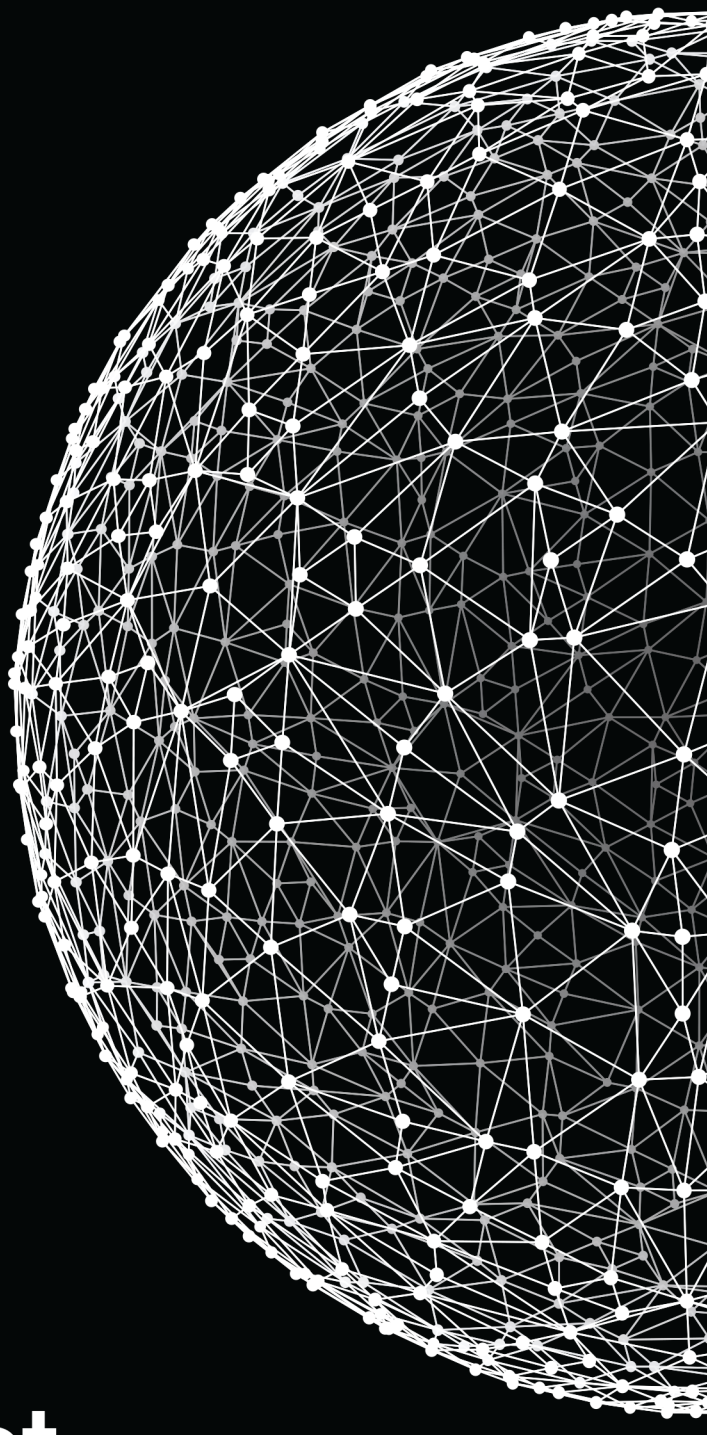
Sprint 05

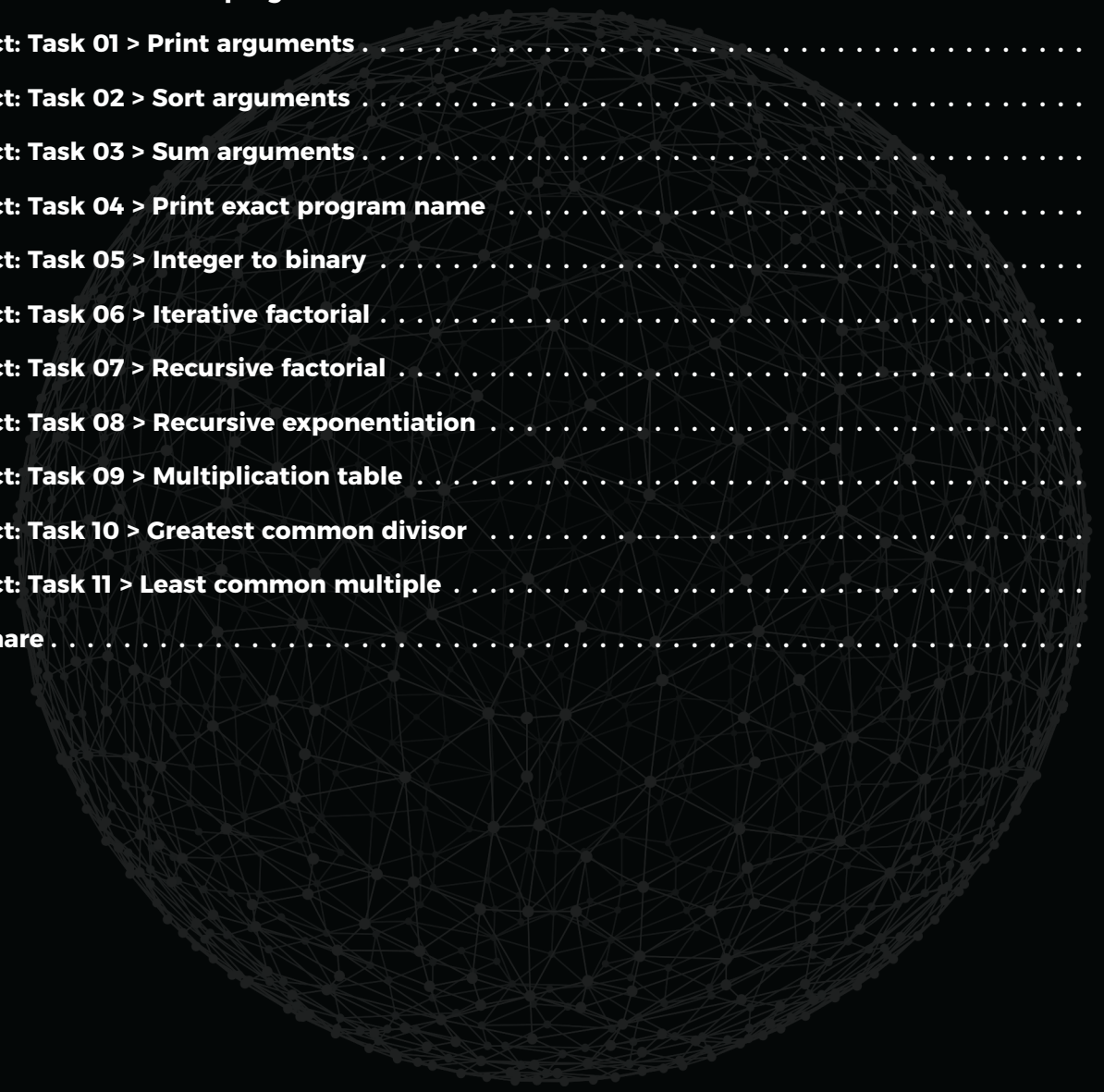
Marathon C

September 3, 2020



ucode connect

Contents



ucode connect

Engage

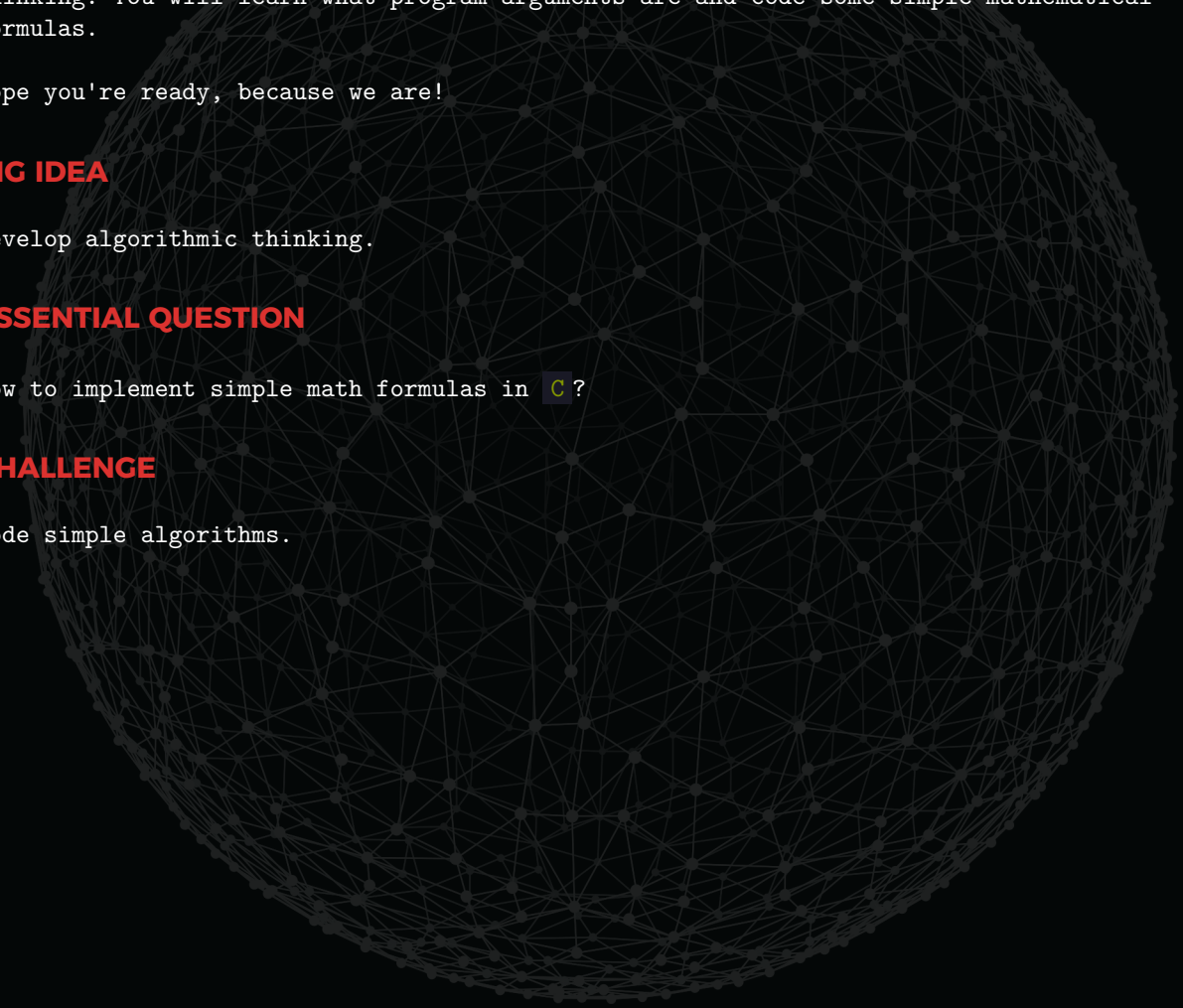
DESCRIPTION

Hey, hey, dear! Let's go!

Congrats on completing the first part of the Marathon C!
However, your journey still continues. So, prepare your mind for more knowledge.

This Sprint is designed to study simple algorithms and the development of algorithmic thinking. You will learn what program arguments are and code some simple mathematical formulas.

Hope you're ready, because we are!



BIG IDEA

Develop algorithmic thinking.

ESSENTIAL QUESTION

How to implement simple math formulas in `C`?

CHALLENGE

Code simple algorithms.

Investigate

GUIDING QUESTIONS

We invite you to find answers to the following questions. By researching and answering them, you will gain the knowledge necessary to complete the challenge. To find answers, ask the students around you and search the internet. We encourage you to ask as many questions as possible. Note down your findings and discuss them with your peers.

- How did you like the first part of the Marathon? How much did you sleep?
- What knowledge have you gained during this time in ucode connect?
- What did you accomplish in the Race?
- What do you know about Unix? What commands do you know?
- What did you learn about pointers?
- What is an array of pointers?
- What kinds of errors in C do you know?
- What is a factorial? What is a GCD and a LCM?
- What is a recursion?

GUIDING ACTIVITIES

Complete the following activities. Don't forget that you have a limited time to overcome the challenge. Use it wisely. Distribute tasks correctly.

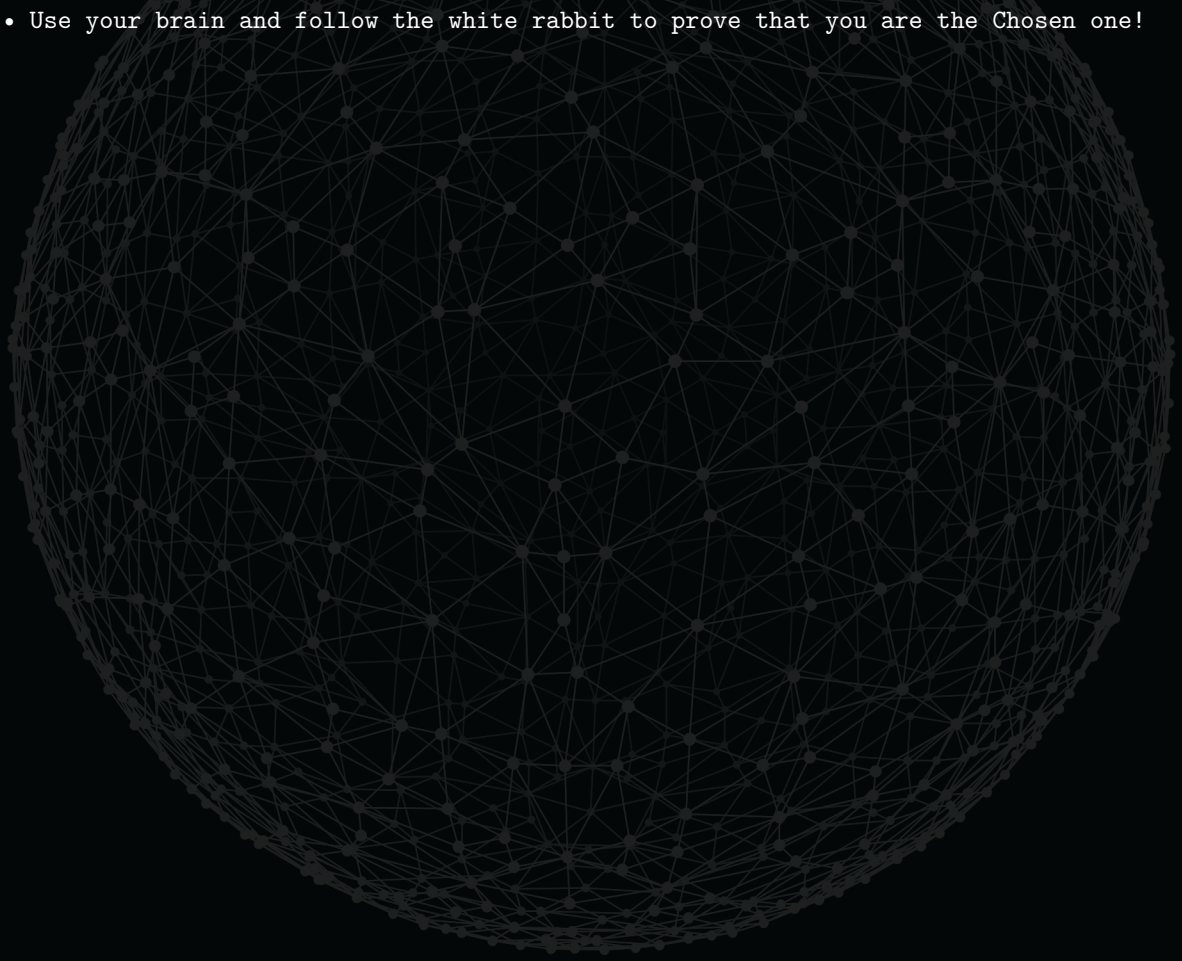
- Start from scratch, from the basics of previous challenges. "Play" with the Terminal, `cd -`, `ls -latr`, `mkdir`, `touch`, `cat -be`.
- Create a simple program with the use of arrays of pointers. Try to do the most difficult tasks from Sprint 03 and Sprint 04 again.
- Read about program arguments. Code a simple program that uses arguments.
- Create a program that displays each new argument followed by a newline.
- Clone your git repository that is issued on the challenge page in the LMS.
- Communicate with students and share information.
- Let's do the `task00`.

ANALYSIS

Analyze your findings. What conclusions have you made after completing guiding questions and activities? In addition to your thoughts and conclusions, here are some more analysis results.

- Be attentive to all statements of the story. Examine the given examples carefully. They may contain details that are not mentioned in the task.
- Perform only those tasks that are given in this document.
- Submit your files using the layout described in the story. Only useful files allowed, garbage shall not pass!

- Compile C-files with clang compiler and use these flags: `clang -std=c11 -Wall -Wextra -Werror -Wpedantic`.
- Pay attention to what is allowed in a certain task. Use of forbidden stuff is considered a cheat and your tasks will be failed.
- Complete tasks according to the rules specified in the `Auditor`.
- The solution will be checked and graded by students like you. Peer-to-Peer learning.
- Also, the challenge will pass automatic evaluation which is called `Oracle`.
- If you have any questions or don't understand something, ask other students or just Google it.
- Use your brain and follow the white rabbit to prove that you are the Chosen one!



Act: Task 00

NAME

Print program name

DIRECTORY

`t00/`

SUBMIT

`mx_print_name.c, mx_printchar.c, mx_printstr.c, mx_printint.c, mx_strlen.c`

ALLOWED FUNCTION

`write`

DESCRIPTION

Create a program that prints to the standard output:

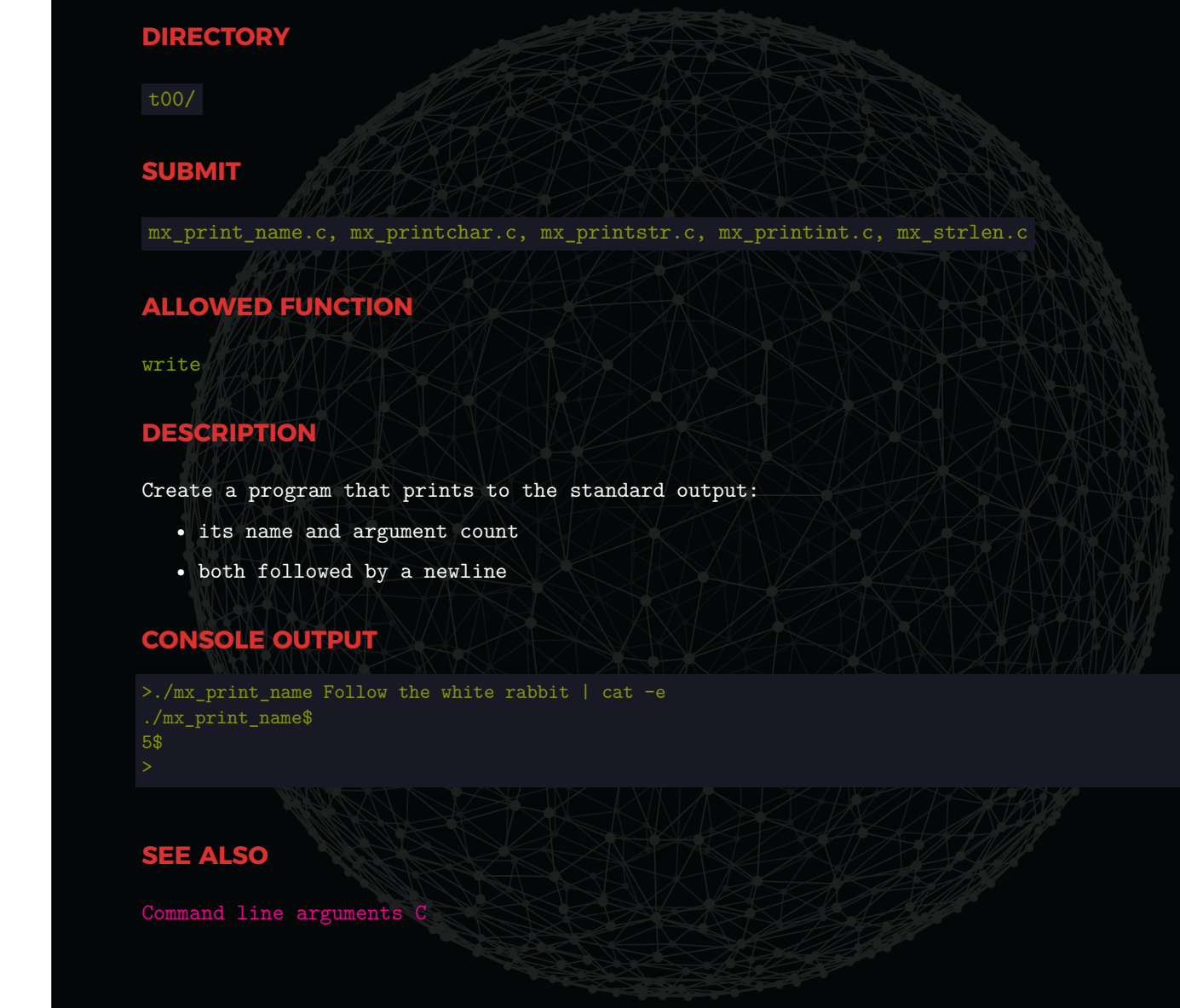
- its name and argument count
- both followed by a newline

CONSOLE OUTPUT

```
>./mx_print_name Follow the white rabbit | cat -e
./mx_print_name$
5$
>
```

SEE ALSO

Command line arguments C



Act: Task 01

NAME

Print arguments

DIRECTORY

`t01/`

SUBMIT

`mx_print_args.c, mx_printchar.c, mx_printstr.c, mx_strlen.c`

ALLOWED FUNCTION

`write`

DESCRIPTION

Create a program that:

- prints its arguments to the standard output, excluding program name
- prints each argument followed by a newline
- does nothing if there are no command-line arguments

CONSOLE OUTPUT

```
>./mx_print_args Follow the white rabbit | cat -e
Follow$
the$
white$
rabbit$
>
```

Act: Task 02

NAME

Sort arguments

DIRECTORY

`t02/`

SUBMIT

`mx_print_sargs.c, mx_printchar.c, mx_printstr.c, mx_strcmp.c, mx_strlen.c`

ALLOWED FUNCTION

`write`

DESCRIPTION

Create a program that:

- sorts the arguments, excluding the name of the program, in ASCII order
- prints its arguments to the standard output followed by a newline
- does nothing if there are no command-line arguments

CONSOLE OUTPUT

```
>./mx_print_sargs Follow the white rabbit | cat -e
Follow$
rabbit$
the$
white$
>
```

Act: Task 03

NAME

Sum arguments

DIRECTORY

`t03/`

SUBMIT

`mx_sum_args.c, mx_printchar.c, mx_printint.c, mx_atoi.c, mx_isspace.c, mx_isdigit.c`

ALLOWED FUNCTION

`write`

DESCRIPTION

Create a program that:

- sums the integer arguments and prints the sum to the standard output followed by a newline
- skips the argument if it is not a valid integer. Integers with a single `-` or `+` signs before the number are considered as valid arguments
- outputs `0` if all arguments are invalid
- does nothing if there are no command-line arguments

CONSOLE OUTPUT

```
>./mx_sum_args 1- -7 | cat -e
-7$
>./mx_sum_args a1 b 2 c-3 | cat -e
2$
>./mx_sum_args 1 "   2" "3" "10  " | cat -e
4$
>./mx_sum_args 1 +2 -3 +-4 5+ 6at "  7" | cat -e
0$
>./mx_sum_args a1 2- | cat -e
0$
>
```

Act: Task 04

NAME

Print exact program name

DIRECTORY

`t04/`

SUBMIT

`mx_print_pname.c, mx_printchar.c, mx_printstr.c, mx_strchr.c, mx_strlen.c`

ALLOWED FUNCTION

`write`

DESCRIPTION

Create a program that prints its name, excluding the leading characters to the standard output, followed by a newline.

CONSOLE OUTPUT

```
>./mx_print_pname Follow the white rabbit | cat -e
mx_print_pname$
>
>/Users/root/marathonc/sprint05/t04/mx_print_pname | cat -e
mx_print_pname$
>
```

Act: Task 05

NAME

Integer to binary

DIRECTORY

`t05/`

SUBMIT

`mx_print_argbints.c, mx_printchar.c, mx_printint.c, mx_atoi.c, mx_isspace.c, mx_isdigit.c`

ALLOWED FUNCTION

`write`

DESCRIPTION

Create a program that:

- prints a binary representation of each integer received as a command-line argument
- prints each binary to the standard output followed by a newline
- does nothing if there are no command-line arguments

You will get well-formatted integers as arguments.

CONSOLE OUTPUT

```
>./mx_print_argbints 2 "  -2" 2147483647 -2147483648 0 1 | cat -e
00000000000000000000000000000010$
11111111111111111111111111111110$
01111111111111111111111111111111$
10000000000000000000000000000000$
00000000000000000000000000000000$
00000000000000000000000000000001$
>
```

Act: Task 06

NAME

Iterative factorial

DIRECTORY

`t06/`

SUBMIT

`mx_factorial_iter.c`

ALLOWED FUNCTION

None

DESCRIPTION

Create a function that calculates the factorial of a `non-negative` integer using an `iterative` algorithm.
Hint: Case when the factorial of a given `n` bigger than MAX_INT - `error` case.

RETURN

- returns the factorial of the `non-negative` integer
- returns `0` in case of `errors`

SYNOPSIS

```c
int mx_factorial_iter(int n);
```

EXAMPLE

```c
mx_factorial_iter(2); //returns 2
mx_factorial_iter(5); //returns 120
```

Act: Task 07

NAME

Recursive factorial

DIRECTORY

`t07/`

SUBMIT

`mx_factorial_rec.c`

ALLOWED FUNCTION

None

DESCRIPTION

Create a function that calculates the factorial of a `non-negative` integer using `recursion`.

RETURN

- returns the factorial of the `non-negative` integer
- returns `0` in case of `errors`

SYNOPSIS

```
int mx_factorial_rec(int n);
```

EXAMPLE

```
mx_factorial_rec(2); //returns 2
mx_factorial_rec(5); //returns 120
```

SEE ALSO

Recursion

Act: Task 08

NAME

Recursive exponentiation

DIRECTORY

`t08/`

SUBMIT

`mx_pow_rec.c`

ALLOWED FUNCTION

None

DESCRIPTION

Create a function that computes `n` raised to the power of a positive integer `pow` using `recursion`.

RETURN

Returns `n` raised to the power of the positive integer `pow`.

SYNOPSIS

```
double mx_pow_rec(double n, unsigned int pow);
```

EXAMPLE

```
mx_pow_rec(5, 4); //returns 625
```

FOLLOW THE WHITE RABBIT

man pow

SEE ALSO

Recursion
Exponentiation

Act: Task 09

NAME

Multiplication table

DIRECTORY

`t09/`

SUBMIT

`mx_mult_table.c, mx_printchar.c, mx_printint.c, mx_atoi.c, mx_isdigit.c, mx_isspace.c, mx_strlen.c`

ALLOWED FUNCTION

`write`

DESCRIPTION

Create a program that:

- prints a table of multiplication of positive integers to the standard output in the range specified as command-line arguments which are `digits`
- uses a tab character `\t` as a delimiter when displaying the results
- prints each table row followed by a newline
- does nothing if the number of command-line arguments is not equal to 2 or arguments are invalid

CONSOLE OUTPUT

```
>./mx_mult_table 1 4 | cat -e
1       2       3       4$
2       4       6       8$
3       6       9       12$
4       8       12      16$
>./mx_mult_table 4 4 | cat -e
16$
>./mx_mult_table 4 2 | cat -e
4       6       8$
6       9       12$
8       12      16$
>./mx_mult_table 3 12 | cat -e
>
```

Act: Task 10

NAME

Greatest common divisor

DIRECTORY

`t10/`

SUBMIT

`mx_gcd.c`

ALLOWED FUNCTION

None

DESCRIPTION

Create a `recursive` function that computes the greatest common divisor of two integers.

RETURN

Returns the greatest common divisor of two integers.

SYNOPSIS

```c
int mx_gcd(int a, int b);
```

EXAMPLE

```c
mx_gcd(20, 15); //returns 5
mx_gcd(-20, -15); //returns 5
```

SEE ALSO

Greatest common divisor

Act: Task 11

NAME

Least common multiple

DIRECTORY

`t11/`

SUBMIT

`mx_lcm.c, mx_gcd.c`

ALLOWED FUNCTION

None

DESCRIPTION

Create a function that computes the least common multiple (LCM) of two integers.

RETURN

- returns the least common multiple of two integers
- returns `0` in case of errors

SYNOPSIS

```
int mx_lcm(int a, int b);
```

EXAMPLE

```
mx_lcm(20, 15); //returns 60
mx_lcm(-20, 15); //returns 60
```

SEE ALSO

Least common multiple

Share

PUBLISHING

Last but not least, the final stage of your work is to publish it. This allows you to share your challenges, solutions, and reflections with local and global audiences. During this stage, you will discover ways of getting external evaluation and feedback on your work. As a result, you will get the most out of the challenge, and get a better understanding of both your achievements and missteps.

To share your work, you can create:

- a text post, as a summary of your reflection
- charts, infographics or other ways to visualize your information
- a video, either of your work, or a reflection video
- an audio podcast. Record a story about your experience
- a photo report with a small post

Helpful tools:

- Canva - a good way to visualize your data
- QuickTime - an easy way to capture your screen, record video or audio

Examples of ways to share your experience:

- Facebook - create and share a post that will inspire your friends
- YouTube - upload an exciting video
- GitHub - share and describe your solution
- Telegraph - create a post that you can easily share on Telegram
- Instagram - share photos and stories from ucode. Don't forget to tag us :)

Share what you've learned and accomplished with your local community and the world. Use #ucode and #CBLWorld on social media.