

Initial preparations

Create a new project named `assignment10_4`. In this project create modules `"player"`, `"molkky_game"` and `"molkky_program"`. The contents of the modules are explained in detail later. In this exercise you will write and return three different modules that are all a part of the same project.

Please note that the names of the modules should be written completely in lowercase. Respectively, the names of the classes should be written in CamelCase (ie. in the form `MyClass`. This is a widely used naming convention which is also required by A+ (or else the grading will not work).

Background

Mölkky is a Finnish outdoor game in which players throw a wooden pin (`mölkky`) towards wooden skittles numbered from 1 to 12. In a game of Mölkky, 12 skittles are placed in a tight group 3-4 meters away from the players. The players take turns to throw the wooden pin and try to knock over the skittles. If a player hits and knocks over only one skittle, they score the number of points marked on the skittle. If a player hits more than 1 skittle, the player scores the number of skittles they were able to knock over. After each turn, the skittles are stood up in the same location that they ended up. The winner is the player that first reaches exactly 50 points. If a player scores more than 50 points, their points drop back to 25 points. If a player misses skittles three times in a row, they will have to leave the game.

Description of the exercise

In this exercise you write a program that keeps record of the points in a Mölkky game. Your task is to write classes `Player` and `MolkkyGame` as well as the main program in the module `molkky_program`, all by yourself. Test your program by running the main program.

In this exercise the game exceptionally continues until all the players, except one, have either won (reached exactly 50 points) or lost. The actual winner of the game is the player to first reach exactly 50 points.

Description of the Player class

A player object represents a player in the game of Mölkky.

Copy the following constants in the `Player` class outside the methods:

```
GOAL = 50
OVER_FIFTY_PENALTY = 25
MAX_MISSED_IN_ROW = 3
MISSED = -1
```

Use the constants inside the class by writing for example `Player.GOAL` .

A `Player` object has the following fields:

- `__name`
 - The name of the player (string)
- `__points_of_each_round`
 - A list that contains the score of the player in each round. For example, first item in the list is the score of the player (integer) at the end of the first round, 2. item is the score at the end of the second round, and so on.

- `__points`
 - The current score of the player (integer)
- `__missed_in_row`
 - The number of missed throws in a row (integer). If the player scores, the value of this field is reset to zero.

Implement the following methods into the Player class (if there is no mention about the return value in the method description, the method does not return anything):

- `__init__(self, name)`
 - Initializes a new Player object. The name of the player (string) is given as a parameter. The fields representing the score and missed throws of the player are initialized with 0. The list representing the scores in each round is set to an empty list.
- `get_name(self)`
 - Returns the name of the player.
- `get_points(self)`
 - Returns the current score of the player.
- `get_points_of_each_round(self)`
 - Returns a list that contains the score of the player in each round.
- `get_number_of_played_rounds_of_player(self)`
 - Returns the number of rounds the player has played (integer).
- `has_won(self)`
 - The method returns **True** if the player has reached exactly 50 points, otherwise returns **False**.
- `has_lost(self)`
 - The method returns **True** if the player has lost. The player has lost if they have missed three times in a row. Otherwise, the method returns **False**.
- `still_in_game(self)`
 - The method returns **True** if the player is still in the game (hasn't won or hasn't lost). Otherwise, returns **False**.
- `add_points(self, points)`
 - The method updates the score of the player and adds the updated score at the end of the list of the round points.
 - The score of the round (integer) is given as a parameter. The score is added up with the old points. If the new score exceeds 50 points, the score of the player updates to 25 points. Otherwise, the updated score of the player is the sum of the old points and the points given as a parameter. If the points given as a parameter are 0, a missed throw is added to the player and a constant **Player.MISSED** is added in the list of the round points. However, whenever the points of the player change, the missed throws in a row -count is reset to zero and the updated points are added to the list of the round points.
- `add_missed_shot(self)`
 - The method increases missed in a row -count by one.

Description of the MolkkyGame class

A MolkkyGame object represents a game of Molkky.

A MolkkyGame object has the following fields:

- `__players`
 - A list of Player objects.
- `__number_of_played_rounds`
 - The number of played rounds (integer).

- `__ranking`
 - A list that contains the ranking of the players. The winner is in the first place and the player that was lost first is in the last place. All the players are eventually added in this list.
- `__ended`
 - A boolean value that tells whether the game has ended.

Implement the following methods into the class (if there is no mention about the return value in the method description, the method does not return anything):

- `__init__(self, players)`
 - Initializes a new MolkkyGame object. A list of the players is given as a parameter and is set as the value of the field `players`. The field `number_of_played_rounds` is initially set to 0, the field `ranking` is an empty list and the field `ended` is set to `False`.
- `get_players(self)`
 - Returns the list of players.
- `get_ranking(self)`
 - Returns the ranking list of the players.
- `get_number_of_played_rounds(self)`
 - Returns the number of played rounds (integer).
- `get_number_of_players_still_in_game(self)`
 - The method returns the number of the players that are still in the game (haven't won or lost).
- `has_ended(self)`
 - Returns `True` if the game has ended, otherwise returns `False`.
- `add_player_to_ranking(self, player)`
 - The method adds a Player object (given as a parameter) to the ranking list. A winner is added to the first place, second player is in the 2. place, and so on. Player is inserted to a place which is right after the players that have won but before the players that have lost.
- `add_round(self)`
 - The method increases the number of played rounds -count by one.
- `end(self)`
 - The method ends the game and adds the remaining player in the ranking list.
- `__str__(self)`
 - The method returns a string that contains the score board of the game.
 - The string is formed as follows:
 - The string starts with a header line that contains fields for the round number and every player name. Every name field is 15 characters wide and the name of the player is aligned to the left. The fields are separated by a vertical line "|" with **one space** in both sides. And at the end of the row there is a space, a vertical line and a newline character "\n".
 - Then, add a row that contains right number of "-" characters. At the end of this row, add a newline character.
 - The rest of the string contains the rows of each round. The rows are separated by a newline character. The first column contains the round number in a field that is 5 characters wide and aligned to the left. The round scores of the players (integers) are in fields that are 15 characters wide and aligned to the left. The fields are separated by a vertical line. There is always **1 space** between a vertical line and a field.
 - A tip: Every player has a list that contains their own points in each round. If there is an integer -1 (constant Player.MISSED) in that list, a "-" character is added to the corresponding round in the table instead of the normal points.
 - Even if a player has left the game (has won or lost), their points are added normally to the table as long as there are points in the player's round points list. If the length of the list is shorter than the number of played rounds, a string "WON" or "LOST" is added to the rest of the rounds instead of the

points. The string is "WON" or "LOST" depending on whether the player has won or lost.

- After the last row of the score table, add **two newline characters**.

Description of the module molkky_program

Write to the module molkky_program a main program that runs the game of Mölkky. This program takes care of all the communication with the user, in other words, it asks for inputs and prints the needed information. First, the program asks for the names of the players until the user inputs an empty line. The program creates Player objects with these names and a new game object (MolkkyGame). Then, the program goes through the game round by round. It goes through the following things during each round:

1. Goes through the turns of every player that is still in the game in the following way:
 1. In each player's turn it asks for the number of the skittles the player hit. If only one skittle was hit, the program asks also for the number marked on that skittle.
 2. Adds points to the player. If only one skittle was hit, player gets as many points as it is marked on the skittle, otherwise they score the same as the number of the skittles hit.
 3. Checks that the player is still in the game. If the player is not in the game anymore, they are added to the ranking list. If the player has lost, the program prints `[The player name] has missed 3 times in a row.` and `[The player name] has to leave the game.` . If the player has won, the program prints `[The player name] has 50 points.` and `[The player name] won!` .
2. Checks how many of the players are still in the game. If there is one or less players left, the program ends the game.
3. Increases the number of played rounds -count by one.
4. Prints the score board. A tip: use the method `__str__` of the class MolkkyGame.

When the game has ended, the program prints the ranking of the players.

See the example execution for the specific outputs of the program in different situations.

Error handling

Error handling is done in the main program. The program should handle the following errors:

- The user inputs less than 2 player names. The program prints

```
You have to enter at least two players.
```

and asks for the names until the user inputs at least two names.

- The number of the skittles / the number marked on the skittle the user inputs, cannot be converted to integer. The program prints

```
Invalid integer! Enter a number again:
```

- The number of skittles / the number marked on the skittle the user inputs is not inside the range from 0 to 12. The program prints

You entered a wrong number.
Enter a number between 0 and 12:

Output formatting

Pay close attention that the output of your program is approximately according to the example execution below. However, line breaks and spaces are only checked from the `__str__`-methods of the class `MolkkyGame`.

Submitting

When your program seems to work correctly and you have tested it by running it many times, submit the files `player.py` , `molkky_game.py` and `molkky_program.py` to A+.

Examples of the execution of the program:

```
[execution of the program begins]
Welcome to play Molkkky!
Enter the name of the first player:
Viljami
Enter the name of the next player:
Varpu
Enter the name of the next player:
Veikko
Enter the name of the next player:
```

```
Viljami's turn.
How many skittles did Viljami hit?
8
Varpu's turn.
How many skittles did Varpu hit?
12
Veikko's turn.
How many skittles did Veikko hit?
5
```

The current score:

Round	Viljami	Varpu	Veikko
1.	8	12	5

```
Viljami's turn.
How many skittles did Viljami hit?
1
How many points are marked on the skittle?
9
Varpu's turn.
How many skittles did Varpu hit?
7
Veikko's turn.
How many skittles did Veikko hit?
0
```

The current score:

Round	Viljami	Varpu	Veikko
1.	8	12	5
2.	17	19	-

Viljami's turn.

How many skittles did Viljami hit?

5

Varpu's turn.

How many skittles did Varpu hit?

1

How many points are marked on the skittle?

12

Veikko's turn.

How many skittles did Veikko hit?

0

The current score:

Round	Viljami	Varpu	Veikko
1.	8	12	5
2.	17	19	-
3.	22	31	-

Viljami's turn.

How many skittles did Viljami hit?

6

Varpu's turn.

How many skittles did Varpu hit?

1

How many points are marked on the skittle?

12

Veikko's turn.

How many skittles did Veikko hit?

0

Veikko has missed 3 times in a row.

Veikko has to leave the game.

The current score:

Round	Viljami	Varpu	Veikko	

1.	8	12	5	
2.	17	19	-	
3.	22	31	-	
4.	28	43	-	

Viljami's turn.

How many skittles did Viljami hit?

4

Varpu's turn.

How many skittles did Varpu hit?

1

How many points are marked on the skittle?

10

The current score:

Round	Viljami	Varpu	Veikko	

1.	8	12	5	
2.	17	19	-	
3.	22	31	-	
4.	28	43	-	
5.	32	25	LOST	

Viljami's turn.

How many skittles did Viljami hit?

7

Varpu's turn.

How many skittles did Varpu hit?

0

The current score:

Round	Viljami	Varpu	Veikko	

1.	8	12	5	
2.	17	19	-	
3.	22	31	-	
4.	28	43	-	
5.	32	25	LOST	
6.	39	-	LOST	

Viljami's turn.

How many skittles did Viljami hit?

4

Varpu's turn.

How many skittles did Varpu hit?

3

The current score:

Round	Viljami	Varpu	Veikko	

1.	8	12	5	
2.	17	19	-	
3.	22	31	-	
4.	28	43	-	
5.	32	25	LOST	
6.	39	-	LOST	
7.	43	28	LOST	

Viljami's turn.

How many skittles did Viljami hit?

1

How many points are marked on the skittle?

7

Viljami has 50 points.

Viljami won!

Varpu's turn.

How many skittles did Varpu hit?

2

The current score:

Round	Viljami	Varpu	Veikko	

1.	8	12	5	
2.	17	19	-	
3.	22	31	-	
4.	28	43	-	
5.	32	25	LOST	
6.	39	-	LOST	
7.	43	28	LOST	
8.	50	30	LOST	

Viljami is the winner!

Varpu is in the 2. place.

Veikko is in the 3. place.

[execution of the program ends]

```
[execution of the program begins]
Welcome to play Molkkky!
Enter the name of the first player:
Perttu
Enter the name of the next player:
Lasse
Enter the name of the next player:
Riina
Enter the name of the next player:
Elli
Enter the name of the next player:
Karoliina
Enter the name of the next player:
```

```
Perttu's turn.
How many skittles did Perttu hit?
6
Lasse's turn.
How many skittles did Lasse hit?
11
Riina's turn.
How many skittles did Riina hit?
0
Elli's turn.
How many skittles did Elli hit?
5
Karoliina's turn.
How many skittles did Karoliina hit?
2
```

The current score:

Round	Perttu	Lasse	Riina	Elli	Karoliina
1.	6	11	-	5	2

```
Perttu's turn.
```

How many skittles did Perttu hit?

7

Lasse's turn.

How many skittles did Lasse hit?

8

Riina's turn.

How many skittles did Riina hit?

0

Elli's turn.

How many skittles did Elli hit?

4

Karoliina's turn.

How many skittles did Karoliina hit?

3

The current score:

Round	Perttu	Lasse	Riina	Elli	Karoliina
1.	6	11	-	5	2
2.	13	19	-	9	5

Perttu's turn.

How many skittles did Perttu hit?

3

Lasse's turn.

How many skittles did Lasse hit?

1

How many points are marked on the skittle?

12

Riina's turn.

How many skittles did Riina hit?

0

Riina has missed 3 times in a row.

Riina has to leave the game.

Elli's turn.

How many skittles did Elli hit?

5

Karoliina's turn.

How many skittles did Karoliina hit?

0

The current score:

Round	Perttu	Lasse	Riina	Elli	Karoliina
1.	6	11	-	5	2
2.	13	19	-	9	5
3.	16	31	-	14	-

Perttu's turn.

How many skittles did Perttu hit?

0

Lasse's turn.

How many skittles did Lasse hit?

1

How many points are marked on the skittle?

9

Elli's turn.

How many skittles did Elli hit?

3

Karoliina's turn.

How many skittles did Karoliina hit?

0

The current score:

Round	Perttu	Lasse	Riina	Elli	Karoliina
1.	6	11	-	5	2
2.	13	19	-	9	5
3.	16	31	-	14	-
4.	-	40	LOST	17	-

Perttu's turn.

How many skittles did Perttu hit?

7

Lasse's turn.

How many skittles did Lasse hit?

1

How many points are marked on the skittle?

10

Lasse has 50 points.

Lasse won!

Elli's turn.

How many skittles did Elli hit?

5

Karoliina's turn.

How many skittles did Karoliina hit?

4

The current score:

Round	Perttu	Lasse	Riina	Elli	Karoliina
1.	6	11	-	5	2
2.	13	19	-	9	5
3.	16	31	-	14	-
4.	-	40	LOST	17	-
5.	23	50	LOST	22	9

Perttu's turn.

How many skittles did Perttu hit?

0

Elli's turn.

How many skittles did Elli hit?

2

Karoliina's turn.

How many skittles did Karoliina hit?

0

The current score:

Round	Perttu	Lasse	Riina	Elli	Karoliina
1.	6	11	-	5	2
2.	13	19	-	9	5
3.	16	31	-	14	-
4.	-	40	LOST	17	-
5.	23	50	LOST	22	9
6.	-	WON	LOST	24	-

Perttu's turn.

How many skittles did Perttu hit?

1

How many points are marked on the skittle?

11

Elli's turn.

How many skittles did Elli hit?

1

How many points are marked on the skittle?

9

Karoliina's turn.

How many skittles did Karoliina hit?

0

The current score:

Round	Perttu	Lasse	Riina	Elli	Karoliina
1.	6	11	-	5	2
2.	13	19	-	9	5
3.	16	31	-	14	-
4.	-	40	LOST	17	-
5.	23	50	LOST	22	9
6.	-	WON	LOST	24	-
7.	34	WON	LOST	33	-

Perttu's turn.

How many skittles did Perttu hit?

1
How many points are marked on the skittle?
9
Elli's turn.
How many skittles did Elli hit?
1
How many points are marked on the skittle?
6
Karoliina's turn.
How many skittles did Karoliina hit?
0
Karoliina has missed 3 times in a row.
Karoliina has to leave the game.

The current score:

Round	Perttu	Lasse	Riina	Elli	Karoliina
1.	6	11	-	5	2
2.	13	19	-	9	5
3.	16	31	-	14	-
4.	-	40	LOST	17	-
5.	23	50	LOST	22	9
6.	-	WON	LOST	24	-
7.	34	WON	LOST	33	-
8.	43	WON	LOST	39	-

Perttu's turn.
How many skittles did Perttu hit?
1
How many points are marked on the skittle?
7
Perttu has 50 points.
Perttu won!

Elli's turn.
How many skittles did Elli hit?


```
1
How many points are marked on the skittle?
11
Elli has 50 points.
Elli won!
```

The current score:

Round	Perttu	Lasse	Riina	Elli	Karoliina
1.	6	11	-	5	2
2.	13	19	-	9	5
3.	16	31	-	14	-
4.	-	40	LOST	17	-
5.	23	50	LOST	22	9
6.	-	WON	LOST	24	-
7.	34	WON	LOST	33	-
8.	43	WON	LOST	39	-
9.	50	WON	LOST	50	LOST

```
Lasse is the winner!
Perttu is in the 2. place.
Elli is in the 3. place.
Karoliina is in the 4. place.
Riina is in the 5. place.
[execution of the program ends]
```

```
[execution of the program begins]
Welcome to play Molkkky!
Enter the name of the first player:

You have to enter at least two players.
Enter the name of the next player:
Oskari
Enter the name of the next player:

You have to enter at least two players.
Enter the name of the next player:
Noora
Enter the name of the next player:

Oskari's turn.
How many skittles did Oskari hit?
0
Noora's turn.
How many skittles did Noora hit?
12

The current score:
Round | Oskari          | Noora          |
-----|-----|-----|
1.    | -                | 12             |

Oskari's turn.
How many skittles did Oskari hit?
-1
You entered a wrong number.
Enter a number between 0 and 12:
13
You entered a wrong number.
Enter a number between 0 and 12:

Invalid integer! Enter a number again:
```

ok
Invalid integer! Enter a number again:
1
How many points are marked on the skittle?
13
You entered a wrong number.
Enter a number between 0 and 12:
-1
You entered a wrong number.
Enter a number between 0 and 12:
none
Invalid integer! Enter a number again:
9
Noora's turn.
How many skittles did Noora hit?
9

The current score:

Round	Oskari	Noora
1.	-	12
2.	9	21

Oskari's turn.
How many skittles did Oskari hit?
3
Noora's turn.
How many skittles did Noora hit?
0

The current score:

Round	Oskari	Noora
1.	-	12
2.	9	21
3.	12	-

Oskari's turn.

How many skittles did Oskari hit?

4

Noora's turn.

How many skittles did Noora hit?

0

The current score:

Round	Oskari	Noora
1.	-	12
2.	9	21
3.	12	-
4.	16	-

Oskari's turn.

How many skittles did Oskari hit?

2

Noora's turn.

How many skittles did Noora hit?

0

Noora has missed 3 times in a row.

Noora has to leave the game.

The current score:

Round	Oskari	Noora
1.	-	12
2.	9	21
3.	12	-
4.	16	-
5.	18	-

Oskari is the winner!

Noora is in the 2. place.
[execution of the program ends]