Student Lesson 1 – Puff Pastry Folded in Half

In your group of two, one of you is the Pastry Chef and the other student will be the Assistant Baker. You will be using parchment paper as your puff pastry ‘dough.’

Exercise 1
Have the assistant baker collect one 15” x 20” piece of parchment paper and a rolling pin from the front of the classroom.

Step 1. Fold the parchment paper in half. Roll the rolling pin on the paper to make a sharp fold.
   a) Record how many layers you have on the “Pastry Layer Table.”

   Solution:

Step 2. Turn the parchment paper 90° and fold it in half again. Roll with the rolling pin, making the folds sharp and the paper lay flat. Make sure you remember which way the paper is facing. Cut a thin strip from an edge of the parchment. Look inside and count the number of layers.
   a) Record how many layers you have on the “Pastry Layer Table.”

   Solution:

Step 3. Turn the parchment paper 90°. Fold the parchment again. Roll the folds to make them sharp and the paper lay flat. Cut a thin strip from the edge of the parchment. Look inside and count the number of layers. You may notice that the parchment is starting to look “flaky.”
   a) Record how many layers have in the “Pastry Layer Table.”

   Solution:

Step 4. Turn the parchment paper 90°. Repeat the process.
   a) Record how many layers have in the “Pastry Layer Table.”

   Solution:
Step 5. Repeat the process one more time. Cut a thin strip from the edge of the parchment. Cut another strip that is about one-inch wide from the same edge. Cut off its ends. Count how many layers that are now in your “puff pastry.”

a) Record how many layers have in the “Pastry Layer Table.”

Solution:

Pastry Layer Table

<table>
<thead>
<tr>
<th>Pastry:</th>
<th>Number of Folds ( x )</th>
<th>Number of Layers ( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Folded in Half</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 = 1(^{st}) Fold</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 = 2(^{nd}) Fold</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = 3(^{rd}) Fold</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 = 4(^{th}) Fold</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = 5(^{th}) Fold</td>
<td></td>
</tr>
</tbody>
</table>

Exercise 2
Construct a connected scatter plot using your graphing calculator with the “Number of Folds” along the \( x \)-axis and the “Number of Layers” along the \( y \)-axis. Copy the calculator scatter plot onto the graph on the next page.

Note: To plot a graph using the Graphing Calculator follow the steps below.

Step 1. First clear all lists and clear all “Y=,”
Step 2. Enter data for “Number of Folds” into list \( L_1 \). Enter data for “Number of Layers” into \( L_2 \).
Step 3. Under button “2nd Stat Plot,” make sure only Plot 1 is On, set Xlist for \( L_1 \) and set Ylist for \( L_2 \) and set the Type on the connect the points type.
Step 4. Push the “Graph” button. The connected scatter plot should appear. You may need to adjust the graph window.
**Exercise 3**
Write a mathematical expression that represents the number of layers you get depending on the number of folds.

**Solution:**

**Exercise 4**
Suppose you folded and rolled the parchment paper 10 times. How many layers would you have?

**Solution:**

**Exercise 5**
Using the equation from exercise 3, what if \( x = 0 \), how many layers would you have? Also, what does it mean for the pastry when \( x = 0 \)?

**Solution:**
Lesson 2 – Puff Pastry Folded into Thirds

Lesson 2 is done the same way as Lesson 1 except that you will fold the parchment into thirds instead of in half. Switch roles from the ones in Lesson 1 so that the pastry chef is now the assistant baker and the assistant baker is now the pastry chef. You will be using parchment paper as your puff pastry ‘dough.’

Have the assistant baker collect one 15” x 20” piece of parchment paper and rolling pin from the front of the classroom.

Don’t forget to look at the recipes for Puff Pastry (pâte feuilletée) and Napoleons at the end of the lesson.

Part A – Folding and Rolling the Pastry

Exercise 1
Fold pastry into thirds

Step 1.  Take your piece of 15” x 20” parchment paper.  Fold it into thirds.  Roll with the rolling pin to make the folds sharp and the parchment lay flat.

a)  Record how many layers you have on the “Pastry Layer Table.”

Solution:

Step 2.  Turn the parchment paper 90° and fold into thirds again. Cut a thin strip from an edge of the parchment. Look inside and count the number of layers.

a)  Record how many layers you have on the “Pastry Layer Table.”

Solution:

Step 3.  Turn the parchment paper 90°. Fold the paper again. Roll the folds to make them sharp and paper lay flat. Cut a thin strip from the edge of the parchment. Look inside and count the number of layers. You may notice that the parchment is starting to look “flaky.”

a)  Record how many layers you have on the “Pastry Layer Table.”

Solution:

Step 4.  Turn the parchment paper 90°. Repeat the process.

a)  Record how many layers you have on the “Pastry Layer Table.”

Solution:
Step 5. Repeat the process one more time. Cut a thin strip from the edge of the parchment. Cut another strip that is about one-inch wide from the same edge. Cut off its ends. Count how many layers that are now in your “puff pastry.”

a) Record how many layers you have on the “Pastry Layer Table.”

Solution:

**Pastry Layer Table**

<table>
<thead>
<tr>
<th>Pastry:</th>
<th>Number of Folds</th>
<th>Number of Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Folded into Thirds</td>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td>1 = 1st Folding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = 2nd Folding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = 3rd Folding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 = 4th Folding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 = 5th Folding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Exercise 2**

Construct a scatter plot using your graphing calculator with the “Number of Folds” along the x-axis and the “Number of Layers” along the y-axis. Copy the calculator scatter plot onto the graph on next page.
Exercise 3
Write a mathematical expression that represents the number of layers you get depending on the number of folds.

Solution:

Exercise 4
Consider what would happen if you folded and rolled the parchment 10 times. How many layers would you have?

Solution:
Exercise 5
Using the equation from exercise 3, what if \( x = 0 \), how many layers would you have? Also, what does it mean for the pastry when \( x = 0 \)?

Solution:

Part B – Comparison with Lesson 1

Exercise 1
In the space below, explain the similarities and differences between the graphs from Lesson 1 and Lesson 2; Part A? Provide two detailed examples, state the equations for both graphs, and state where each graph crosses the \( y \)-axis.

Exercise 2
What conclusions can you make regarding how the pastry is folded and the number of layers you get?

Conclusions:
Part C – Mille-feuille

**Exercise 1**
Suppose you wanted a thousand layers in your puff pastry. How many folds would you have to do if you folded the pastry in half each time you rolled? *Hint:* look at Lesson 1.

**Exercise #2**
If you wanted a thousand layers in your puff pastry, how many folds would you have to do if you folded the pastry in thirds each time you rolled? *Hint:* look at Lesson 2; Part A.

**Exercise 3**
If you wanted to do the least amount of folding, rolling, and turning, what fraction would you need to fold the pastry into each time to end up with exactly 1,000 layers (i.e., fold the pastry in half, thirds, fourths, fifths, etc.)?

**Exercise 4**
Determine the equation for the number of layers if the pastry is folded into fourths each time.

**Exercise 5**
Determine the equation for the number of layers if the pastry is folded into fifths each time.
Pâte Feuilleteé

1 cup unsalted butter, chilled
2 cups unbleached all-purpose flour
½ teaspoon salt
7 tablespoons ice water

1) Take ¼ cup butter and set aside. Divide the remaining butter into four equal parts and keep refrigerated. Sift together the flour and salt. Cut into the flour the 1/4 cup butter until the butter is thoroughly mixed and pieces look like small peas. Gradually stir in the water with a fork. Press dough together firmly. It should be soft but not sticky. Wrap in plastic wrap and put in refrigerator for 15 minutes. If your kitchen is very warm you may want to leave the dough in the refrigerator for up to 30 minutes between each step.

2) Take dough out of refrigerator and out of plastic wrap. On a lightly floured surface or marble slab, roll into a rectangle 1/4 inch thick. Take one portion of the butter and crumble it over 2/3 of the rectangle. Fold rectangle into thirds; starting with the non-buttered third, fold it over the center third and then fold over the last butted third. Press the two open edges with the rolling pin to seal. Wrap again in plastic wrap and refrigerate for another 15 minutes.

3) Take the dough out of the refrigerator and out of plastic wrap. Place the dough on the lightly floured surface with a pressed open edge toward you. Roll into a 1/4 inch thick rectangle. Take a second portion of the butter out of the refrigerator and crumble it over 2/3 of the rectangle. Fold as in Step 2, wrap and refrigerate for 15 minutes.

4) Repeat with the third portion of butter. Wrap and refrigerate 15 minutes.

5) Repeat again with the fourth and last portion of butter. Wrap and refrigerate 15 minutes.

6) For the final step, place dough on the lightly floured surface with pressed open edge toward you. Roll into a ¼ inch thick rectangle. Fold in thirds as before but without butter. Wrap in plastic wrap and refrigerate until ready to use, at least 15 minutes.

Napoleons

These are individually sized rectangular pastries that alternate between puff pastry slices and pastry cream or pudding then topped with a glaze. Sometimes you will see them with strawberry slices layered with the puff pastry and cream.

1) Take dough out of refrigerator, unwrap, and divide into three portions. Rewrap two of the portions and put back into the refrigerator. For the portion you kept out, roll into a 1/8 inch thick rectangle. Cut into even 3” x 5” strips. Place on chilled baking sheet. Prick the pastry strips all over with a fork. Put into refrigerator and take out another portion of dough. Repeat the process with this portion and then the last portion of dough. Chill 30 minutes.

2) Bake at 425°F for 10 minutes. Then reduce the oven temperature to 325°F and bake for another 20 minutes or until golden brown. Remove from baking sheets and allow to cool on wire racks. When cold, split each piece lengthwise. Let stand about 30 minutes to dry.

3) Make a pastry cream while the pieces are drying. You can use pudding in place of pastry cream. The pastry cream or pudding can be chocolate, vanilla, almond, or whatever is your favorite flavor.

4) Fill one split piece with pastry cream. Press together gently. Spread more cream on top. Take one half of another piece and place it cut-side down on the cream. Spread more cream on top of that and cover with the other half piece, cut-side down.

5) Make a glaze with confectioners’ sugar. Spread evenly over tops of Napoleons.

Serve to all of your friends with a cup of hot tea and enjoy!