

## ExperimentalFarm FRQ

SHOW ALL YOUR WORK. REMEMBER THAT PROGRAM SEGMENTS ARE TO BE WRITTEN IN JAVA.

Assume that the classes listed in the Java Quick Reference have been imported where appropriate. Unless otherwise noted in the question, assume that parameters in method calls are not *null* and that methods are called only when their preconditions are satisfied.

In writing solutions for each question, you may use any of the accessible methods that are listed in classes defined in that question. Writing significant amounts of code that can be replaced by a call to one of these methods will not receive full credit.

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) */
    }
}
```

(a) 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.

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

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

Method Call	Return Value
<code>f.getHighestYield("corn")</code>	<code>farmPlots[1][3]</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>

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)
```

(b) 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.

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

	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 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").

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)
```