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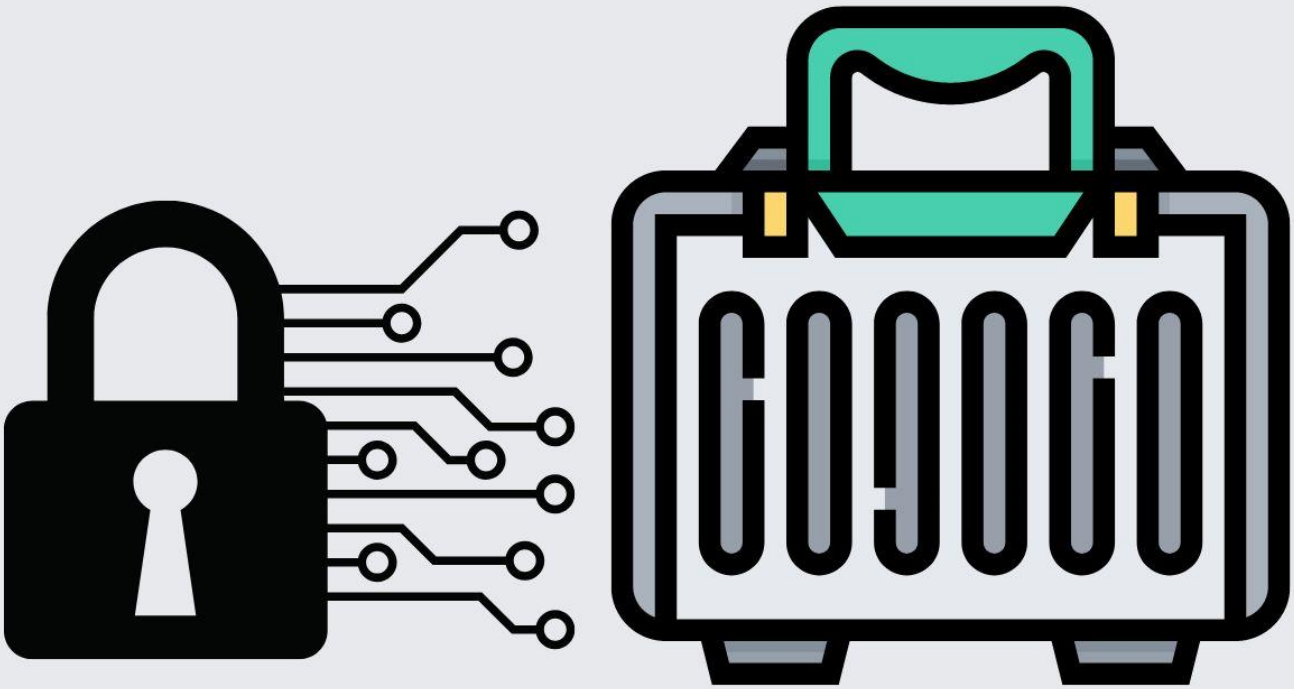
The CodER Virtual Scenarios Handbook

Instruction for youth workers

Title: Can you open a suitcase with a microcontroller?



Can you open a suitcase with a microcontroller?

Instruction guide for youth workers/ teachers

1. Introduction

a. Context

The CodER project seeks to enable youth workers to gain basic knowledge in programming and microcontrollers so they can transfer this knowledge to young people through non-formal education and using innovative methods like escape room creation. CodER also aims to address youth unemployment by giving them access to training relevant to the labour market's needs. Basic programming knowledge is a skill needed in every field discipline nowadays, from social sciences to business and entrepreneurship. The objective is to use escape rooms appropriately to positively impact young people's engagement and learning in programming and microcontrollers. The aim is ERs to be converted into effective and efficient educational tools, which take into consideration the validated results of the already existing research, and which simultaneously employ various synchronous digital tools, such as online courses and interactive platforms, digital gamified processes, digital media, VR Elements, apps, QR codes, etc.

b. Partners

Digijeunes www.digijeunes.com/
CIP www.citizensinpower.org
RITE https://ritecy.org/
Challedu https://challedu.com/
Kalimera www.kalimera.hr
AKMI https://iek-akmi.edu.gr/

To know more about the project: https://coderproject.eu/

c. Learning goals of the ER

- Familiarise young people with simple coding
- Introduce microcontrollers and their use to young people
- Teach young people how to create *QR codes, use scratch etc*

d. Targeted audience

i. Age: 12+
ii. Level: Beginner
iii. Group size: 4-8 people

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iv. Type of target group: People interested in learning some basics about coding and microcontrollers

2. The ER scenario

a. Storyline

Christos Papadimitriou is a professor in the Electrical Engineering and Computer Sciences Department at University of California, Berkeley. Before joining UC Berkeley in 1996, he taught at Harvard, MIT, Athens Polytechnic, Stanford, and University of California, San Diego. Papadimitriou received the 2002 Knuth Prize from ACM SIGACT and the IEEE Technical Committee on the Mathematical Foundations of Computing for longstanding and seminal contributions to the foundations of computer science.

This year's Human Brain Project Open Day, coordinated by the "Athena RC" welcomes the Greek distinguished professor Christos Papadimitriou of Columbia University, for a keynote speech on the contribution of computational science to the study of the brain and intelligence. You and your team are there to attend the conference as you admire Mr Papadrimitriou's work. Soon you realise something is not going well as loud voices are heard from the conference lobby, and when you go there you see Christos Papadimitriou having lost the access to his usb stick and all notes from his speech that are inside to his luggage. Only 60' minutes are left before the time of his speech, so you decide to help him. The thing is that you are not looking for just a key to open the luggage, you have to deal with a complicated security system that will give you access to the presentation.

b. Objective of the game

You and your team have decided to help Christos Papadimitriou regain access to his presentation. So you have to solve all the riddles and open the file that contains the presentation. But you only have one hour before the conference starts. To solve the riddles you will use simple coding, the program scratch, qr codes and an online program with microcontrollers. If you succeed in solving all the riddles you will find Dr. Papadimitriou's presentation.

3. Creating the setting

a. Needed materials/ equipment

- 1 computer/laptop with internet connection
- 1 suitcase

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- 1 usb stick
- 1 small box that fits inside the suitcase
- 2 padlocks with 3 digits
- 1 smartphone or tablet that can read QR codes
- 1 envelope that fit inside the suitcase

Game details (printable and non-printable)

- Introductory note (file1) (printable)
- Document named “Final presentation” (file2) (not printable)
- Document named “Suitcase” (file3) (not printable)
- QR code1 (file4) (printable)
- QR code2 (file5) (printable)
- Photo of Christos Papadimitriou (file6a) (printable)
- Miscellaneous notes (file6b) (printable)
- Cards with one line of code each (file7) (printable)
- Paper with 3 lights (file8) (printable)
- Document named “How to open the box” (file9) (not printable)
- Paper with 3 numbers (file10) (printable)
- Instructions about arduino (file 11) (printable)

Software to be used

- Scratch (website)
- PyCharm Community (software)
- Tinkercad (website)
- winrar (software)

b. Setup of the room

The Escape Room starts with the following items available:

- 1 computer
- 1 suitcase locked with a padlock with a qr code stuck on it, that has inside 2 envelopes, 1 small box(that contains various notes (file6a & file6b), a paper with 3 lights (file8), a folder of papers that each have a series of codes
- 1 USB stick.

We recommend adding relevant accessories to the room to make it more appealing(books, or posters or any other material related to the subject) but it’s not necessary.

c. Installation and reset

1. Open the laptop and then open the website “scratch” following the steps described on **How to use scratch**. Then minimise this window.

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2. If you have not already done so, please install “Python” and “PyCharm Community” according to the instructions above **How to use the PyCharm Community** and make a new Python file. Then minimise this window.
3. Open the “tinkercad” website by following the steps described on: How **to use tinkercad.**
4. Put the usb stick in the computer and inside it make a folder called "Presentation for the conference". Inside this folder place file2 and name it "Final presentation". Then put the code “58533” in the “Conference Presentation” folder following the instructions on **How to download winrar** and put code to the folder.
5. Add another folder to the usb stick named “Box inside the suitcase”. Inside this folder place file9 and name it “How to open the box”. Then put in the folder “Box inside the suitcase” the code “brain”.
6. Add the **file3** to the USB and name it “Suitcase”.
7. Take out the usb stick and place it near the laptop.
8. Print the **file6a & file6b** that has the various notes and place them inside the suitcase.
9. Print **file8** which is a paper with 3 lights and place it inside the suitcase.
10. Print **file7** and cut the paper so that there are 5 pieces of paper with one line of code each. Place the slips of paper in an envelope, then place the envelope inside the suitcase.
11. Print **file11** which has instructions for arduino and place this paper inside the box.
12. Print **file5** and place it inside the box.
13. Print **file10** and place it inside the box.
14. Close the box and lock it with a padlock with code “105”
15. Place the box inside the suitcase.
16. Close the suitcase and lock it with a padlock with code “612”
17. Print **file4** and glue it to the bottom of the suitcase.
18. Print **file1** and place it on the closed suitcase.

How to download winrar and put code in a folder.

1. Open the following link: https://www.win-rar.com/download.html
2. Click where it says “WinRAR 6.11 English 64 bit” to download it.
3. Open the downloaded file and follow the steps it mentions to install it.
4. Select the folder you want to put a password on.
5. Right click on it and click on select “Add to archive”
6. In the window that appears, click on the option “Set password”
7. Enter the code you want and press “OK”
8. A new folder will be created as a copy which if you try to open it will ask for the password you have entered. Delete the previous folder that has no password.

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How to use scratch:

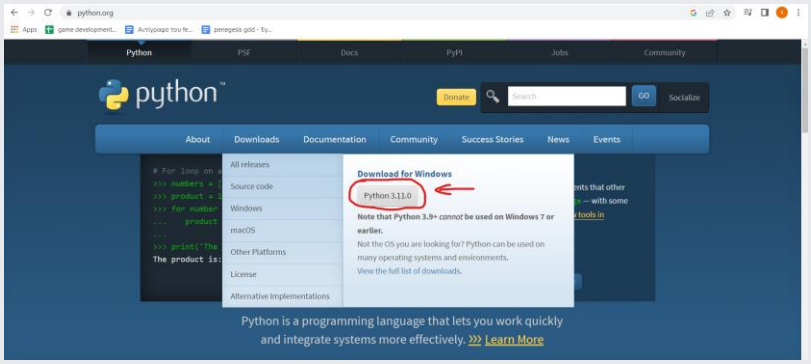
1. You open the following link https://scratch.mit.edu/projects/768142965/editor

2. You log in using as username:**coderusers** and as password:**users4coder!**

3. The riddle will appear in front of you. In case it is solved, disassemble and scatter the tiles in different places (it is important to know that scratch saves any changes made so if you want to use the puzzle again you have to scatter the tiles so that it is not solved).

How to use PyCharm Community

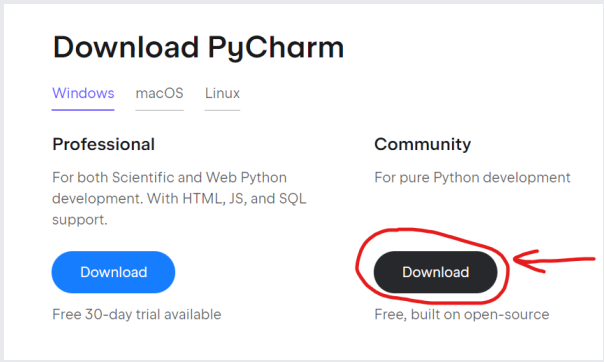
1. You open the following link https://www.python.org/
2. Click on the button that says “Download” and then “Python 3.11.0” (maybe when you follow these instructions a new version has been released so you can download the newest one)



3. Open the downloaded file and follow the steps to install it.

4. Open the following link
https://www.jetbrains.com/pycharm/download/#section=windows

5. Click on the button that says "Download" under Community



6. Open the downloaded file and follow the steps to install it.

7. Open the program named PyCharm Community that was just installed.

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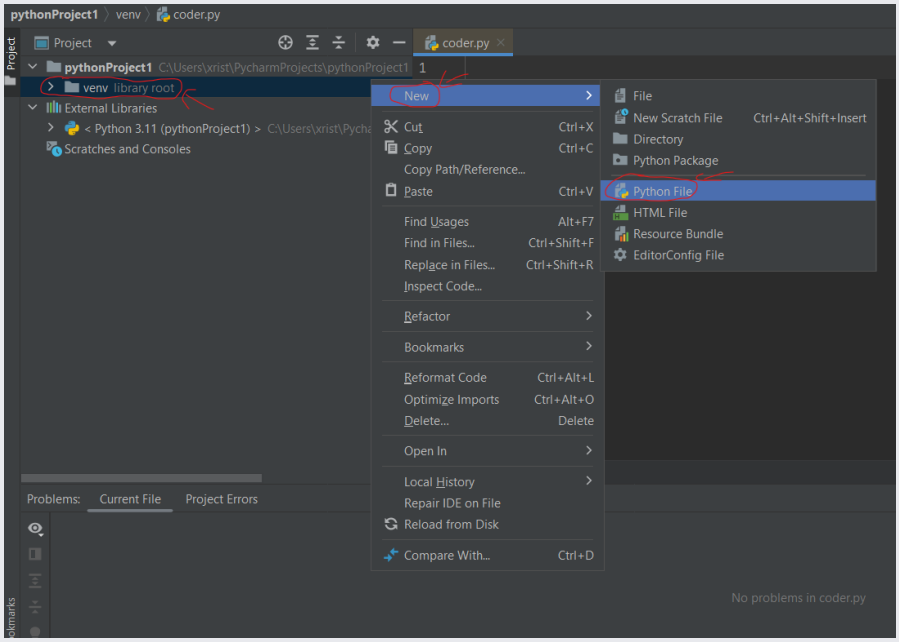
8. A new project is created, with the name you want, by filling it in at the top next to the point that says “PycharmProjects/”. Then press the button that says “create”.

9. In the left column click where it says “venv” then “new” and finally “Python file”.



10. Put the name you want and then press enter

11. In the window that will appear, players can write the code.

12. To run the code you have to click on the tab that says the name you gave to the file and click on the “Run” option. Then you will see the result of the code at the bottom of the screen

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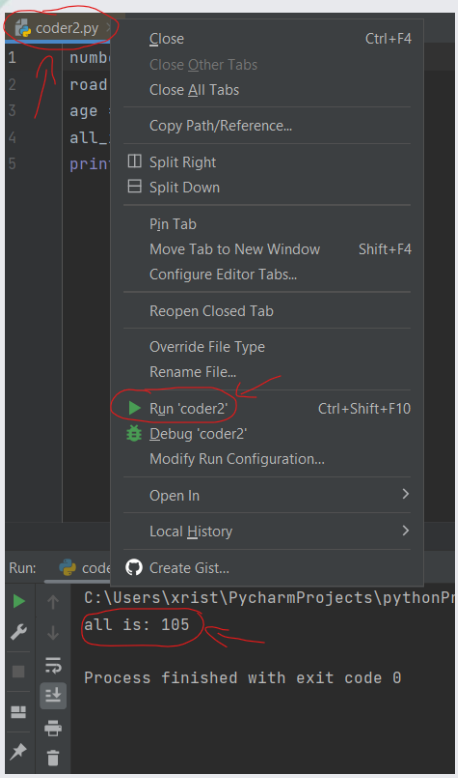
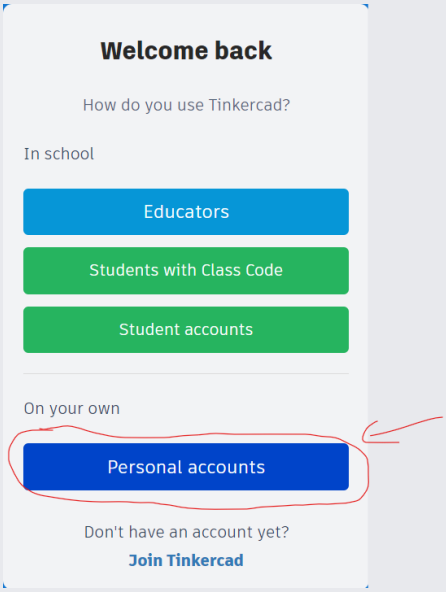


How to use tinkercad

1. Open the following link https://www.tinkercad.com/things/dakZUCutP9D-grand-hillar/editel?tenant=circuits

2. On the screen that will appear, press personal accounts



3. In the next screen that will appear, press Email or Username

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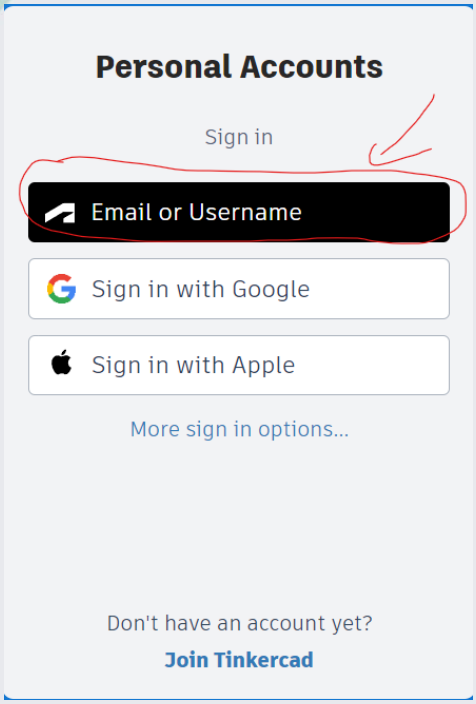

4. You log in using as username: **coderusers** and password: **users4coder!**
5. The riddle will appear in front of you. To run the program after solving the puzzle you have to press the button that says "Start Simulation".
   After the activity has finished don't forget to put the components back in the initial position. In case two users need to access the file at the same time, please duplicate the file.

   d. To have in mind

   Make sure that you have followed the instructions when setting up the room, and all the materials are properly placed, all the files have codes, the padlocks are correctly placed. An option is building the Escape Room backwards(from the inside of the suitcase) to make sure you haven't forgotten anything.

4. The game

a. The game master

The game master, when the players come, should make a short introduction, engage them through the story and give them the printed file named "template for participants". Also it's important that he/she will stay close to them so he/she can facilitate them in case they get stuck in a riddle.

b. Introduction & instructions

It's important that the players receive a short introduction about the theme of the Escape Room, listen to the story, and understand what they have to do. Make clear to the players that they will have to use all the elements that

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they will find. The game master could also take the role of Christos Papadimitriou(or another relevant professor/scientist) and take part in the procedure. In this case the game master could pretend that he/she doesn't remember anything from the solutions of the riddles, and only give some hints when the players get stuck.

c. **Hints**

The Escape Room should last around one hour; if the game master sees that the players take a lot of time to solve a riddle, or discover what they have to do next, he/she should try and help them by pointing out some hints. In order to do so the game master must have a really good understanding of the mechanics of the game and its stages.

d. **Game stages**

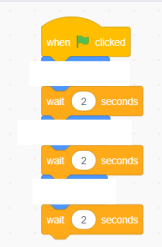
i. **The beginning**

Players receive a note (**file1**) describing what has happened before and what they have to do. Then they find on the table a suitcase that is locked with a padlock, a computer and a usb stick. Then they have to connect the **usb stick** and they will see inside 2 folders and a document. The first folder will be named "presentation for the conference" and will be locked (**file 2**, this is the folder players must open to solve the entire mystery), the second locked folder will say "box inside the suitcase". The document will be named "Suitcase" (**file3**)

ii. **The course of the game & solutions**

1. *Challenge #1*

Players can open the document named "Suitcase" and read the text that says: "*To keep the suitcase code safe I have created a combination in scratch. The numbers the cat will end up with are what will help me remember the code. I need to line up some blocks one below the other. I'll hide half here and the other half somewhere in the suitcase! When I put the right blocks, I have to press the green flag for the cat to show me the code*". The following image will appear at the bottom of the document:



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The players should then look at the suitcase and see that there is a piece of paper stuck to it with a qr code (**file4**). When they scan it with a mobile phone or tablet they will see an image showing the missing blocks. They will open after the scratch which will be minimised on the computer and then they will have to put the blocks in the right order and press the green flag. When they do this the cat will move 3 numbers **(612**). This is the **code they have to put in the suitcase to open it**.

2. *Challenge #2*
   When they open the suitcase they will find inside a box with a lock that has 3 numbers, various notes (**file6a & file6b**), a paper with 3 lights **(file8**), an envelope with papers that each have a series of codes (**file7**). Players should take the cards from the envelope and place them one under the other. If they put them in the right order they will see that there are some red letters that form the word "**brain**". This word is the **code for the folder named "box inside the suitcase"** which is on the computer inside the usb stick.

3. *Challenge #3*
   When they open this folder they will find inside a file (**file9**) that is **named "How I can open the box"** that will say "*If I write the code in Python and run the program, I might be able to find the code for the box*". Then the players have to open the program PyCharm Community that is minimised and write there the code as they see it on the pieces of paper in the correct order. Then they have to press run, to run the program. They will see a 3-digit code appear at the bottom(**105**). This **code must be put into the lock from the box** inside the suitcase to open it.

4. *Challenge #4*
   Inside the box they will find a paper which will have instructions on how to use the arduino and how they should place the wires and lights so that they light it up in a certain order (**file11**). They will also find a paper with 3 numbers (**file10**) and at the bottom of the box will be a qr code (**file5**). By scanning the qr code they will see two images that the

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steps described in file11 to make it easier for them to place the lights correctly. To use the arduino they will click on the computer program that is minimised and says "tinkercad". Players must then place the paper with the 3 lights on top of the paper with the 3 numbers to see which number corresponds to each light. So they will see that first the green light that has the number 5 next to it on the paper lights up. So they will understand that the first number is 5. In the same way they will find all the numbers and **put the code**(**58533**) **in the folder** on the computer named **"presentation for the conference**". The folder will open and players will see the "final presentation" (**file2**) and win.

iii. Ending

1. In case of success
   If the players manage to solve all the riddles, they will gain access to **file2** with the presentation for the conference and they will have solved the Escape Room.
2. In case of failure
   If the players fail to solve all the riddles and successfully reach to the last file(file2), or exceed the time set by the game master a debriefing phase should follow. In this phase the game master should guide the players again through the Escape Room, show the solutions of the riddles, explain the procedure and encourage the players to understand what didn't go so well.

e. Debriefing phase and feedback

Debriefing phase and discussion is really important either in case of success or failure, in order to ensure the transformation of the experience into knowledge. Firstly, the trainer can give some time to the players to share their experiences. Then he/she can lead an open discussion about the themes of coding and microcontrollers and point out all the parts of the Escape Room that tools related to those themes were used. Also if the player(s) didn't manage to solve all the riddles, it is advised to revise those riddles, find the solution and explain the procedure. This discussion can also be based on specific questions that the trainer has prepared that can be different depending on the specific subject that he/she wants to focus on. Some examples could be:

- Did you enjoy the game? Did you find it engaging?
- How was the level of difficulty for you?

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- What did you learn related to coding?
- What did you learn related to microcontroller programming?
- Did you already know some of the tools that were used?
- Do you feel like you want to learn and try these tools more?

Another option is to do this debriefing phase by questionnaire(in case there is not enough time, or the trainer wants more structured feedback). In that case the trainer can prepare the questionnaire and hand it to the players after the game; it is advised not to let the players leave without feedback, or send them the questionnaires much later.

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