You have a captain's log due before 2022-09-25 (in 2 days)! Log it now! (/captain\_logs/971202/edit)

# 0x06. C - More pointers, arrays and strings



- By: Julien Barbier
- Weight: 1
- 🛗 Ongoing second chance project started Sep 21, 2022 6:00 AM, must end by Sep 24, 2022 6:00 AM
- An auto review will be launched at the deadline



# **Learning Objectives**

At the end of this project, you are expected to be able to explain to anyone (/rltoken/tkwwPs3MT3JT07FSsmXy-A), without the help of Google:

# General

- · What are pointers and how to use them
- · What are arrays and how to use them
- What are the differences between pointers and arrays
- · How to use strings and how to manipulate them
- Scope of variables



# Copyright - Plagiarism

- You are tasked to come up with solutions for the tasks below yourself to meet with the above learning objectives.
- You will not be able to meet the objectives of this or any following project by copying and pasting someone else's work.
- · You are not allowed to publish any content of this project.
- · Any form of plagiarism is strictly forbidden and will result in removal from the program.

# Requirements

## General

- Allowed editors: vi, vim, emacs
- All your files will be compiled on Ubuntu 20.04 LTS using gcc, using the options -Wall -Werror -Wextra -pedantic -std=gnu89
- · All your files should end with a new line
- A README.md file, at the root of the folder of the project is mandatory
- Your code should use the Betty style. It will be checked using betty-style.pl (https://github.com/holbertonschool/Betty/blob/master/betty-style.pl) and betty-doc.pl (https://github.com/holbertonschool/Betty/blob/master/betty-doc.pl)
- · You are not allowed to use global variables
- No more than 5 functions per file
- You are not allowed to use the standard library. Any use of functions like printf, puts, etc... is forbidden
- You are allowed to use \_putchar (https://github.com/holbertonschool/\_putchar.c/blob/master/\_putchar.c)
- You don't have to push \_putchar.c, we will use our file. If you do it won't be taken into account
- In the following examples, the main.c files are shown as examples. You can use them to test your functions, but you don't have to push them to your repo (if you do we won't take them into account). We will use our own main.c files at compilation. Our main.c files might be different from the one shown in the examples
- The prototypes of all your functions and the prototype of the function \_putchar should be included in your header file called main.h
- · Don't forget to push your header file

#### Quiz questions

Great! You've completed the quiz successfully! Keep going! (Show quiz)

# **Tasks**



Write a function that concatenates two strings.

- Prototype: char \*\_strcat(char \*dest, char \*src);
- This function appends the src string to the dest string, overwriting the terminating null byte ( \0 ) at the end of dest, and then adds a terminating null byte
- · Returns a pointer to the resulting string dest

FYI: The standard library provides a similar function: strcat . Run man strcat to learn more.

```
julien@ubuntu:~/0x06$ cat 0-main.c
#include "main.h"
#include <stdio.h>
/**
 * main - check the code
 * Return: Always 0.
 */
int main(void)
{
    char s1[98] = "Hello ";
    char s2[] = "World!\n";
    char *ptr;
    printf("%s\n", s1);
    printf("%s", s2);
    ptr = _strcat(s1, s2);
    printf("%s", s1);
    printf("%s", s2);
    printf("%s", ptr);
    return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 0-main.c 0-strc
at.c -o 0-strcat
julien@ubuntu:~/0x06$ ./0-strcat
Hello
World!
Hello World!
World!
Hello World!
julien@ubuntu:~/0x06$
```

#### Repo:

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 0-strcat.c

Q

(/)

1. strncat mandatory

Write a function that concatenates two strings.

- Prototype: char \*\_strncat(char \*dest, char \*src, int n);
- The \_strncat function is similar to the \_strcat function, except that
  - it will use at most n bytes from src; and
  - src does not need to be null-terminated if it contains n or more bytes
- Return a pointer to the resulting string dest

FYI: The standard library provides a similar function: strncat . Run man strncat to learn more.



```
julien@ubuntu:~/0x06$ cat 1-main.c
#include "main.h"
#include <stdio.h>
/**
 * main - check the code
 * Return: Always 0.
 */
int main(void)
{
    char s1[98] = "Hello";
    char s2[] = "World!\n";
    char *ptr;
    printf("%s\n", s1);
    printf("%s", s2);
    ptr = _strncat(s1, s2, 1);
    printf("%s\n", s1);
    printf("%s", s2);
    printf("%s\n", ptr);
    ptr = _strncat(s1, s2, 1024);
    printf("%s", s1);
    printf("%s", s2);
    printf("%s", ptr);
    return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 1-main.c 1-strn
cat.c -o 1-strncat
julien@ubuntu:~/0x06$ ./1-strncat
Hello
World!
Hello W
World!
Hello W
Hello WWorld!
World!
Hello WWorld!
julien@ubuntu:~/0x06$
```

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 1-strncat.c

☑ Done! Help Check your code >\_ Get a sandbox

2. strncpy (/) mandatory

Write a function that copies a string.

- Prototype: char \*\_strncpy(char \*dest, char \*src, int n);
- Your function should work exactly like strncpy

FYI: The standard library provides a similar function: strncpy . Run man strncpy to learn more.

```
mulien@ubuntu:~/0x06$ cat 2-main.c
#include "main.h"
#include <stdio.h>
/**
* main - check the code
* Return: Always 0.
*/
int main(void)
   char s1[98];
   char *ptr;
   int i;
   for (i = 0; i < 98 - 1; i++)
   {
      s1[i] = '*';
   s1[i] = '\0';
   printf("%s\n", s1);
   ptr = \_strncpy(s1, "First, solve the problem. Then, write the code\n", 5);
   printf("%s\n", s1);
   printf("%s\n", ptr);
   ptr = \_strncpy(s1, "First, solve the problem. Then, write the code\n", 90);
   printf("%s", s1);
   printf("%s", ptr);
   for (i = 0; i < 98; i++)
      if (i % 10)
      {
         printf(" ");
      if (!(i % 10) && i)
         printf("\n");
      printf("0x%02x", s1[i]);
   printf("\n");
   return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 2-main.c 2-strn
cpy.c -o 2-strncpy
julien@ubuntu:~/0x06$ ./2-strncpy
*************************
*****
First, solve the problem. Then, write the code
First, solve the problem. Then, write the code
```

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 2-strncpy.c

☑ Done! Help Check your code >\_ Get a sandbox

### 3. strcmp

mandatory

Write a function that compares two strings.

- Prototype: int \_strcmp(char \*s1, char \*s2);
- Your function should work exactly like strcmp

FYI: The standard library provides a similar function: strcmp. Run man strcmp to learn more.

```
julien@ubuntu:~/0x06$ cat 3-main.c
#include "main.h"
#include <stdio.h>
/**
 * main - check the code
 * Return: Always 0.
 */
int main(void)
{
    char s1[] = "Hello";
    char s2[] = "World!";
    printf("%d\n", _strcmp(s1, s2));
    printf("%d\n", _strcmp(s2, s1));
    printf("%d\n", _strcmp(s1, s1));
    return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 3-main.c 3-strc
mp.c -o 3-strcmp
julien@ubuntu:~/0x06$ ./3-strcmp
-15
15
0
julien@ubuntu:~/0x06$
```

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 3-strcmp.c

✓ Done! Help Check your code >\_ Get a sandbox

## 4. I am a kind of paranoid in reverse. I suspect people of plotting to make me happy

mandatory

Write a function that reverses the content of an array of integers.

- Prototype: void reverse\_array(int \*a, int n);
- Where n is the number of elements of the array

```
julien@ubuntu:~/0x06$ cat 4-main.c
#include "main.h"
#include <stdio.h>
/**
 * main - check the code
 * @a: an array of integers
 * @n: the number of elements to swap
 * Return: nothing.
 */
void print_array(int *a, int n)
    int i;
    i = 0;
    while (i < n)
    {
        if (i != 0)
        {
            printf(", ");
        printf("%d", a[i]);
        i++;
    }
    printf("\n");
}
 * main - check the code
 * Return: Always 0.
int main(void)
{
    int a[] = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 98, 1024, 1337\};
    print_array(a, sizeof(a) / sizeof(int));
    reverse_array(a, sizeof(a) / sizeof(int));
    print_array(a, sizeof(a) / sizeof(int));
    return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 4-main.c 4-rev_
array.c -o 4-rev_array
julien@ubuntu:~/0x06$ ./4-rev_array
0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 98, 1024, 1337
1337, 1024, 98, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0
julien@ubuntu:~/0x06$
```

Q

```
• Directory: 0x06-pointers_arrays_strings
(/)• File: 4-rev_array.c
```

#### 5. Always look up

mandatory

Write a function that changes all lowercase letters of a string to uppercase.

• Prototype: char \*string\_toupper(char \*);

```
julien@ubuntu:~/0x06$ cat 5-main.c
#include "main.h"
#include <stdio.h>
/**
 * main - check the code
 * Return: Always 0.
 */
int main(void)
    char str[] = "Look up!\n";
    char *ptr;
    ptr = string_toupper(str);
    printf("%s", ptr);
    printf("%s", str);
    return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 5-main.c 5-stri
ng_toupper.c -o 5-string_toupper
julien@ubuntu:~/0x06$ ./5-string_toupper
LOOK UP!
LOOK UP!
julien@ubuntu:~/0x06$
```

#### Repo:

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 5-string\_toupper.c

☑ Done! Help Check your code >\_ Get a sandbox

Q

mandatory

Write a function that capitalizes all words of a string.

- Prototype: char \*cap\_string(char \*);
- Separators of words: space, tabulation, new line, , , ; , . , ! , ? , " , ( , ) , { , and }

```
julien@ubuntu:~/0x06$ cat 6-main.c
#include "main.h"
#include <stdio.h>
/**
 * main - check the code
 * Return: Always 0.
int main(void)
    char str[] = "Expect the best. Prepare for the worst. Capitalize on what come
s.\nhello world! hello-world 0123456hello world\thello world.hello world\n";
    char *ptr;
    ptr = cap_string(str);
    printf("%s", ptr);
    printf("%s", str);
    return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 6-main.c 6-cap_
string.c -o 6-cap
julien@ubuntu:~/0x06$ ./6-cap
Expect The Best. Prepare For The Worst. Capitalize On What Comes.
Hello World! Hello-world 0123456hello World Hello World.Hello World
Expect The Best. Prepare For The Worst. Capitalize On What Comes.
Hello World! Hello-world 0123456hello World Hello World.Hello World
julien@ubuntu:~/0x06$
```

#### Repo:

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 6-cap\_string.c

☑ Done! Help Check your code >\_ Get a sandbox

7. Mozart composed his music not for the elite, but for everybody



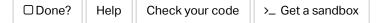
Write a function that encodes a string into 1337 (/rltoken/9v9KfpvWnL0GoMu5mozbug).

- (/)Letters a and A should be replaced by 4
  - Letters e and E should be replaced by 3
  - Letters o and 0 should be replaced by 0
  - Letters t and T should be replaced by 7
  - Letters 1 and L should be replaced by 1
  - Prototype: char \*leet(char \*);
  - You can only use one if in your code
  - You can only use two loops in your code
  - You are not allowed to use switch
  - You are not allowed to use any ternary operation

```
julien@ubuntu:~/0x06$ cat 7-main.c
#include "main.h"
#include <stdio.h>
/**
 * main - check the code for
 * Return: Always 0.
int main(void)
    char s[] = "Expect the best. Prepare for the worst. Capitalize on what come
s.\n";
   char *p;
    p = leet(s);
    printf("%s", p);
    printf("%s", s);
    return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 7-main.c 7-lee
t.c -o 7-1337
julien@ubuntu:~/0x06$ ./7-1337
3xp3c7 7h3 b3s7. Pr3p4r3 f0r 7h3 w0rs7. C4pi741iz3 0n wh47 c0m3s.
3xp3c7 7h3 b3s7. Pr3p4r3 f0r 7h3 w0rs7. C4pi741iz3 0n wh47 c0m3s.
julien@ubuntu:~/0x06$
```

#### Repo:

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 7-leet.c



8(/)ot13

#advar ced

Write a function that encodes a string using rot13 (/rltoken/YRxmNA7BnP6yZhl09TKX3A).

- Prototype: char \*rot13(char \*);
- You can only use if statement once in your code
- You can only use two loops in your code
- You are not allowed to use switch
- You are not allowed to use any ternary operation

```
julien@ubuntu:~/0x06$ cat 100-main.c
#include "main.h"
#include <stdio.h>
/**
* main - check the code
* Return: Always 0.
*/
int main(void)
{
   char s[] = "ROT13 (\"rotate by 13 places\", sometimes hyphenated ROT-13) is a si
mple letter substitution cipher.\n";
   char *p;
   p = rot13(s);
   printf("%s", p);
   printf("-----\n");
   printf("%s", s);
   printf("-----\n"):
   p = rot13(s);
   printf("%s", p);
   printf("-----\n");
   printf("%s", s);
   printf("-----\n");
   p = rot13(s);
   printf("%s", p);
   printf("-----\n");
   printf("%s", s);
   return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 100-main.c 100-
rot13.c -o 100-rot13
julien@ubuntu:~/0x06$ ./100-rot13
EBG13 ("ebgngr ol 13 cynprf", fbzrgvzrf ulcurangrq EBG-13) vf n fvzcyr yrggre fhofgv
ghgvba pvcure.
EBG13 ("ebgngr ol 13 cynprf", fbzrgvzrf ulcurangrq EBG-13) vf n fvzcyr yrggre fhofgv
ghgvba pvcure.
ROT13 ("rotate by 13 places", sometimes hyphenated ROT-13) is a simple letter substi
tution cipher.
ROT13 ("rotate by 13 places", sometimes hyphenated ROT-13) is a simple letter substi
tution cipher.
EBG13 ("ebgngr ol 13 cynprf", fbzrgvzrf ulcurangrq EBG-13) vf n fvzcyr yrggre fhofgv
ghgvba pvcure.
EBG13 ("ebgngr ol 13 cynprf", fbzrgvzrf ulcurangrq EBG-13) vf n fvzcyr yrggre fhofgv
ghgvba pvcure.
julien@ubuntu:~/0x06$
```

# GitHub repository: alx-low\_level\_programming Directory: 0x06-pointers\_arrays\_strings File: 100-rot13.c

>\_ Get a sandbox

## 9. Numbers have life; they're not just symbols on paper

Check your code

#advanced

Write a function that prints an integer.

Help

**☑** Done!

- Prototype: void print\_number(int n);
- You can only use \_putchar function to print
- You are not allowed to use long
- You are not allowed to use arrays or pointers
- · You are not allowed to hard-code special values

```
invlien@ubuntu:~/0x06$ cat 101-main.c
#include "main.h"
  * main - check the code
  * Return: Always 0.
 int main(void)
 {
     print_number(98);
     _putchar('\n');
     print_number(402);
     _putchar('\n');
     print_number(1024);
     _putchar('\n');
     print_number(0);
     _putchar('\n');
     print_number(-98);
     _putchar('\n');
     return (0);
 }
 julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 _putchar.c 101-
 main.c 101-print_number.c -o 101-print_numbers
 julien@ubuntu:~/0x06$ ./101-print_numbers
 98
 402
 1024
 0
 -98
 julien@ubuntu:~/0x06$
Repo:
```

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 101-print\_number.c

☑ Done! Help Check your code >\_ Get a sandbox

10. A dream doesn't become reality through magic; it takes sweat, determination and hard work

#advanced



Add one line to this code (https://github.com/holbertonschool/make\_magic\_happen/blob/master/magic.c), so that the program prints a[2] = 98, followed by a new line.

- You are not allowed to use the variable a in your new line of code
- You are not allowed to modify the variable p
- · You can only write one statement
- · You are not allowed to use ,
- You are not allowed to code anything else than the line of expected line of code at the expected line
- Your code should be written at line 19, before the ;
- Do not remove anything from the initial code (not even the comments)
- and don't change anything but the line of code you are adding (don't change the spaces to tabs!)
- You are allowed to use the standard library

#### Repo:

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 102-magic.c

☑ Done! Help Check your code >\_ Get a sandbox

## 11. It is the addition of strangeness to beauty that constitutes the romantic character in art

#advanced

Write a function that adds two numbers.

- Prototype: char \*infinite\_add(char \*n1, char \*n2, char \*r, int size\_r);
- Where n1 and n2 are the two numbers
- r is the buffer that the function will use to store the result
- size\_r is the buffer size
- The function returns a pointer to the result
- You can assume that you will always get positive numbers, or 0
- You can assume that there will be only digits in the strings n1 and n2
- n1 and n2 will never be empty
- If the result can not be stored in r the function must return 0

```
إن lien@ubuntu:~/0x06$ cat 103-main.c
#include "main.h"
#include <stdio.h>
/**
 * main - check the code
 * Return: Always 0.
*/
int main(void)
{
        char *n = "12345678924345743678235745756784776857856456858768767745867347345
63456453743756756784458";
        char *m = "90347906634706972346829145693462596349586932465973246597623479563
49265983465962349569346";
        char r[100];
        char r2[10];
        char r3[11];
        char *res;
        res = infinite_add(n, m, r, 100);
        if (res == 0)
        {
                printf("Error\n");
        }
        else
        {
                printf("%s + %s = %s\n", n, m, res);
        }
        n = "1234567890";
        m = "1";
        res = infinite_add(n, m, r2, 10);
        if (res == 0)
        {
                printf("Error\n");
        }
        else
        {
                printf("%s + %s = %s\n", n, m, res);
        n = "999999999";
        m = "1";
        res = infinite_add(n, m, r2, 10);
        if (res == 0)
        {
                printf("Error\n");
        }
        else
        {
                printf("%s + %s = %s\n", n, m, res);
        res = infinite_add(n, m, r3, 11);
        if (res == 0)
```

```
{
(/)
                printf("Error\n");
        else
        {
                printf("%s + %s = %s\n", n, m, res);
        return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 103-main.c 103-
infinite_add.c -o 103-add
julien@ubuntu:~/0x06$ ./103-add
123456789243457436782357457567847768578564568587687677458673473456345645374375675678
4458 + 90347906634706972346829145693462596349586932465973246597623479563492659834659
62349569346 = 1026935855590527160250648914502473732074433893247420143434908269091272
2437209719106353804
Error
Error
99999999 + 1 = 1000000000
julien@ubuntu:~/0x06$
```

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 103-infinite\_add.c

□ Done? Help Check your code >\_ Get a sandbox

#### 12. Noise is a buffer, more effective than cubicles or booth walls

#advanced

Write a function that prints a buffer.

- Prototype: void print\_buffer(char \*b, int size);
- The function must print the content of size bytes of the buffer pointed by b
- The output should print 10 bytes per line
- Each line starts with the position of the first byte of the line in hexadecimal (8 chars), starting with 0
- Each line shows the hexadecimal content (2 chars) of the buffer, 2 bytes at a time, separated by a space
- Each line shows the content of the buffer. If the byte is a printable character, print the letter, if not, print .
- Each line ends with a new line \n
- If size is 0 or less, the output should be a new line only \n
- You are allowed to use the standard library
- The output should look like the following example, and formatted exactly the same way:



```
ற்µlien@ubuntu:~/0x06$ cat 104-main.c
#include "main.h"
#include <stdio.h>
/**
* main - check the code
* Return: Always 0.
*/
int main(void)
{
   char buffer[] = "This is a string!\OAnd this is the rest of the #buffer :)\1\2\3
un #infernumisfun\n";
   printf("%s\n", buffer);
   printf("-----\n");
   print_buffer(buffer, sizeof(buffer));
   return (0);
}
julien@ubuntu:~/0x06$ gcc -Wall -pedantic -Werror -Wextra -std=gnu89 104-main.c 104-
print_buffer.c -o 104-buffer
julien@ubuntu:~/0x06$ ./104-buffer
This is a string!
00000000: 5468 6973 2069 7320 6120 This is a
0000000a: 7374 7269 6e67 2100 416e string!.An
00000014: 6420 7468 6973 2069 7320 d this is
0000001e: 7468 6520 7265 7374 206f the rest o
00000028: 6620 7468 6520 2362 7566 f the #buf
00000032: 6665 7220 3a29 0102 0304 fer :)....
0000003c: 0506 0723 6369 7366 756e ...#cisfun
00000046: 0a00 0000 0000 0000 0000 ......
00000050: 0000 0000 0000 0000 0000 ......
0000005a: 2021 3456 2370 6f69 6e74 !4V#point
00000064: 6572 7361 7265 6675 6e20 ersarefun
0000006e: 2369 6e66 6572 6e75 6d69 #infernumi
00000078: 7366 756e 0a00
                                sfun..
julien@ubuntu:~/0x06$
```

- GitHub repository: alx-low\_level\_programming
- Directory: 0x06-pointers\_arrays\_strings
- File: 104-print\_buffer.c

☑ Done! Help Check your code >\_ Get a sandbox

Copyright © 2022 ALX, All rights reserved.

