]	1543
c[5]	-89
c[6]	0
c[7]	62
c[8]	-3
c[9]	1
c[10]	6453
c[11]	78

Position number of the element within array c

The position number contained within square brackets is called a **subscript** or **index**.



Name of array (note that all elements of this array have the same name, c)

c[0]	-45
c[1]	6
c[2]	0
c[3]	72
c[4]	1543
c[5]	-89
c[6]	0
c[7]	62
c[8]	-3
c[9]	1
c[10]	6453
c[11]	78

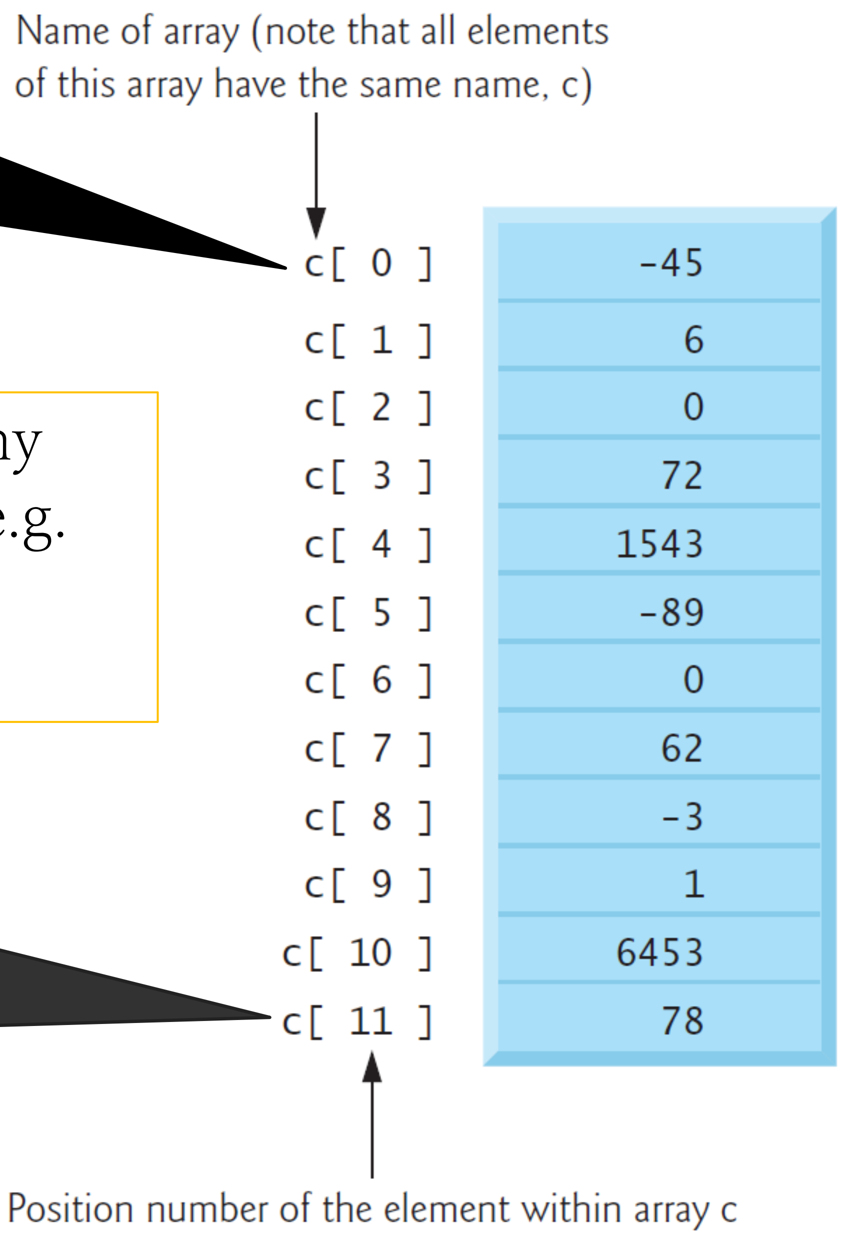
Position number of the element within array c

The index starts at **zero**.

The index can be any integer expression, e.g.

```
int a = 1;
c[a+2] += 2;
```

The index ends at the number of array elements, **minus 1**



Name of array (note that all elements of this array have the same name, c)

c[0]	-45
c[1]	6
c[2]	0
c[3]	72
c[4]	1543
c[5]	-89
c[6]	0
c[7]	62
c[8]	-3
c[9]	1
c[10]	6453
c[11]	78

Position number of the element within array c

HOW TO USE

```
#include <stdio.h>

#define MAX_STUDENTS 10

int main() {
```

Define

```
    int studentId[MAX_STUDENTS];
```

Initialize

```
    for (int i = 0; i < MAX_STUDENTS; i++)
            studentId[i] = i + 1;

    printf("%7s%13s\n", "Element", "Value");
```

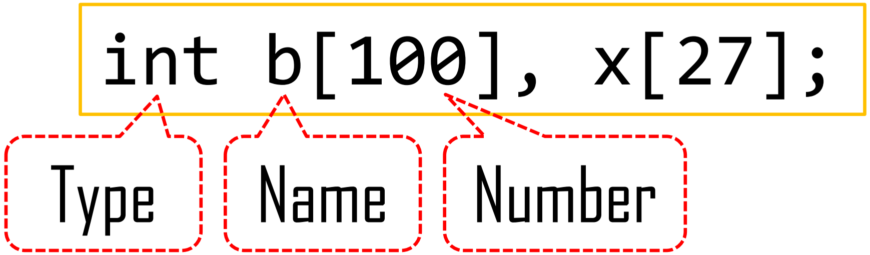
Use

```
    for (int i = 0; i < MAX_STUDENTS; i++)
            printf("%7d%13d\n", i, studentId[i]);

    return 0;
}
```

DEFINING ARRAYS

To define an array we need to specify:

- the type of the elements
- the name of the array
- the number of elements



```
int b[100], x[27];
```

Type

Name

Number

VS

```
int a,       y;
```

ARRAY INITIALISATION

We can use a loop to initialise array elements:

Define an array

Initialize the array

```
#include <stdio.h>

#define MAX_STUDENTS 10

int main() {

        int studentId[MAX_STUDENTS];
        for (int i = 0; i < MAX_STUDENTS; i++)
                studentId[i] = i + 1;

        printf("%7s%13s\n", "Element", "Value");
        for (int i = 0; i < MAX_STUDENTS; i++)
                printf("%7d%13d\n", i, studentId[i]);

        return 0;
}
```

Use the array

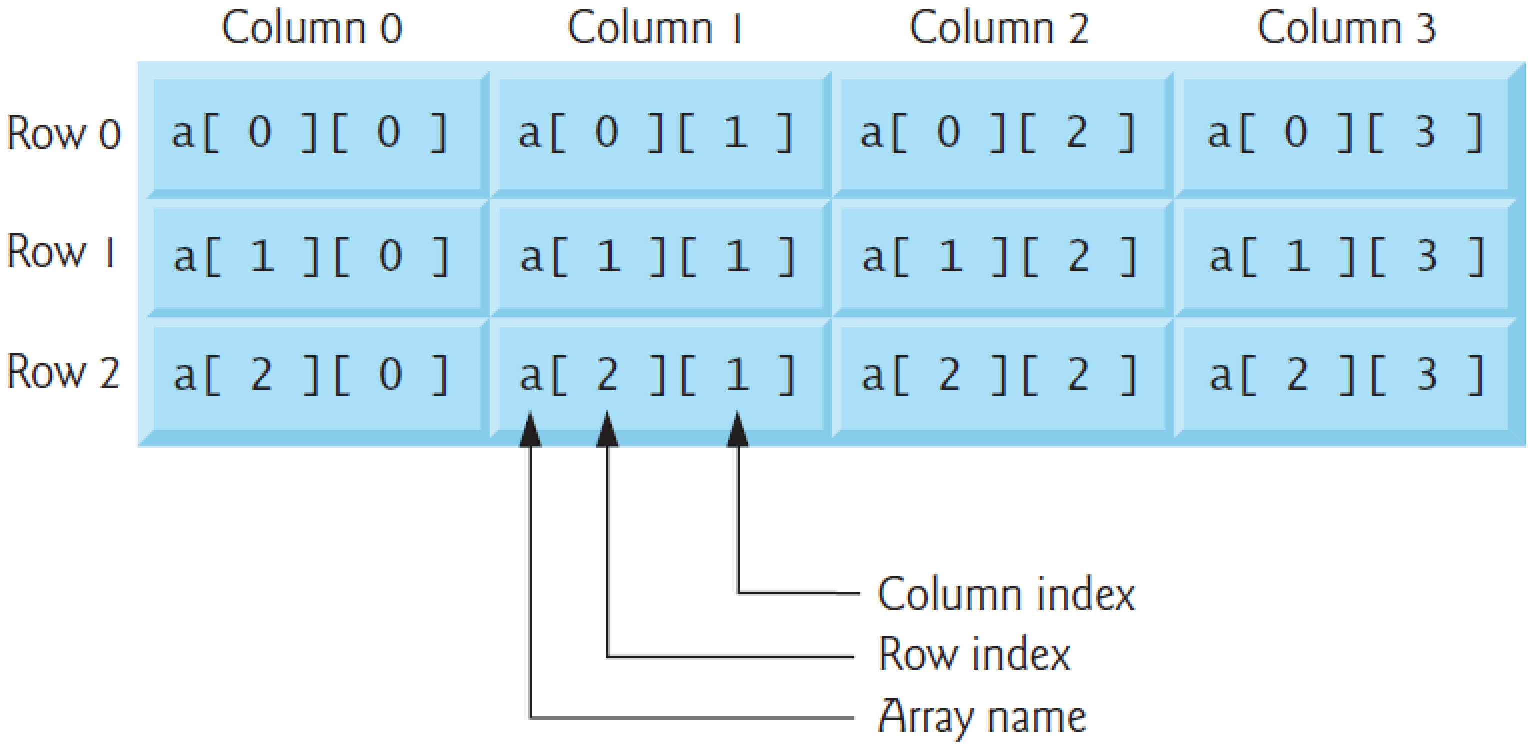
ARRAY INITIALISATION

We can also use an initialiser list:

```
#include <stdio.h>

#define MAX_STUDENTS 10

int main() {

        int studentId[MAX_STUDENTS] =
                { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 };

        printf("%7s%13s\n", "Element", "Value");
        for (int i = 0; i < MAX_STUDENTS; i++)
                printf("%7d%13d\n", i, studentId[i]);

        return 0;
}
```

MULTI-DIMENSIONAL ARRAYS

- The most commonly used are two dimensional arrays or double-subscripted arrays.
- In general, an array with m rows and n columns is called an `m-by-n array`.



	Column 0	Column 1	Column 2	Column 3
Row 0	a[0][0]	a[0][1]	a[0][2]	a[0][3]
Row 1	a[1][0]	a[1][1]	a[1][2]	a[1][3]
Row 2	a[2][0]	a[2][1]	a[2][2]	a[2][3]

DECLARING MULTIDIMENSIONAL ARRAYS

```
int b[ 2 ][ 2 ] = { { 1, 2 }, { 3, 4 } };
```

Declare and initialise a two-dimensional array of integers.

The values in the initialiser list are grouped by row.

b	1	2
	3	4

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STRINGS

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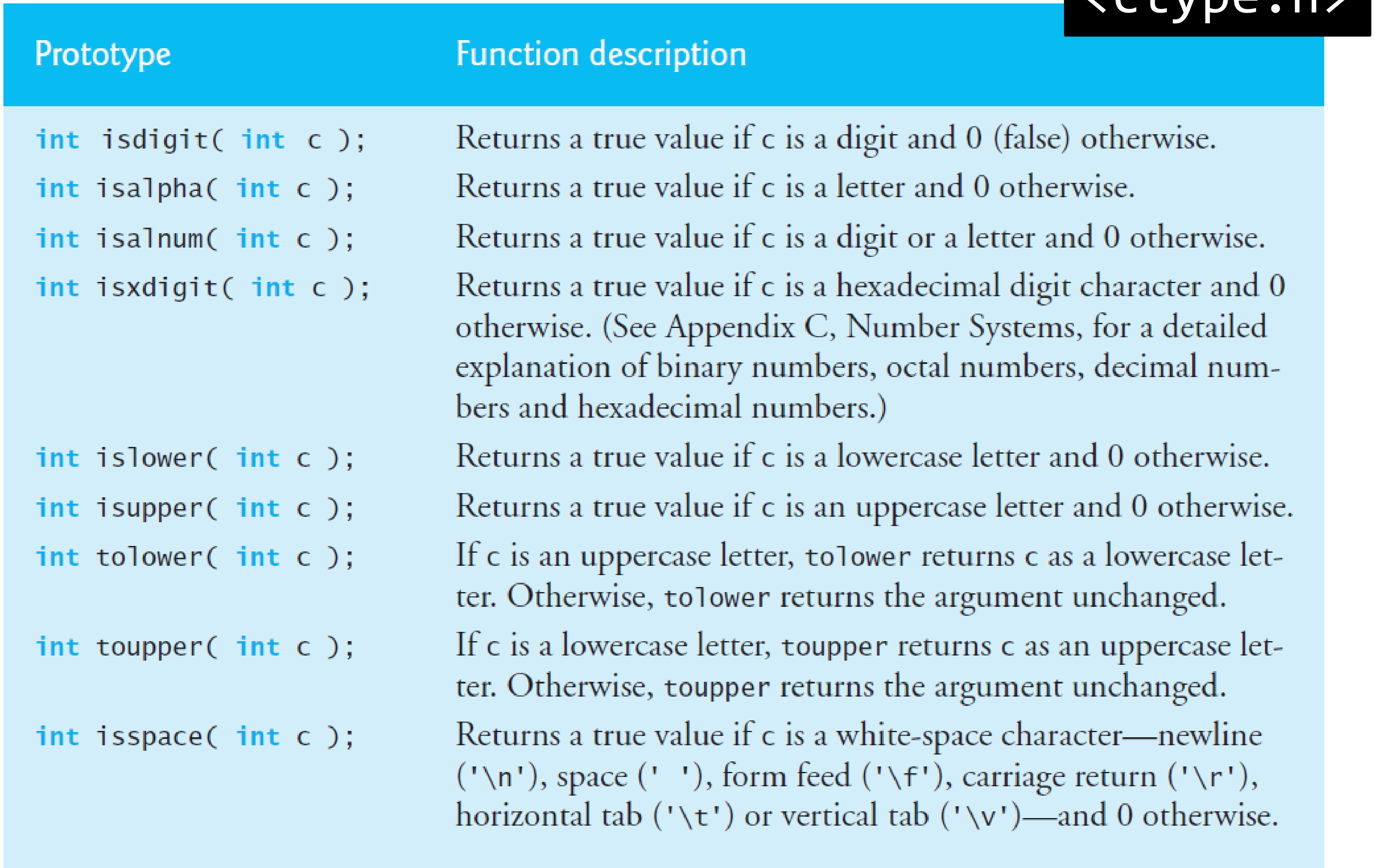
FUNDAMENTALS OF CHARACTERS

A program may contain character constants

- A character constant is denoted by single quotes and has an integer value according to the character set
- E.g. in ASCII:
  - `'z'` has an integer value of 122
  - `'\n'` has an integer value of 10
- Some mathematical operators can be applied to characters
  - + and – move up and down the character set
  - <, >, ==, != compare according to the character set

CHARACTER HANDLING LIBRARY

<ctype.h>



Prototype	Function description
`int isdigit( int c );`	Returns a true value if c is a digit and 0 (false) otherwise.
`int isalpha( int c );`	Returns a true value if c is a letter and 0 otherwise.
`int isalnum( int c );`	Returns a true value if c is a digit or a letter and 0 otherwise.
`int isxdigit( int c );`	Returns a true value if c is a hexadecimal digit character and 0 otherwise. (See Appendix C, Number Systems, for a detailed explanation of binary numbers, octal numbers, decimal numbers and hexadecimal numbers.)
`int islower( int c );`	Returns a true value if c is a lowercase letter and 0 otherwise.
`int isupper( int c );`	Returns a true value if c is an uppercase letter and 0 otherwise.
`int tolower( int c );`	If c is an uppercase letter, `tolower` returns c as a lowercase letter. Otherwise, `tolower` returns the argument unchanged.
`int toupper( int c );`	If c is a lowercase letter, `toupper` returns c as an uppercase letter. Otherwise, `toupper` returns the argument unchanged.
`int isspace( int c );`	Returns a true value if c is a white-space character—newline (`'\n'`), space (`' '`), form feed (`'\f'`), carriage return (`'\r'`), horizontal tab (`'\t'`) or vertical tab (`'\v'`)—and 0 otherwise.

FUNDAMENTALS OF STRINGS

A string in C is an **array** of characters **ending in the null character (`'\0'`)**.

String literals (constants) are written in double quotation marks:

- `"SIT-DNA"`
- `"Thinking Tinkerers"`
- `"Able to Learn, Unlearn and Relearn"`
- `"Catalyst for Transformation"`
- `"Grounded in Community"`

STRING INITIALISATION

This is how you can initialise a string:

```
char colour[] = "blue";
```

This creates an array of 5 elements as follows:

b	l	u	e	\0

If no size is specified, the size will be determined based on the number of initialisers in the list. E.g.: 5 in this case

When defining a character array to contain a string, the array must be large enough to store the string and its terminating null character.

STRING INITIALISATION

A string can be stored in an array using **`scanf`**:

```
char word[10];
scanf("%9s\n", word);
```

Variable **`word`** is an array, which is a memory address, so the address operator **`&`** is not needed with argument **`word`**.

STRING INITIALISATION

A string can be stored in an array using `scanf`:

```
char word[10];
scanf("%9s\n", word);
```

Note that `scanf` will read characters until a `space`, `tab`, `newline` or `end-of-file` indicator is encountered. So it is possible that the user could exceed 9 characters and your program might crash.

STRING INITIALISATION

A string can be stored in an array using **`scanf`**:

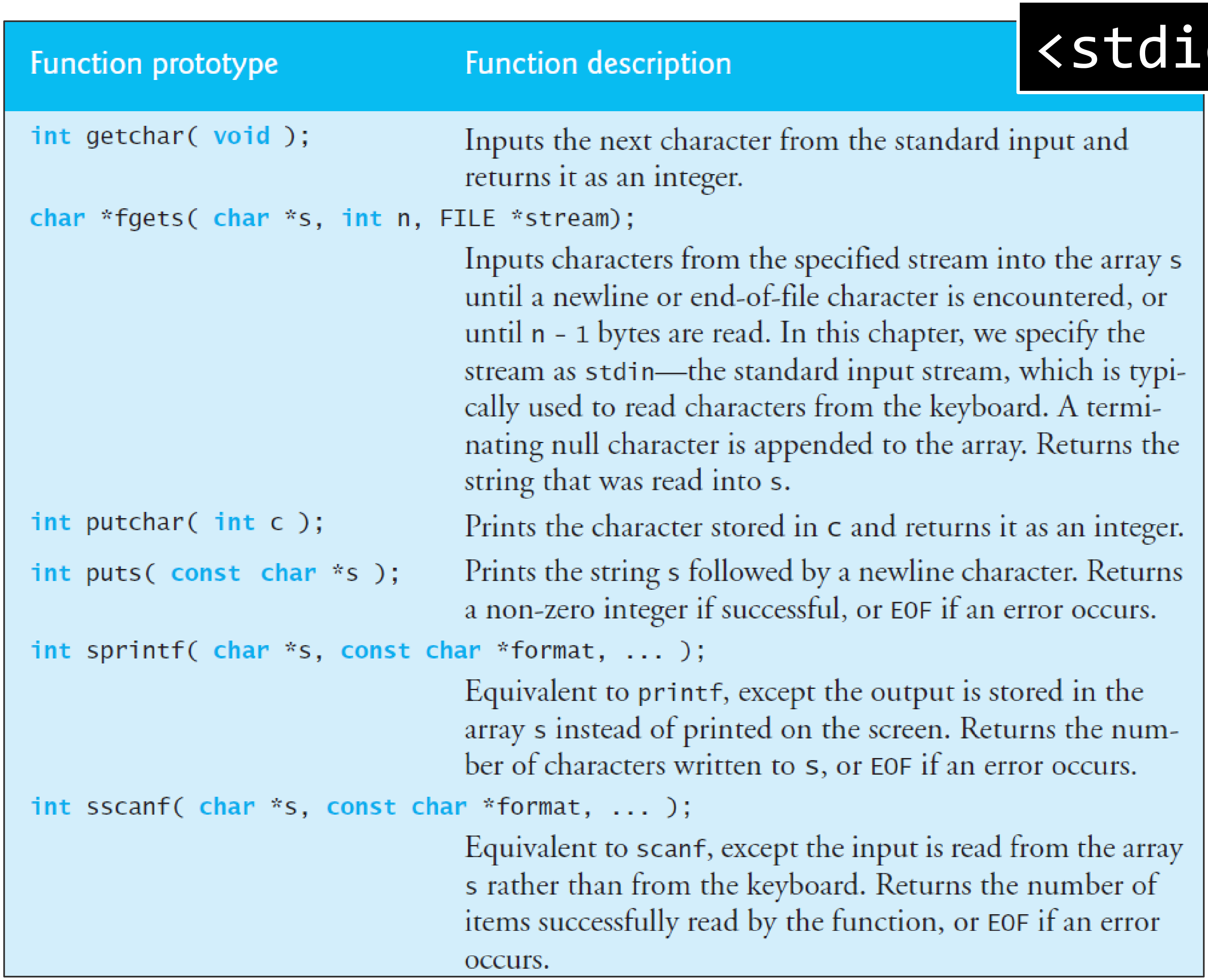
```
char word[10];
scanf("%9s\n", word);
```

It is good practice to use the conversion specifier `%9s` so that **`scanf`** reads up to 9 characters and saves the last one for the null character.

STANDARD I/O FUNCTIONS

FOR STRINGS & CHARACTERS

<stdio.h>



Function prototype	Function description
`int getchar( void );`	Inputs the next character from the standard input and returns it as an integer.
`char *fgets( char *s, int n, FILE *stream);`	Inputs characters from the specified stream into the array s until a newline or end-of-file character is encountered, or until n - 1 bytes are read. In this chapter, we specify the stream as stdin—the standard input stream, which is typically used to read characters from the keyboard. A terminating null character is appended to the array. Returns the string that was read into s.
`int putchar( int c );`	Prints the character stored in c and returns it as an integer.
`int puts( const char *s );`	Prints the string s followed by a newline character. Returns a non-zero integer if successful, or EOF if an error occurs.
`int sprintf( char *s, const char *format, ... );`	Equivalent to printf, except the output is stored in the array s instead of printed on the screen. Returns the number of characters written to s, or EOF if an error occurs.
`int sscanf( char *s, const char *format, ... );`	Equivalent to scanf, except the input is read from the array s rather than from the keyboard. Returns the number of items successfully read by the function, or EOF if an error occurs.

STANDARD I/O FUNCTIONS

FOR STRINGS & CHARACTERS

```c
#include <stdio.h>
#include <string.h>

#define MAX_LENGTH 80

/* print the characters of a string in reverse order */
void print_reverse(const char[]);

int main() {

        char sentence[MAX_LENGTH];
        printf("Enter a line of text:\n");
        fgets(sentence, MAX_LENGTH, stdin);
        printf("The input line written backwards:\n");
        print_reverse(sentence);

        return 0;

}
```

fgets() reads characters into an array of chars until a newline or the end-of-file indicator is encountered, or until the maximum number of characters is read.

STANDARD I/O FUNCTIONS

PUTS() AND GETCHAR()

```
#include <stdio.h>

#define MAX_LENGTH 80

int main() {

    char sentence[MAX_LENGTH];
    char c;
    int index = 0;
    puts("Enter a line of text: ");
    while ((c = getchar()) != '\n' && index < MAX_LENGTH - 1)
        sentence[index++] = c;
    sentence[index] = '\0';
    puts("The input line was: ");
    puts(sentence);

    return 0;

}
```

`puts()` takes a string as an argument and prints the string followed by a newline character.

`getchar()` reads a character from the standard input and returns the character as an integer.

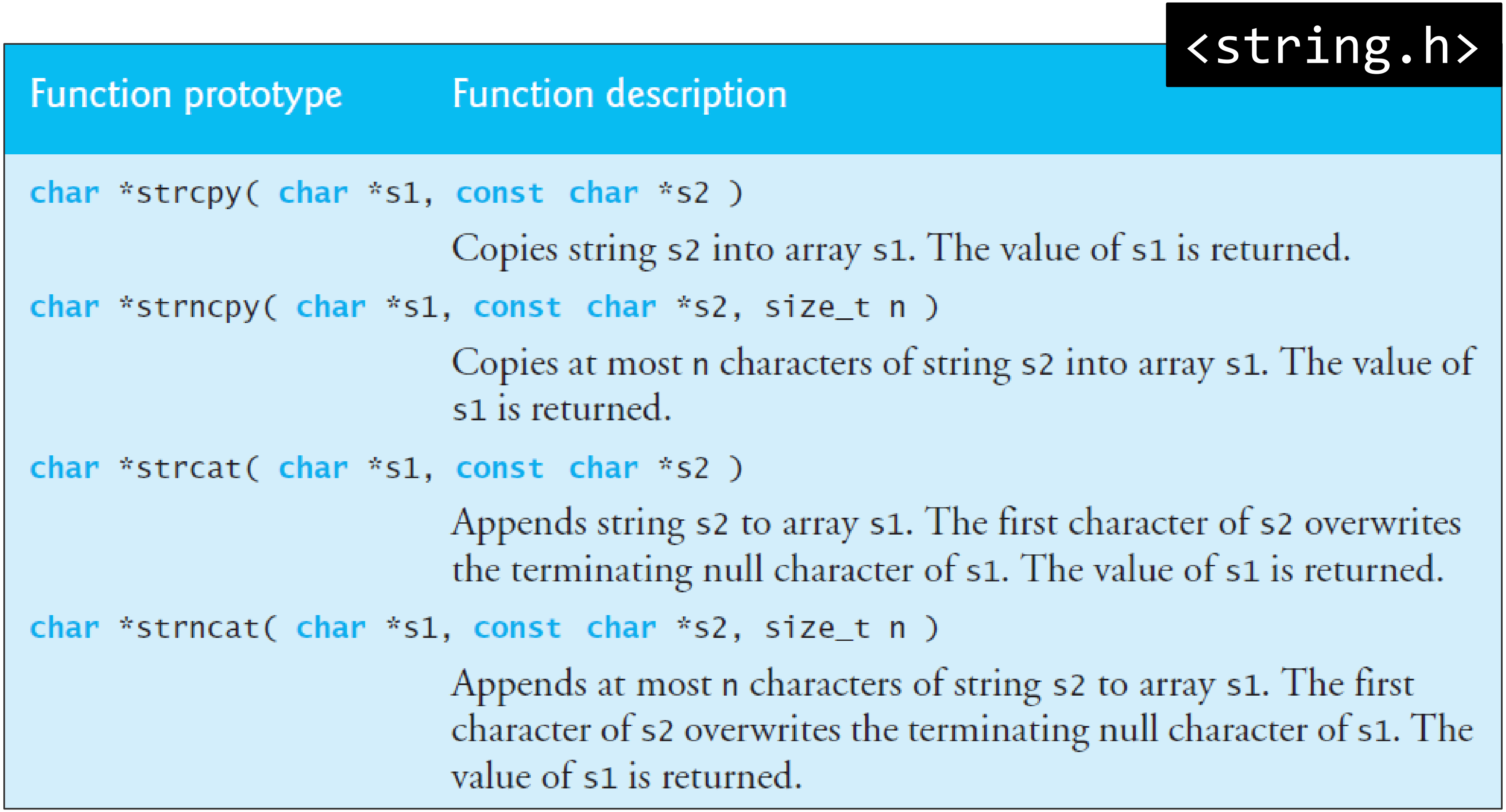
STANDARD I/O FUNCTIONS

FORMATTED DATA TO A STRING WITH SPRINTF()

sprintf() prints formatted data into an array of characters. The function uses the same conversion specifiers as `printf`

```
#include <stdio.h>

#define MAX_LENGTH 80

int main() {

    char s[MAX_LENGTH];
    int x;
    double y;

    printf("Enter an integer and a double: ");
    scanf("%d%lf", &x, &y);

    sprintf(s, "integer: %d, double: %f\n", x, y);
    printf("The formatted string stored in the array is: %s", s);

    return 0;

}
```

STRING MANIPULATION FUNCTIONS



<string.h>

Function prototype	Function description
`char *strcpy( char *s1, const char *s2 )`	Copies string s2 into array s1. The value of s1 is returned.
`char *strncpy( char *s1, const char *s2, size_t n )`	Copies at most n characters of string s2 into array s1. The value of s1 is returned.
`char *strcat( char *s1, const char *s2 )`	Appends string s2 to array s1. The first character of s2 overwrites the terminating null character of s1. The value of s1 is returned.
`char *strncat( char *s1, const char *s2, size_t n )`	Appends at most n characters of string s2 to array s1. The first character of s2 overwrites the terminating null character of s1. The value of s1 is returned.

STRING MANIPULATION LIBRARY

EXAMPLE – WHAT DOES THIS PROGRAM DO?

```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <time.h>

#define MAX_FULLNAME  80
#define MAX_USERNAME  9
#define RANDOM_DIGITS 3

int main() {

    char name[MAX_FULLNAME];
    char userID[MAX_USERNAME];
    int  n, i;

    printf("Enter your name: ");
    scanf("%79s", name);
    strncpy(userID, name, MAX_USERNAME - RANDOM_DIGITS - 1);
    userID[MAX_USERNAME - RANDOM_DIGITS - 1] = '\0';

    n = strlen(userID);
    for (i = 0; i < RANDOM_DIGITS; i++)
        userID[n + i] = '0' + rand() % 10;
    userID[n + RANDOM_DIGITS] = '\0';
    printf("Your username is: %s\n", userID);

    return 0;

}
```

Ensure the string is terminated by ‘\0’.

srand() and rand() generate random numbers.

STRING MANIPULATION LIBRARY

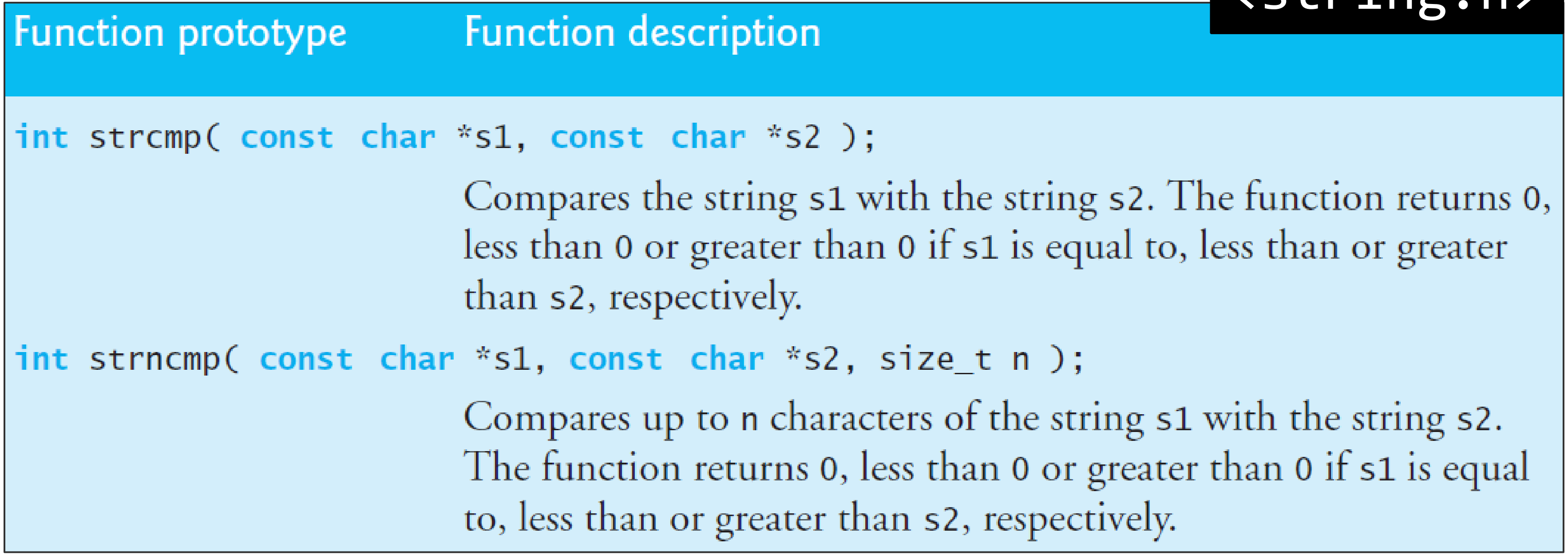
EXAMPLE – OUTPUT

```
Enter your full name: Cristal Ngo Minh Ngoc
Your username is: Crist610
```

```
Enter your full name: Rachel Green
Your username is: Rache822
```

STRING COMPARISON FUNCTIONS

<string.h>



Function prototype	Function description
`int strcmp( const char *s1, const char *s2 );`	Compares the string s1 with the string s2. The function returns 0, less than 0 or greater than 0 if s1 is equal to, less than or greater than s2, respectively.
`int strncmp( const char *s1, const char *s2, size_t n );`	Compares up to n characters of the string s1 with the string s2. The function returns 0, less than 0 or greater than 0 if s1 is equal to, less than or greater than s2, respectively.

Note:

`strcmp()` and `strncmp()` are both case-sensitive.

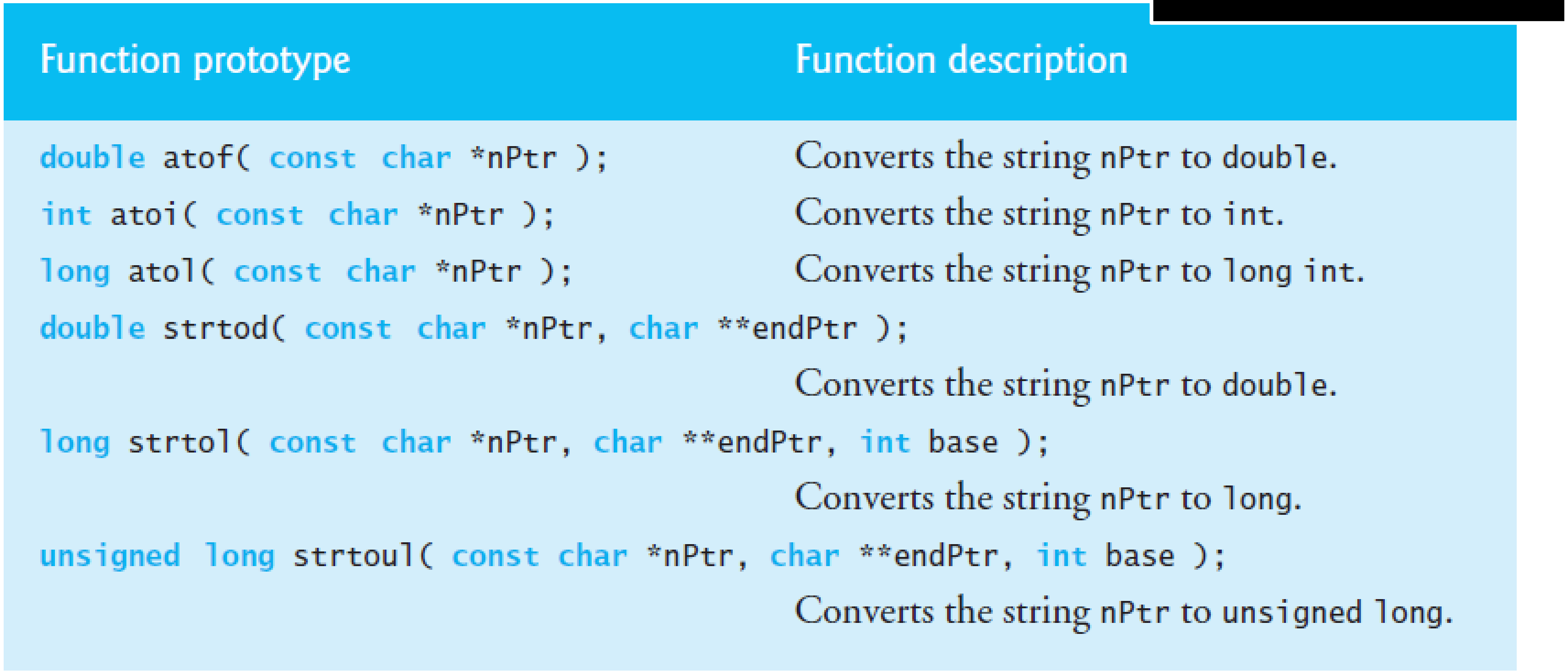
STRING COMPARISON FUNCTIONS

EXAMPLE

```c
#include <stdio.h>
#include <string.h>

int main() {

           char word1[20], word2[20];

           printf("Enter two words, separated by a space: ");
           scanf("%19s%19s", word1, word2);

           int c = strcmp(word1, word2);
           if (c < 0)
                      printf("\"%s\" comes first.\n", word1);
           else if (c > 0)
                      printf("\"%s\" comes first.\n", word2);
           else
                      printf("Those two words are the same.\n");

           return 0;
}
```

STRING CONVERSION FUNCTIONS

<stdlib.h>



Function prototype	Function description
`double atof( const char *nPtr );`	Converts the string nPtr to double.
`int atoi( const char *nPtr );`	Converts the string nPtr to int.
`long atol( const char *nPtr );`	Converts the string nPtr to long int.
`double strtod( const char *nPtr, char **endPtr );`	Converts the string nPtr to double.
`long strtol( const char *nPtr, char **endPtr, int base );`	Converts the string nPtr to long.
`unsigned long strtoul( const char *nPtr, char **endPtr, int base );`	Converts the string nPtr to unsigned long.

STRING CONVERSION FUNCTIONS

EXAMPLES

```
long l;
l = atol("123456789");
```

convert the string "123456789" to the long integer 123456789

END-OF-WEEK CHECKLIST

- □ Function prototypes
- □ Function definitions
- □ Call by value
- □ Scope rules
- □ Array declarations
- □ Array initialiser lists
- □ Multi-dimensional arrays
- □ Characters
- □ Strings
- □ String manipulation functions
- □ String comparison functions
- □ String I/O functions

GROUP PROJECT

- Group Project
  - Grouping
    - Each team is formed with members from the same lab session
    - Each team will have 5 members (adjustments will be made wherever needed)
    - The final grouping will be announced on LMS
  - Project specs will be uploaded to LMS soonest.
  - Plagiarism is strictly NOT allowed
    - The group project is designed to help you to learn better.
    - Do not copy from peers or from seniors or from other places
    - Do not share your code with others or onto other platforms (e.g. GitHub)

ABOUT USAGE OF AI TOOLS

- For Group Project
  - AI tools are NOT allowed
  - A declaration is needed from each team

- For Test
  - AI tools are NOT allowed