COMP8270
Programming for Artificial Intelligence

Practical Assignment 1

Rock-Paper-Scissors-Lizard-Spock is a game between two players that extends the classic game Rock-Paper-Scissors. It uses five-gestures to reduce the chances of a round ending in a draw. Each game contains many rounds; in each round, the players each simultaneously choose one of Rock, Paper, Scissors, Lizard or Spock; then, a winner for that round is selected:

- Scissors cut Paper
- Paper covers Rock
- Rock crushes Lizard
- Lizard poisons Spock
- Spock smashes Scissors
- Scissors decapitate Lizard
- Lizards eats Paper
- Paper disproves Spock
- Spock vaporizes Rock
- Rock breaks Scissors

If both players choose the same shape, the round instead ends in a draw. The winner of the game is the player with the highest score. The **total score** of a player is the sum of the scores for each round. The score for a single round is the score of the **shape selected** (`1` for `[Ro]`ck, `2` for `[Pa]`per, `1` for `[Sc]`issors, `2` for `[Li]`zard, and `1` for `[Sp]`ock) plus the score for the **outcome of the round** (`0` if the player lost, `3` if the round was a draw, and `5` if the player won).

Consider the following example of a game with 4 rounds:

```
game = [('Ro', 'Sp'), ('Ro', 'Li'), ('Sc', 'Pa'), ('Pa', 'Pa')]
```

	Round 1	Round 3	Round 3	Round 4	Total
Player 1	1 (Ro)	1 + 5 (Ro)	1 + 5 (Sc)	2 + 3 (Pa)	**18**
Player 2	1 + 5 (Sp)	2 (Li)	2 (Pa)	2 + 3 (Pa)	**15**

Note that a game can have more or less than 4 rounds.

Assessment

Using a single Jupyter notebook, complete the following tasks. Use markdown and different cells to separate your work.

Task 1 [20%]

Create a function named `generate_game` that randomly initialises a list representing a game. The function should return a list of tuples, where each tuple has the value of the hand of a player. The function should take as parameters the number of rounds of the game. You should use the `random` module (https://docs.python.org/3/library/random.html) to generate pseudo-random numbers.

Task 2 [15%]

Create a function named `score` that computes the total score of each player given a game list. The function should return a tuple (*score player 1*, *score player 2*), e.g., `(16, 13)`.

Task 3 [15%]

Create a function named `common_hand` that given a game list, it returns a tuple with the values of the most common played hand for each player – e.g., considering the example above, it would return `('Ro', 'Pa')`. If there is more than one hand with the same total number, the function should choose one to return.

Task 4 [25%]

Create a function named `common_pair` that given a **list of games** (list of lists), returns the most common pair of hands played. Note that this should be independent of the order of the hands in a pair – e.g., the hand `('Ro', 'Pa')` should be considered the same pair of hands as `('Pa', 'Ro')` for this calculation. If there is more than one pair of hands with the same total number, the function should choose one to return.

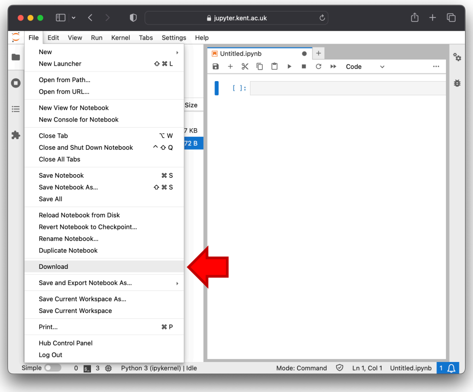
Task 5 [25%]

Create a function that given a **list of games** (list of lists), return a tuple with the hand that won most rounds, and the number of rounds won. In case there are more than one hand with the same number of winning rounds, then your function should return a list of tuples.

Submission

The tasks should be complete in a single Jupyter Notebook, which should be submitted on Moodle by **23:55 Thursday 28 November, 2024 (Week 17)**.

To submit your Jupyter Notebook, you will need to save it to your local computer as an `.ipynb` file using the "`File > Download`" option – shown below.



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The work you submit must be your own, except where its original author is clearly referenced. We reserve the right to run checks on all submitted work in an effort to identify possible plagiarism, and take disciplinary action against anyone found to have committed plagiarism.

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In addition, substantial amounts of verbatim or near verbatim cut-and-paste from web-based sources, course material and other resources will not be considered as evidence of your own understanding of the topics being examined.

The School publishes an on-line Plagiarism and Collaboration Frequently Asked Questions (FAQ) which is available at:
http://www.cs.ukc.ac.uk/teaching/student/assessment/plagiarism.local

Work may be submitted to Turnitin for the identification of possible plagiarism. You can find out more about Turnitin at the following page:
https://www.kent.ac.uk/ai/using-turnitin.html

Late or non-submission of coursework assessments

The penalty for late or non-submission of coursework is normally that a mark of zero is awarded for the missing piece of work and the final mark for the module is calculated accordingly.