

2D Arrays: class ExperimentalFarm

Free Response Question 1

The `ExperimentalFarm` class represents crops grown on an experimental farm. An experimental farm is a rectangular tract of land that is divided into a grid of equal-sized plots. Each plot in the grid contains one type of crop. The crop yield of each plot is measured in bushels per acre.

A farm plot is represented by the `Plot` class. A partial definition of the `Plot` class is shown below.

```
public class Plot {
    private String cropType;
    private int cropYield;
    public Plot(String crop, int yield) {
        /* implementation not shown */
    }
    public String getCropType() {
        return cropType;
    }
    public int getCropYield() {
        return cropYield;
    }
}
```

The grid of equal-sized plots is represented by a two-dimensional array of `Plot` objects named `farmPlots`, declared in the `ExperimentalFarm` class. A partial definition of the `ExperimentalFarm` class is shown below.

```
public class ExperimentalFarm {
    private Plot[][] farmPlots;
    public ExperimentalFarm(Plot[][] p) {
        /* implementation not shown */
    }
    /** Returns the plot with the highest yield for a given
     * crop type, as described in part (a). */
    public Plot getHighestYield(String c) {
        /* to be implemented in part (a) */
    }
    /** Returns true if all plots in a given column in the
     * two-dimensional array farmPlots contain the same
     * type of crop, or false otherwise, as described in
     * part (b) */
    public boolean sameCrop(int col) {
        /* to be implemented in part (b) */
    }
}
```

Write the `getHighestYield` method, which returns the `Plot` object with the highest yield among the plots in `farmPlots` with the crop type specified by the parameter `c`. If more than one plot has the highest yield, any of these plots may be returned. If no plot exists containing the specified type of crop, the method returns `null`.

Assume that the `ExperimentalFarm` object `f` has been created such that its `farmPlots` array contains the following `cropType` and `cropYield` values.

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	0	1	2
0	"corn" 20	"corn" 30	"peas" 10
1	"peas" 30	"corn" 40	"corn" 62
2	"wheat" 10	"corn" 50	"rice" 30
3	"corn" 55	"corn" 30	"peas" 30

The following are some examples of the behavior of the `getHighestYield` method.

Method Call	Return Value
<code>f.getHighestYield("corn")</code>	<code>farmPlots[1][2]</code>
<code>f.getHighestYield("peas")</code>	<code>farmPlots[1][0]</code> or <code>farmPlots[3][2]</code>
<code>f.getHighestYield("bananas")</code>	<code>null</code>

(a) Write the `getHighestYield` method below.

```
/** Returns the plot with the highest yield for a given crop type,
 * as described in part (a). */
public Plot getHighestYield(String c)
```

Write the `sameCrop` method, which returns `true` if all the plots in a given column of `farmPlots` grow the same crop and returns `false` otherwise.

The following are two examples of the behavior of `sameCrop`.

- The method call `f.sameCrop(0)` returns `false` because the values of `cropType` for the elements of column 0 ("corn", "peas", "wheat", and "corn") are not all the same.
- The method call `f.sameCrop(1)` returns `true` because the values of `cropType` for all elements of column 1 are the same ("corn").

(b) Write the `sameCrop` method below.

```
/** Returns true if all plots in a given column in the two-dimensional
 * array farmPlots contain the same type of crop, or false otherwise,
 * as described in part (b).*/
public boolean sameCrop(int col)
```