

**AP CSP Python with Robots
Design Process and Flowcharts
Activity Guide**

Name:

Activity #1 : The Design Process

What is the design process?

The design process is a tool that helps you break down large projects into smaller, easier-to handle stages.

Briefly describe each step of the design process:

Step 1

Understand the problem: Come up with a new programming idea that solves a problem – make sure you understand what it should do.

Step 2

Research possible solutions: Review what you already know how to do. What programming skills and concepts can you use?

Step 3

Design the solution: Plan the solution to your idea. What will it look like (buttons pressed) and coding (variables, conditions, etc.)?

Step 4

Code the solution: Code the solution. Add a few lines at a time. Documenting and fixing bugs as you go.

Step 5

Document and reflect: Document your code by adding comments. Get feedback on the project, and reflect on how it works so far. Then improve it.

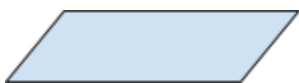
Activity #2 : Flowchart Symbols Give a brief summary of what each flowchart shape is used for.



Start or stop
Use an oval to mark the beginning and end of the program.



Action or process
Use a rectangle to process an action. It could be used to assign a value to a variable, or increment a counter, or get a random number.



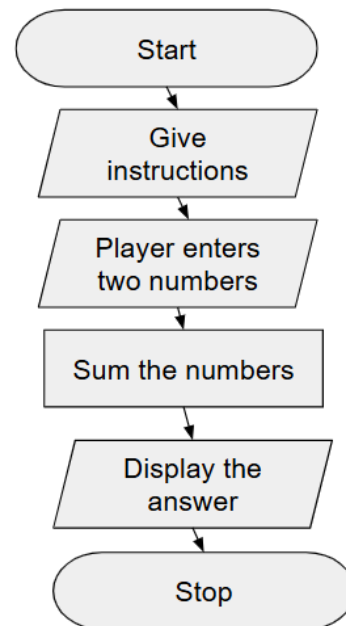
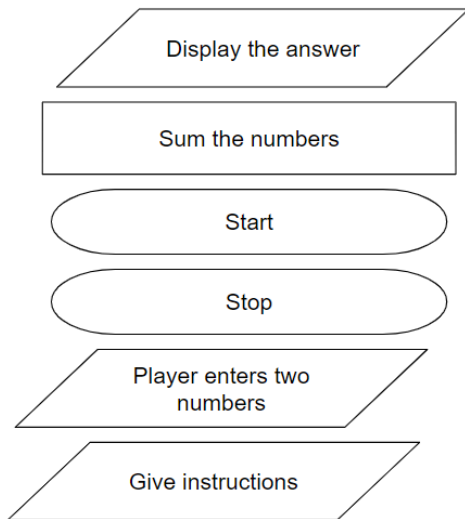
Input or output
Use a parallelogram to show input or output. **Input** could be the button pressed. **Output** could be text on the console panel, sound played, LEDs lit, or movement.



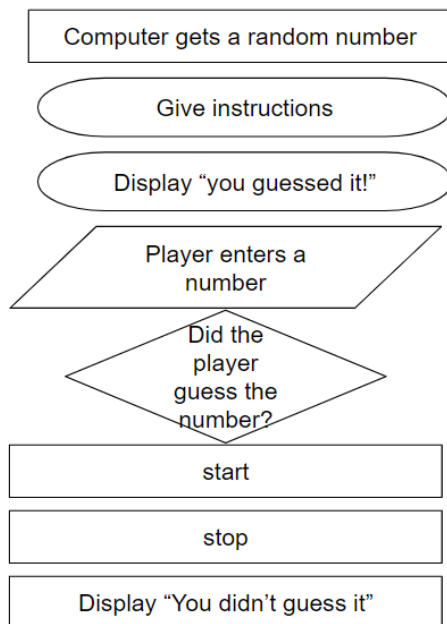
Decision
Use a diamond to make decisions. This shape will have two or more lines that come from it – one for each outcome. This step might ask a question or provide options. The result could be true or false, yes or no, or choices (which button is pressed).

Activity #3 : Flowcharts

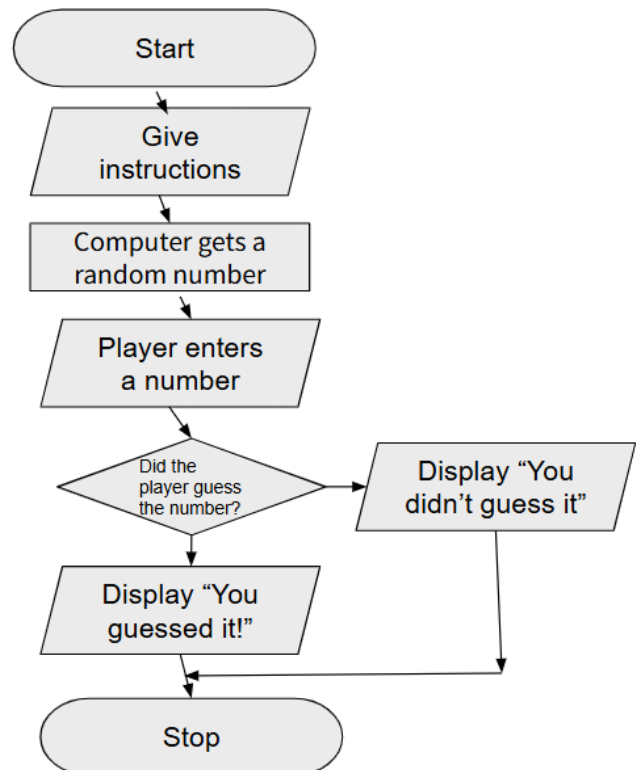
Example #1 Rearrange the flowchart shapes into the correct algorithm.



Example #2 Use the correct shapes and rearrange the steps into the correct algorithm:



One possible solution:



Activity #4 Create flowchart of the program for Mission 3 NavSquare

One possible solution:

Mission 3: Time & Motion Flowchart

Here is one example of how you could represent the NavSquare program in flow chart form.

Some things to notice:

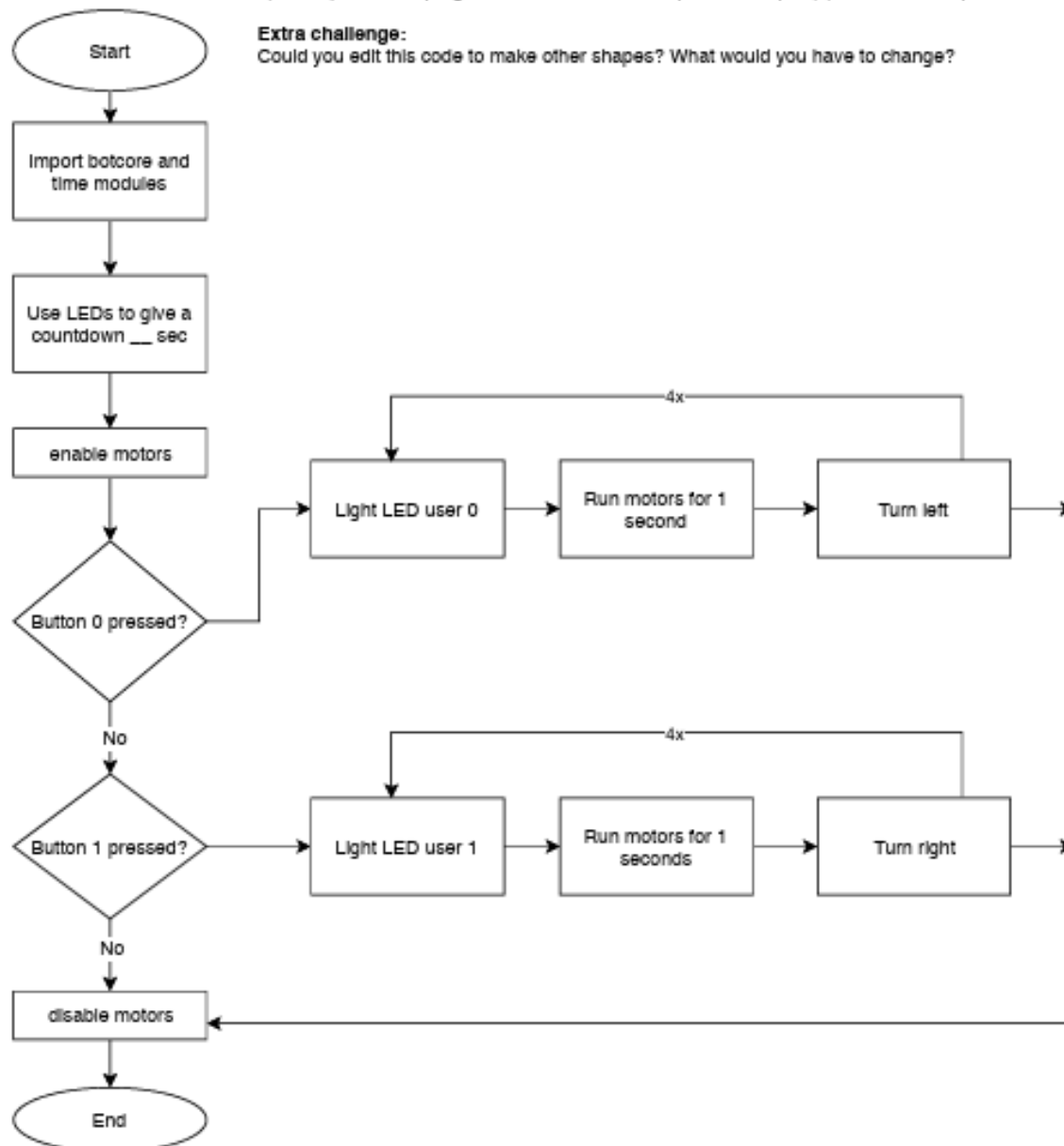
- 1) We are utilizing a loop counter instead of a forever loop
- 2) Don't forget to enable and disable the motors!

Some things to think about when you convert this diagram into actual code:

- 1) How do we know how many times to repeat the light/motors/turn loop?
- 2) What part of this program is in a while True loop and what part(s) are in a for loop?

Extra challenge:

Could you edit this code to make other shapes? What would you have to change?



Activity #5 Create your own flowchart of a daily activity.

Answers will vary

Wrap Up:

In your own words, describe an algorithm.

Answer could be similar to: A step-by-step process a computer can follow to solve a problem.

In your own words, describe a flowchart.

Answer could be similar to: A visualization of an algorithm, or a graphic organizer for a program.