Geometry Puzzle

You are designing a simple geometry puzzle for children to learn more about shapes. The puzzle works by having the below functionalities

1. **Create a custom shape:** Allow the user to create a custom shape by providing a minimum of 3 (x,y) valid coordinates.
2. **Validate input coordinates:** Ensure coordinates input are valid and a convex shape can be formed by joining the set of coordinates. Also ensures that points are not repeated.
3. **Create a random shape:** Randomly creates a custom shape with at least 3 valid coordinates
4. **Puzzle Section:** Allow the user to key in different coordinates and check if the coordinate is within the shape that has been created

User input and output can be from command line.

When launching the application, it prompts user for actions:

```
Welcome to the GIC geometry puzzle app
[1] Create a custom shape
[2] Generate a random shape
```

User should be able to enter `1` or `2` to select how they want the shape to be generated.

Create a custom shape

Upon selecting option 1, application prompts user to key in coordinates Note that the custom shape is created by joining coordinates 1 to 2 followed by coordinates 2 to 3 then coordinates 3 to 4 ..... to coordinates n to n+1 and finally coordinates n+1 back to 1 At any point the application should validate if the new coordinated is a valid coordinate, if not it should alert the user and ask the user to key in another coordinate.

Application prompts:

```
Please enter coordinates 1 in x y format
```

User is then able to enter:

```
1 1
```

The system responds with:

```
Your current shape is incomplete
1:(1,1)
Please enter coordinates 2 in x y format
```

User is then able to enter:

```
5 1
```

The system responds with:

```
Your current shape is incomplete
1:(1,1)
2:(5,1)
Please enter coordinates 3 in x y format
```

User is then able to enter:

```
5 5
```

The system responds with:

```
Your current shape is valid and is complete
1:(1,1)
2:(5,1)
3:(5,5)
Please enter # to finalize your shape or enter coordinates 4 in x y format
```

At this point the User can finalize the shape by pressing # or carry on adding additional points by keying in coordinates in x y format Assuming the user chooses to finalize the shape.

User responds with # and proceed to the puzzle part of the game:

```
#
```

The system then responds with, user then proceeds to the puzzle section from this point on:

```
Your finalized shape is
1:(1,1)
2:(5,1)
3:(5,5)

Please key in test coordinates in x y format or enter # to quit the game
```

Validate input coordinates

The system should recognize when new coordinates are invalid and display the new coordinates invalid message followed by the previous prompt.

Example 1 If the user has created an incomplete shape with coordinates 1:(1,1) 2:(5,1) and tries to key in (5,1) again.

```
New coordinates(5,1) is invalid!!!
Not adding new coordinates to the current shape.

Your current shape is incomplete
1:(1,1)
2:(5,1)
Please enter coordinates 3 in x y format
```

Example 2 If the user has created a triangle with coordinates 1:(1,1) 2:(5,1) 3:(5,5) and tries to key in (4,0)

```
New coordinates(4,0) is invalid!!!
Not adding new coordinates to the current shape.

Your current shape is valid and is complete
1:(1,1)
2:(5,1)
3:(5,5)
Please enter # to finalize your shape or enter coordinates 4 in x y format
```

Generate a random shape

Upon selecting option 2, application proceeds to create a random shape with between 3 to 8 coordinates Note that the shape created must be valid and similar to the custom shape creation scenario, the shape is created by joining coordinates 1 to 2 followed by coordinates 2 to 3 then coordinates 3 to 4 ..... to coordinates n to n+1 and finally coordinates n+1 back to 1

Example random triangle created.

Application prompts the random shape created and user proceeds to the puzzle section:

```
Your random shape is
1:(1,1)
2:(5,1)
3:(5,5)

Please key in test coordinates in x y format or enter # to quit the game
```

Puzzle Section

At any point once the shape is finalized the system always responds with

```
Your finalized shape is
1:(1,1)
2:(5,1)
3:(5,5)

Please key in test coordinates in x y format or enter # to quit the game
```

At this point the User can choose to quit by entering # or play the game by keying in coordinates in x y format Assuming the user chooses to play the game.

User enters:

```
3 2
```

System then responds with:

```
Your finalized shape is
1:(1,1)
2:(5,1)
3:(5,5)

Coordinates (3,2) is within your finalized shape
Please key in test coordinates in x y format or enter # to quit the game
```

User enters another test coordinate:

```
0 1
```

System then responds with:

```
Your finalized shape is
1:(1,1)
2:(5,1)
3:(5,5)

Sorry, coordinates (0,1) is outside of your finalized shape
Please key in test coordinates in x y format or enter # to quit the game
```

User chooses to quit:

```
#
```

System responds with:

```
Thank you for playing the GIC geometry puzzle app
Have a nice day!
```