University of Echahid Hamma Lakhdar
Faculty of Exact Sciences
Department of Computer Science

Module: Algo & Data Structure I
University Year: 2025/2026
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# Series of exercises N° : 00

## *Reflection games*

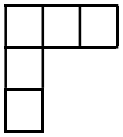


Figure 1

**1.** Consider Figure 1, where we have 5 similar squares made up using matches.
- Remove two matches to have only 4 similar squares.
- Move two matches to have only 4 similar squares.

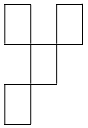


Figure 2

**2.** Consider Figure 2, where we have 5 similar squares made up using matches.
- Move two matches to have only 4 similar squares.

**3.** Fill in the circles and squares in Figure 3 with all the numbers from 1 to 8, respecting the following conditions:
- Each number must appear only once.
- The number in a square must be the difference of the numbers in the circles surrounding it

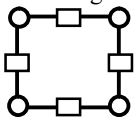


Figure 3

**4.** How many triangles are there in Figure 4 ?

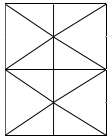


Figure 4

**5.** Consider the Figures (a), (b), (c) and (d) :

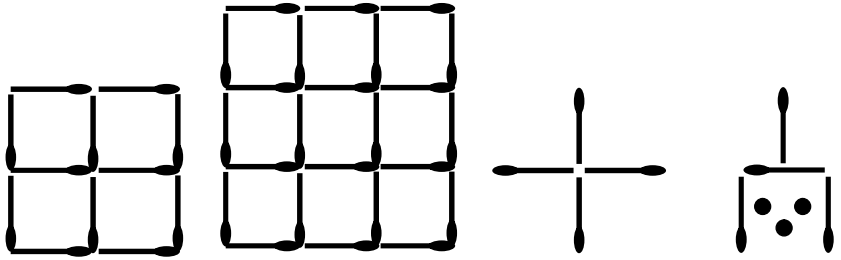


Figure (a) Figure (b) Figure (c) Figure (d)

1. Move 3 matches from Figure (a) to get only 3 similar squares ?
2. Remove only 2 matches from Figure (a) to get only 2 squares ?
3. Knowing that there are 09 similar squares in Figure (b)
   Remove only 4 matches so that there are only 5 similar squares left ?
4. How to get a square by moving only one matchstick from Figure (c) ?
5. Figure (d) represents a fork containing 3 objects, move only two matches to obtain a fork of the same shape and the objects end up outside?



## *Number Math Puzzle*

1. Use the basic operations: -, / ,*, + and use only one time the numbers 6, 4, 3, 1 to get 24 ?
2. Assuming that the following systems of equations are all correct. Can you guess the solution of the last equation for each of them ?

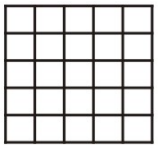
| | | | |
|---|---|---|---|
| 2 + 3 = 10 | 9 = 10 | 9 + 1 = 91 | 2 = 3 |
| 3 + 4 = 14 | 8 = 18 | 8 + 2 = 75 | 4 = 14 |
| 4 + 5 = 18 | 7 = 24 | 7 + 3 = 61 | 6 = 33 |
| 5 + 6 = 22 | 6 = 28 | 6 + 4 = 49 | 10 = 95 |
| 6 + 7 = 26 | 5 = 30 | 5 + 5 = 39 | 8 = **??** |
| 8 + 9 = **??** | 3 = **??** | 3 + 7 = **??** | |

## *Magic squares games*

Consider the following magic squares (a) and (b):
In a magic square, the numbers are arranged so that their sums in each row, column, and main diagonals are equal to a constant $C=n(n^2+1)/2$ where n is the square order.
For example, the constant of square(a) is 15.

| | | |
|---|---|---|
| 8 | 1 | 6 |
| 3 | 5 | 7 |
| 4 | 9 | 2 |

Carré (a)



Carré (b)

| Rows | Colomns | Diagonals |
|---|---|---|
| 8 + 1 + 6 = 15 | 8 + 3 + 4 = 15 | 8 + 5 + 2 = 15 |
| 3 + 5 + 7 = 15 | 1 + 5 + 9 = 15 | 4 + 5 + 6 = 15 |
| 4 + 9 + 2 = 15 | 6 + 7 + 2 = 15 | |

1. Complete the magic square (b) knowing that the order n = 5 and the constant is 65

## Towers of Hanoi

We have three towers (rods) fixed to a base, and on the left one, we have arranged, one on top of the other, 4 disks (perforated in the middle) of increasing diameters.

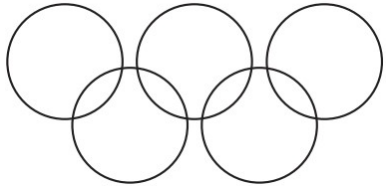
The goal is to transfer, one by one, all the disks from the left tower to the right one, never placing a disk on top of a smaller one.

You can, of course, use the middle tower to transit.

If you have a maximum of 15 moves to do that, show us how you do it.

## Numbers and Rings

Place the numbers 1 to 9 in the 9 regions created by the 5 Olympic rings so that the sum of the numbers in each of the 5 circles is equal.



**Enigma 01 :**

In one classroom, a teacher uses six colored balls in student activities, placing them according to their colors in three boxes labeled "Blue-Blue," "Blue-Red," and "Red-Red." Unfortunately, due to an error, none of the labels correspond to the contents of the box. How do you determine the contents of the three boxes by drawing only one ball from one of the three boxes?

**Enigma 02**

Ten bags of 100 gold coins (10 coins per bag) are lined up in front of you. They inform you that there is a bag of counterfeit coins. A real coin weighs 5 grams and a counterfeit 4.5 grams. We have a digital scale, which therefore gives an exact weight in grams.

How do you determine the bag of counterfeit coins with a single weighing?

**Enigma 03**

Assuming we have 81 gold coins: 80 real coins and 1 counterfeit coin. We know that the real coins weigh the same, and the counterfeit coin is heavier than the real one.

You must, in a maximum of 4 weighings, find the counterfeit coin among the 81 using a Roberval balance.

Note: One weighing corresponds to one manipulation on the balance.

**Enigma 04**

Achref and Farouk are playing a game in pairs (taking turns) as follows: 17 matches are placed on a table. Each time they take a match, they are allowed to take either 1, 2, or 3 matches.

Assuming that whoever takes the last match wins, can you help Farouk get started and show him the trick to win the game surely ?

**Enigma 05**

Four people (A, B, C, D) are stranded on one of the river banks and must cross a mined bridge. They know that as soon as they set foot on the bridge, a mechanism will blow it up in 17 minutes. Furthermore, the bridge can only support the weight of two people. The darkness forces them to use their single torch to cross the bridge. Furthermore, if two people cross the bridge at the same time, they will go at the pace of the slowest person.

Given their ages and physical abilities, it takes them 10 minutes, 5 minutes, 2 minutes, and 1 minute respectively to cross the footbridge.

How can they all get to the other side before the bridge explodes ?

**Enigma 06** :

If 3 lions can catch 3 deer (gazelle) in 3 minutes.

how long will it take 100 lion's to catch 100 deers.

**Enigma 07** :

Three very intelligent prisoners are lined up in single file, one behind the other, so that the last one sees the first two, the second one sees the first one, and the first one sees no one.

The prison chief wants to give them a chance to be free from prison, and to do so, he places a hat on the head of each of the three prisoners chosen at random from five hats (two black and three white) and asks them in turn if they know the color of the hat they are wearing. The last one replies that he doesn't know. The second one also replies that he doesn't know. Then the first one, who sees nothing, says, "I know the color of my hat." What color is his hat?