

Assignment 07

CS 120: Software Design I

Program 1: Cooking

Several websites exist to curate recipes. Aside from offering recipes for users to peruse, these websites also allow users to filter recipes based on ingredients and cook time, as well as genre. Your program will emulate a basic subset of that functionality from the console.

This program will be done in two parts: Part 1 will establish the code for all of the classes, and Part 2 will require writing the functionality of the program.

Part 1: Writing Classes

Part 1 of this program requires that you have downloaded the code available from Eclipse and imported it into your project.

Your classes for this project will be organized as follows:

- The `Cooking` class is where `main` is. This is where you will write code pertaining to the functionality outlined in Part 2. There is some code already in `Cooking` to help build your repertoire of recipes. Do not modify this code.
- The `RecipeBook` class will be written by you. A `RecipeBook` object will contain the name of the book and an array of recipes.
- The `Recipe` class will be written by you. A `Recipe` object will have a name, how long it takes to make, the total number of people it serves, and a list of ingredients.
- The `IngredientLine` class has been provided for you. An `IngredientLine` object represents a single ingredient for a recipe, noting the ingredient, how much is needed of that ingredient, and the unit of measurement.
- The `Ingredient` and `Unit` enums represent all the possible ingredients and units (e.g., table-spoons) available for the program. You do not need to modify these.

In total, you will have six files in your project: `Cooking`, `RecipeBook`, `Recipe`, `IngredientLine`, `Ingredient`, and `Unit`. `IngredientLine`, `Ingredient`, and `Unit` are provided for you; do **not** change anything about these files. Do not change the code provided in `Cooking`, although you are expected to write additional code where indicated. Be sure to review the `IngredientLine` file in particular before beginning the assignment.

As you complete this assignment, I will be describing methods you need to write to receive full credit. However, you are welcome to write additional methods for any classes. In particular, I will not suggest writing any of the getter methods for these classes, but you will need to write some getter methods as you complete your implementation. You are free to write other methods as well. Please be sure to document all additional methods. Also, be sure to consider methods you have written, as they might be helpful in the method you are currently writing.

Recipe

Start by creating a new class called `Recipe`. This class will have four attributes: the name of the recipe (`String`), how many people it serves (`int`), the total time required to make the recipe in hours (`double`; e.g., 1.5 would be 90 minutes), and a list of ingredients (`IngredientLine[]`). Declare, but do not initialize, these attributes.

Next, write the constructor method. The constructor should take in four values that will then be used to initialize/instantiate the attribute for this class.

Write the method `getRecipe()`. This method has no parameters and returns a `String` value that contains all of the data that makes up a recipe in a readable format. You can see many demonstrations of output from this method in the example runs later in this document. Please copy and paste the below comment above your method header:

```
/**
 * Returns all components of this recipe nicely formatted.
 * The format is as follows:
 *
 * <name of the recipe>
 * ----- (← underline the name of the recipe)
 *
 * Total time: <the time for this recipes in hours and minutes>
 * Serves: <the number of people it serves> (person || people)
 *
 * <ingredientLine1>.getIngredientLine()
 * <ingredientLine2>.getIngredientLine()
 * ...
 *
 * @return The Recipe in a readable format
 */
```

Write the method `containsIngredient(Ingredient ingredient)`. This method accepts a single argument of type `Ingredient`, and returns `true` if that ingredient is contained in the recipe, `false` otherwise. You can compare two values of type `Ingredient` by using `==`. Please copy and paste the below comment above your method header:

```
/**
 * Checks to see if this recipe contains a particular ingredient.
 *
 * @param ingredient The ingredient to check for.
 * @return true if this recipe contains the ingredient, false otherwise
 */
```

Finally, write the method `sameRecipe(Recipe recipe)`. This method accepts a single argument of type `Recipe`, and returns `true` if the argument is the same as this recipe, `false` otherwise. For the purposes of this program, we say that two `Recipe` objects are the same if they have the exact same name. Please copy and paste the below comment above your method header:

```
/**
 * Checks to see if this recipes and the parameter recipe are the same,
 * as determined by equality between the names of the recipes.
 *
 * @param recipe The recipe to check whether it is the same as this recipe
 * @return true if the recipes are the same, false otherwise
 */
```

RecipeBook

Start by creating a new class called `RecipeBook`. This class will have two attributes: the name of the recipe book (`String`), and an array of recipes contained in the book (`Recipe[]`¹). Declare, but do not initialize, these attributes.

¹This program does not allow the user to add recipes. I have predetermined the sizes of each `RecipeBook` object in the code in `main`.

Next, write the constructor method. The constructor should take in two values: the name of the book, and the number of recipes in the book. Your constructor method should set the name attribute accordingly. The method should then initialize the array to the size provided.

Previously, we have discussed the importance of initializing each position in an array to some starting value, e.g., 0 for numbers, or the empty string for arrays with `String` values. However, for most class types, we will need to use `null` as our value, as there is no convenient starting value. This use of `null` will require you to be vigilant against `NullPointerExceptions` in your code.

Next, write the method `addRecipe(Recipe recipe)`. This method accepts a single argument of type `Recipe`, and returns nothing. The method should successfully add the provided recipe to the attribute that maintains the array of recipes for this class. Provide your own comment for this method.

Next, write the method `printBook()`. This method has no parameters and returns nothing. The method should print out the entire book, starting with the name of the `RecipeBook` object, followed by each recipe in the array of recipes. Several examples of the formatting for this are provided in the example run at the end of the program. Provide your own comment for this method.

Next, write the method `findRecipesWithIngredient(Ingredient ingredient)`. This method accepts a single argument of type `Ingredient`, and returns a `Recipe[]` of the recipes with that ingredient. Provide your own comment for this method.

Next, write the method `sortRecipesByTotalTime()`. This method has no parameters and returns nothing. The method should sort the array of recipes for this object in ascending time order, with the recipe with the shortest total time first. Provide your own comment for this method.

Finally, write the method `findOverlappingRecipes(RecipeBook recipeBook)`. This method accepts a single argument of type `RecipeBook`, and returns a `Recipe[]` of the overlapping recipes between the argument and this `RecipeBook`. Provide your own comment for this method.

If you believe you have successfully written the `Recipe` and `RecipeBook` classes, run the program from `main`, which will test adding recipes to a recipe book. If no exceptions are thrown, you are ready to move on to Part 2.

Part 2: Application Functionality

You will now be writing the console interface that will enable a user to find, sort, and print recipes from the two recipe books provided. Your program will have the following functionality:

- Option 1 will allow users to print out all of the recipes from a single book.
- Option 2 will allow users to find all recipes from one book that have a particular ingredient. To see what ingredients you can search for, check the `Ingredient` enum. The user can type in any of the strings there, exactly as they appear. You can use `Ingredient.getIngredient(<String>)` (a `static` method in `Ingredient`) to determine what `Ingredient` the user is searching for based on the `String` they entered. Note that this prints only the name of the recipes, not the recipes themselves.
- Option 3 will allow users to sort and print one of the books. Sorting will be done from least amount of time required to most amount of time required.
- Option 4 will allow users to find recipes that are contained in both recipe books. For a recipe to be in both books, it must have the same name in both books. Note that this prints only the name of the recipes, not the recipes themselves.

- Option 5 will allow the user to quit the program.

For this program, you can assume all input is always valid; do not perform error checking.

There should be a fairly clear mapping between the methods you have previously written and the options provided to the user.

Below are several example runs of the program. The first several show only one option, while the last is a longer run of several options.

Option 1

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 1

What book are you looking to print? [1 = baking, 2 = southern] 2

** Southern Cooking **

Cornbread

Total time: 36 minutes

Serves 9 people

8.0 tablespoons butter
0.5 cups granulated sugar
0.25 cups honey
2.0 egg
1.0 cup milk
1.0 cup flour
1.0 cup cornmeal
0.5 teaspoons salt
0.5 teaspoons baking soda

BBQ Ribs

Total time: 8 hours 15 minutes

Serves 6 people

3.0 pounds pork ribs
3.5 cups pineapple juice
1.5 cups brown sugar
16.0 ounces BBQ sauce

Biscuits

Total time: 30 minutes

Serves 12 people

3.0 cups flour

3.0 tablespoons sugar

0.5 teaspoons salt

4.0 teaspoons baking powder

0.5 teaspoons cream of tartar

0.75 cups butter

1.0 egg

1.0 cup milk

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 5

Thank you for looking at the recipes!

Option 2

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 2

What book are you looking in? [1 = baking, 2 = southern] 1

What ingredient are you looking for? egg

Pancakes

Cake

Biscuits

Chocolate Chip Cookies

Cornbread

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 5

Thank you for looking at the recipes!

Option 3

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 3

What book are you looking to print? [1 = baking, 2 = southern] 2

** Southern Cooking **

Biscuits

Total time: 30 minutes

Serves 12 people

3.0 cups flour

3.0 tablespoons sugar

0.5 teaspoons salt

4.0 teaspoons baking powder
0.5 teaspoons cream of tartar
0.75 cups butter
1.0 egg
1.0 cup milk

Cornbread

Total time: 36 minutes
Serves 9 people

8.0 tablespoons butter
0.5 cups granulated sugar
0.25 cups honey
2.0 egg
1.0 cup milk
1.0 cup flour
1.0 cup cornmeal
0.5 teaspoons salt
0.5 teaspoons baking soda

BBQ Ribs

Total time: 8 hours 15 minutes
Serves 6 people

3.0 pounds pork ribs
3.5 cups pineapple juice
1.5 cups brown sugar
16.0 ounces BBQ sauce

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 5

Thank you for looking at the recipes!

Option 4

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 4

Biscuits

Cornbread

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 5

Thank you for looking at the recipes!

Option 5

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 5

Thank you for looking at the recipes!

Longer Run

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 4

Biscuits

Cornbread

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 1

What book are you looking to print? [1 = baking, 2 = southern] 1

** Baking **

Pancakes

Total time: 18 minutes

Serves 8 people

1.5 cups flour
3.5 teaspoons baking powder
1.0 teaspoon salt
1.0 tablespoon white sugar
1.25 cups milk
1.0 egg
3.0 tablespoons butter

Cake

Total time: 50 minutes

Serves 12 people

1.0 cup butter
1.5 cups granulated sugar
4.0 egg
1.0 tablespoon vanilla extract
2.75 cups flour

1.0 tablespoon baking powder
0.5 teaspoons salt
1.0 cup milk

Pizza Dough

Total time: 45 minutes
Serves 1 person

2.0 cups water
1.0 tablespoon yeast
1.0 tablespoon salt
5.0 cups flour
4.0 tablespoons olive oil

Biscuits

Total time: 30 minutes
Serves 12 people

3.0 cups flour
3.0 tablespoons sugar
0.5 teaspoons salt
4.0 teaspoons baking powder
0.5 teaspoons cream of tartar
0.75 cups butter
1.0 egg
1.0 cup milk

Chocolate Chip Cookies

Total time: 1 hour 45 minutes
Serves 24 people

0.75 cups butter
0.75 cups brown sugar
0.25 cups granulated sugar
1.0 egg
2.0 teaspoons vanilla extract
2.0 cups flour
2.0 teaspoons cornstarch
1.0 teaspoon baking soda
0.5 teaspoons salt
1.25 cups chocolate chips

Cornbread

Total time: 36 minutes

Serves 9 people

8.0 tablespoons butter
0.5 cups granulated sugar
0.25 cups honey
2.0 egg
1.0 cup milk
1.0 cup flour
1.0 cup cornmeal
0.5 teaspoons salt
0.5 teaspoons baking soda

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 3

What book are you looking to print? [1 = baking, 2 = southern] 1

** Baking **

Pancakes

Total time: 18 minutes

Serves 8 people

1.5 cups flour
3.5 teaspoons baking powder
1.0 teaspoon salt
1.0 tablespoon white sugar
1.25 cups milk
1.0 egg
3.0 tablespoons butter

Biscuits

Total time: 30 minutes

Serves 12 people

3.0 cups flour
3.0 tablespoons sugar
0.5 teaspoons salt
4.0 teaspoons baking powder
0.5 teaspoons cream of tartar
0.75 cups butter
1.0 egg
1.0 cup milk

Cornbread

Total time: 36 minutes
Serves 9 people

8.0 tablespoons butter
0.5 cups granulated sugar
0.25 cups honey
2.0 egg
1.0 cup milk
1.0 cup flour
1.0 cup cornmeal
0.5 teaspoons salt
0.5 teaspoons baking soda

Pizza Dough

Total time: 45 minutes
Serves 1 person

2.0 cups water
1.0 tablespoon yeast
1.0 tablespoon salt
5.0 cups flour
4.0 tablespoons olive oil

Cake

Total time: 50 minutes
Serves 12 people

1.0 cup butter
1.5 cups granulated sugar
4.0 egg
1.0 tablespoon vanilla extract

```
2.75 cups flour
1.0  tablespoon baking powder
0.5  teaspoons salt
1.0  cup milk
```

Chocolate Chip Cookies

```
Total time: 1 hour 45 minutes
Serves 24 people
```

```
0.75 cups butter
0.75 cups brown sugar
0.25 cups granulated sugar
1.0  egg
2.0  teaspoons vanilla extract
2.0  cups flour
2.0  teaspoons cornstarch
1.0  teaspoon baking soda
0.5  teaspoons salt
1.25 cups chocolate chips
```

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 2

```
What book are you looking in? [ 1 = baking, 2 = southern ] 1
What ingredient are you looking for? milk
```

```
Pancakes
Biscuits
Cornbread
Cake
```

Below are the menu options:

1. Print out the recipes in one of the recipe books.
2. Find recipes from one book with a particular ingredient.
3. Sort and print one of the recipe books by time.
4. Find what recipes are in both recipe books.
5. Quit the program.

Enter your option here: 5

Thank you for looking at the recipes!