Programming Fundamentals 2
(2023/24)

Assignment 2

Revisions	
25/04/2024	Fixed, in the example printout, the colours for Muguet in summer, and Walnut Tree in Autumn. Changes are highlighted in Yellow on the last page.

- To solve this assignment, you can rely only on the constructs we have seen in class. You cannot rely on Collections or Java reflection.
- Implement the classes needed to develop a garden simulator
- The garden simulator enables you to simulate how colourful a garden is during the different seasons.
- A garden can be seen as a grid of N rows and M columns. Each cell will contain an ornament, a plant or a tile.
- Plants can be flowers, grass, or trees.
- All the plants share some commonality: they have a name and daily water consumption (in litres). For simplicity, we assume plants consume the same amount of water during the whole year.
- Plant classes provide a method (consumedWater) reporting the amount of water consumed in a given number of days.
- Trees can produce fruit. They implement the method 'String getFruit()' which returns the name of the fruit being produced.
- Thanks to genetics research, flowers (except Muguets) can be of any colour (selected by the user). However, the user-selected colour is seen only in Spring and Summer (see the table at the bottom).
- Ornament should be implemented as an interface.
- The interface Ornament provides the method 'public String colour(season int)', which returns the colour observable in a given season.
    - The valid season identifiers are 0 (winter), 1 (spring), 2 (summer), and 3 (autumn).
    - A wrong identifier should lead to an empty string being returned.
- The interface Ornament also provides the method 'public String getName()', which returns the name of the ornament.
- Tiles have the same colour in all the seasons.
- The Garden class provides the method
    - public boolean add(int rowPosition, int columnPosition, Ornament ornament)
        - enables adding an ornament to a given cell of our grid
        - returns false if cannot be added (i.e., when the cell is already filled)
    - public void remove(int rowPosition, int columnPosition)
        - removes an ornament from a cell of our grid
    - public int count()

        - returns the number of ornaments in our garden
    - void displayColours(int season)
        - Prints on screen the colour of each item of our grid
        - For an empty cell it should print an '*'
        - Invalid seasons should not be printed
    - void displayNames()
        - Prints on screen the name of each item of our grid
    - double consumedWater(int days)
        - Returns the amount of water consumed by the entire garden
        - Empty cells and tiles do not consume any water
    - int count(Ornament ornament)
        - Count how many ornaments identical to the provided one appears in the garden
        - It implies that you have implemented the method equals, as appropriate. In this program, objects are equal when all their attributes are equal and they have the same type.
    - For pretty-printing, leave two tabulations between each column and print a formatted string generated with
        - String.format("%12s", variableToPrint)
- Plant colours depend on the plant type. Water consumption depends on the plant.
- In our garden, Grass is always green at every season.
- Tiles can be made of stone or ceramic. Stone tiles are gray, ceramic tiles are red.
- Tiles can be glossy or not. The colour of a glossy tile is shown surrounded by parenthesis "(*colour*)".
- The program GardenSimulator is provided. You need to place it in the appropriate package, create all the necessary classes to make it work, and implement the incomplete methods (see comments with "//FIXME: implement").
- All the supported colours are provided as constants in the class "Colours"

Ornament type	Ornament Name	Season colours				Water consumption	Fruit
		Winter	Spring	Summer	Autumn		-
Flowers	Rose	Brown	user-selected colour	user-selected colour	Brown	0.4	-
	Muguets	None	White	Green	None	0.3	-
	Sunflower	Brown	user-selected colour	user-selected colour	Green	0.5	-
Trees	Walnut tree	Brown	Green	Green	Yellow	20	Walnut
	Fir	Green	Green	Green	Green	30	None
	Peach tree	Brown	Pink	Green	Yellow	35	Peach
Grass	Cynodon	Green	Green	Green	Green	0.3	-
	Dicondra	Green	Green	Green	Green	0.1	-
Tiles	Stone tile	Gray	Gray	Gray	Gray	-	-
	Ceramic tile	Red	Red	Red	Red	-	-

None should be displayed as an asterisk *

The output of the provided program should be as follows:

```
Garden items:
          *                  Rose             Stone tile               Muguets              Sunflower
 Walnut tree                   Fir             Stone tile           Peach tree              Cynodon
    Dicondra           Stone tile          Ceramic tile          Ceramic tile                    *


Winter colours:
          *                 Brown                   Gray                     *                 Brown
      Brown                 Green                   Gray                 Brown                 Green
      Green               (Gray)                    Red                 (Red)                     *


Spring colours:
          *                Violet                   Gray                 White                  Pink
      Green                 Green                   Gray                  Pink                 Green
      Green               (Gray)                    Red                 (Red)                     *


Summer colours:
          *                Violet                   Gray                 Green                  Pink
      Green                 Green                   Gray                 Green                 Green
      Green               (Gray)                    Red                 (Red)                     *


Autumn colours:
          *                 Brown                   Gray                     *                 Green
     Yellow                 Green                   Gray                Yellow                 Green
      Green               (Gray)                    Red                 (Red)                     *


Unknown season:


In a year, the garden will consume 31609.0 litres of water.


The garden contains 2 stone tiles.


The garden contains 1 glossy ceramic tile(s).


The garden contains 1 fir(s).
```