



# 15-110 PRINCIPLES OF COMPUTING – F21

## LAB 1: ALGORITHMS!

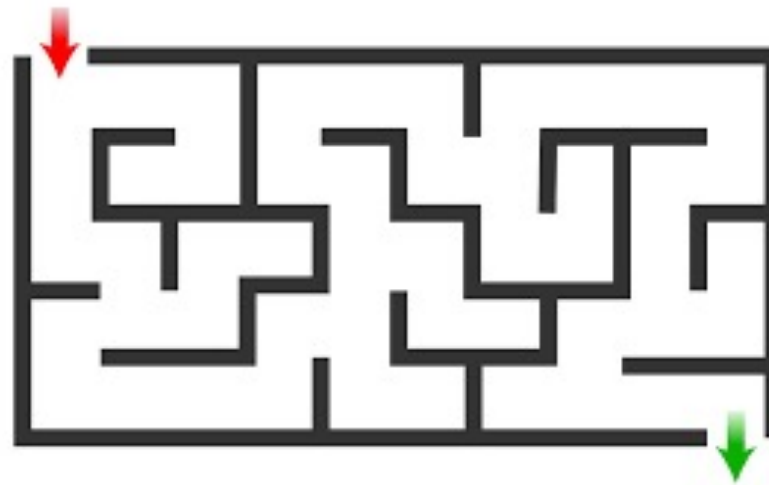
TEACHER:  
GIANNI A. DI CARO

# More problems: Navigating out of a maze

---

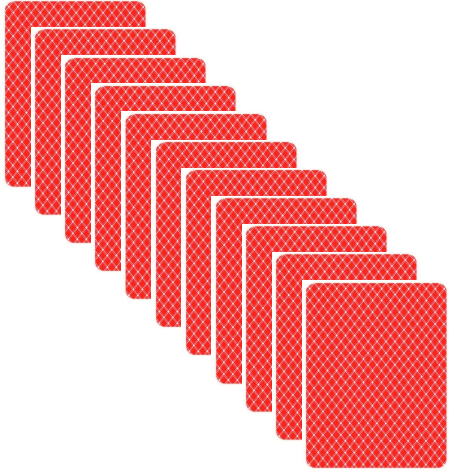
## Getting out of a maze!

- Describe the step-by-step algorithm (sequence of instructions) to get out of the maze (from the red to the green open accesses)
  - You don't know distances and don't know how measure them, but you have a sensor that let you know when you're hitting a wall
  - You can move straight forward and rotate in place of the desired angle (clockwise or anti-clockwise)



# A sorting problem: you know the numbers

---



## Use information about the cards

- You are given a set of cards (covered) as show in the figure
- Cards are uniquely numbered from 1 to 100, but cards aren't necessarily placed in the 1-100 order!
- You must **sort** the cards in the  $1 \rightarrow 100$  order using an algorithm that explicitly makes use of the information that card numbers are between 1 and 100



# Get statistics about your volunteers



## How many people are there? What is the average age?

- You are evaluating a group of volunteers who came to help for a music event.
- The first thing to do is to know how many volunteers are there and what is the average age of the group.
- Write an algorithm that you can use to accomplish the task. The algorithm shall output the total number of volunteers and their average age.

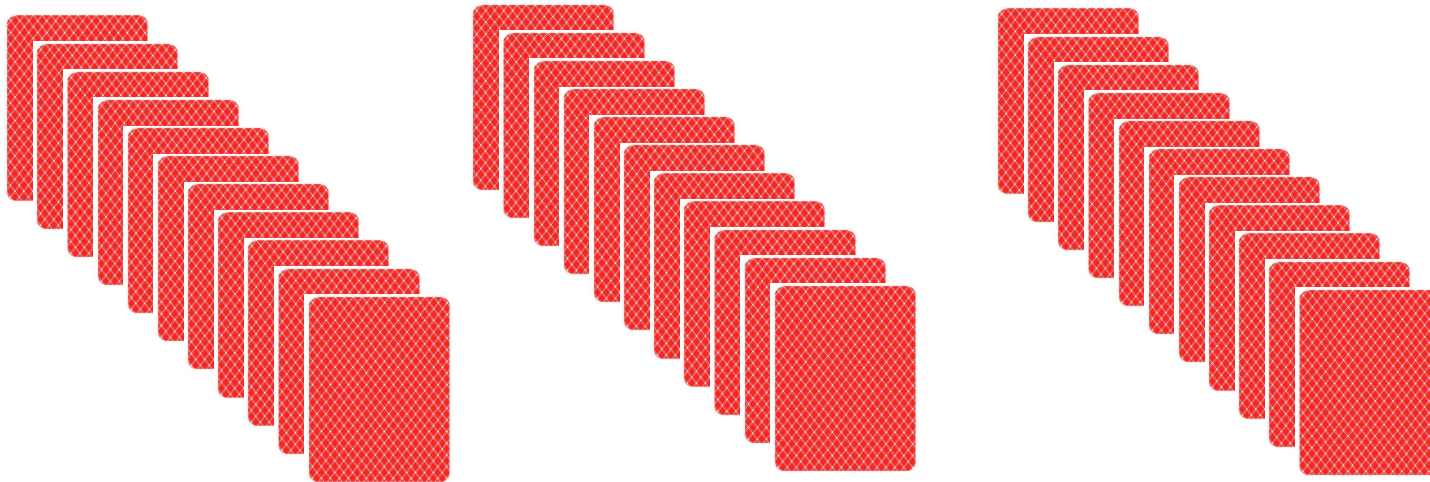


# Merge sorted piles of cards

---

## Split the job among your friends!

- Still need to sort a pile of  $n$  cards, and you don't know their ranges.
- Luckily, you have three friends who can help you in the task. You split the cards in three piles, giving each pile to each one of your friends (what if  $n$  is not precisely divisible by 3?)
- Each friend know how to sort a pile of cards, such that he/she will return a sorted pile of cards (e.g., sorted in ascending order).
- Now you need to use / merge the sorted piles to create a single sorted pile of cards, which will be your output



# Pair the socks in a heap!

---

## Pair the socks!

- Taking care of organizing clothes at home, sometimes can be a very frustrating job! Image you have an unorganized heap of (many) socks, and you need to pair all the socks and put them aside to bring them to the wardrobe.
- Socks might have different colors, patterns, shape.
- Define two different algorithms that can achieve the task.
- Discuss which one of the two algorithms you think is more efficient (i.e., it would take less time to complete)

