# PERCENT COMPOSITION OF AN OREO

**BACKGROUND:** Students usually struggle with determining percentages.  This lab is a way to have students work with percentages. It emphasizes the percentage as a piece of the whole.

**PURPOSE:** To determine and compare  the percentage  of crème in Oreo original and Double Stuff cookies and to develop a program to calculate the data on the  Google Colaboratory Platform using  Python.

**HYPOTHESIS:**

**MATERIALS:**

Balance                            1- Original Oreo
Weigh boat                       1- Oreo double stuff
Spatula

## *SAFETY:  DO NOT EAT ANYTHING DURING THIS LAB!!!!!!!*

**PROCEDURE:**

1. Take a weigh boat. Put it on the balance. Zero the balance.

2. Place an Original Oreo cookie in the weigh boat. Record the mass in the data table on page 2 of your packet.

3.  Twist the cookie apart. Try not to break it.

4. Scrape the crème filling into the weigh boat using the spatula.  Record the mass of the crème filling in the data table on page 2.

5. Empty the crème from the weigh boat onto a paper towel.

6.  Wash and dry the weigh boat in the lab sink.

7.  Place the weigh boat on the balance. Zero the balance.

8. Repeat steps 1-7 for the other oreos.

**CLEAN UP:**

11. Empty the crème from the weigh boat onto a paper towel.

12.  Wash and dry the weigh boat in the lab sink.

13. Place the cookies in the paper towel with the crème. Wrap it all up and throw it in the trash can. **WIPE YOUR TABLE WITH A WET PAPER TOWEL.**

## DATA:

### MASS OF CREME AND WAFER IN ORIGINAL AND DOUBLE STUFF OREOS

| COOKIE TYPE | MASS OF COOKIE (g) | MASS OF WAFER (g) | MASS OF CRÈME (g) |
|---|---|---|---|
| Original 1 | | | |
| Original  2 | | | |
| Original 3 | | | |
| AVERAGE MASS | | | |
| Double Stuff 1 | | | |
| Double Stuff 2 | | | |
| Double Stuff 3 | | | |
| AVERAGE MASS | | | |

**Data Table 1**

| COOKIE TYPE | PERCENTAGE WAFER | PERCENTAGE CREME |
|---|---|---|

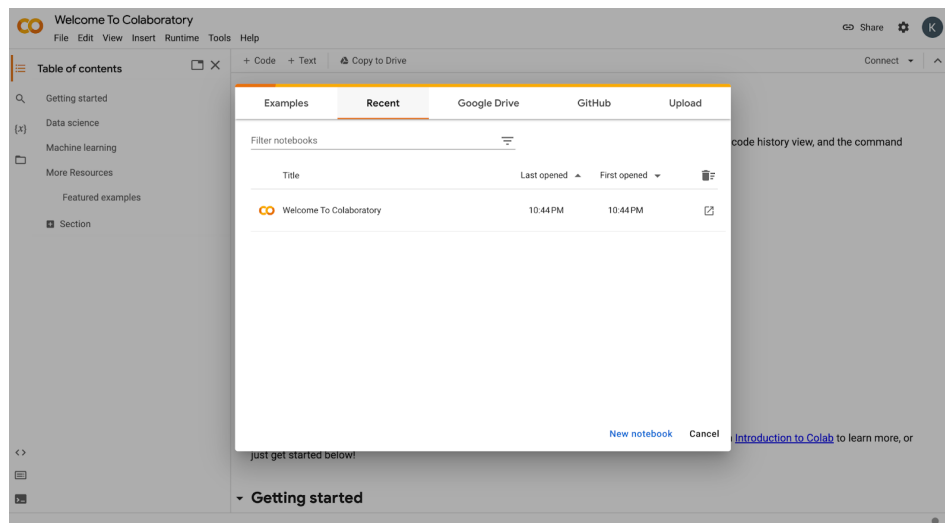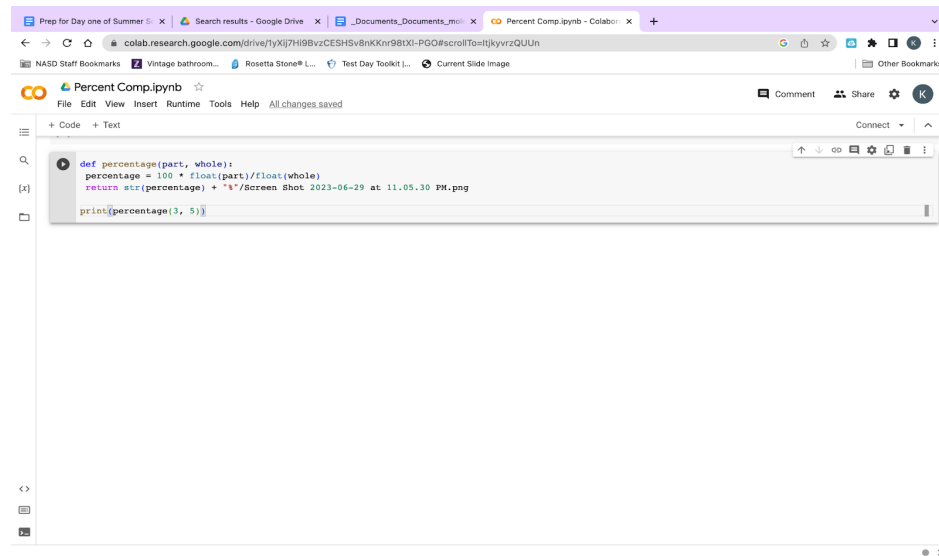| ORIGINAL | | |
|---|---|---|
| DOUBLE STUFF | | |

<div align="right">**Data Table 2**</div>

## Calculations:

You will use Google Colaboratory and Python to write a program to calculate your data.

1. Go to [www.colab.google.com](www.colab.google.com)

2. It will take you to a screen that looks like this:



5. At the bottom of the screen click new notebook.

6. The notebook page will appear.

7. Give your notebook a title at the top right.

8. Under the title you will see the words code and text.

9. Click on code. This will add a code box to your notebook. This will allow you to write a formula to calculate your data. What steps will you need to take to TELL THE COMPUTER how to calculate the data for the percentage?

List the steps here:

      a.

      b.

      c.

10. Type the following into the code cell EXACTLY.

```
def percentage(part, whole):
percentage = 100 * float(part)/float(whole)
return str(percentage) + "%"

print(percentage(3, 5))
```

11. Click the little play sign on the left of the block.

12. To calculate your results, you only need to copy and paste the same formula into a new "code" cell. Substitute your value for the mass of the wafer or creme for the number 3 and substitute the mass of the cookie for the number 5. Click the play button and run the program again to get your values.

13. Put the values in Data Table 1 above under % creme and % wafer

## Calculations Table:

## PERCENT COMPOSITION OF OREO

| COOKIE TYPE | PERCENTAGE WAFER | PERCENTAGE CREME |
|---|---|---|
| ORIGINAL | | |
| DOUBLE STUFF | | |

**Data Table 2**

**Group Comparisons of percentages:**

| Your Group: | Comparison Group A | Comparison GroupB |
|---|---|---|
| Original Oreo: | Original Oreo: | Original Oreo: |
| Oreo Double Stuff: | Oreo Double Stuff: | Oreo Double Stuff: |

**What possible errors could have occurred to explain the difference in values?**

**ANALYSIS AND CONCLUSION QUESTIONS:**

1.  How do the percent composition of the cookies compare?

2.  What is the ratio of creme in original oreo to the ratio of creme in double stuff oreo?

3.  Is the double stuff creme, double the original oreo? Use <u>evidence</u> to support your statements.

4. If each Original Oreo had a molar mass of 120 g/mol, how many *moles* would be present in one Original Oreo cookie? **USE DIMENSIONAL ANALYSIS! Show all work!**

5. If each Original Oreo had a molar mass of 120 g/mol, how many *particles* would be present in one Oreo? **USE DIMENSIONAL ANALYSIS! Show all work!**