Module 10 - Sales at the Sandwich Shop

Background

- In this module, you will look at how transaction data from a sandwich shop can be used for analyzing performance and planning inventory. For this module, you may find the aggregating effect of a *Pivot Table* quite useful. If you are unfamiliar with the Pivot Table tool, first view the screencast *Pivot Tables*.
- The Excel workbook for this module consists of 3 tabs.
    1. The "POS Data" tab contains a list of one full month of transaction data from the point-of-sale system for the sandwich shop. Each transaction is recorded in a row that identifies the product name, the date of sale, the transaction number, the product type, and the price.
    2. The "Ingredients" tab provides a recipe matrix for the sandwiches sold by the shop.
    3. The "Current Inventory" tab contains a list of the sandwich ingredients recorded in stock as of the end of the month presented in the POS data.

Part 0: Matrix Multiplication

Matrices have many applications. Any array of values can be considered a matrix. By using the arithmetic of matrices, values of two separate matrices can be combined to form a new matrix, the values of which have a particular (and useful) meaning.

1) To begin this Module, view the screencast *Matrix Multiplication*.

Part 1: Graphing Point-of-Sale (POS) Data

On the tab called POS Data, you have one month of transaction data from the POS system (point-of-sale system, also known as the "cash register").

1) Revenue per day
    a. What was the total revenue on July 8?

    b. Create a graph of daily revenue.

2) Number of items per day
    a. How many items were sold on July 15?

    b. Create a graph of items sold per day.

3) What patterns do you notice in the graphs?

Part 2: Understanding the Product Mix

1) How many different product types does the sandwich shop sell?

2) How many different desserts?

3) How many different sandwiches?

4) What is the most expensive sandwich?

5) Create a graph that shows the frequency (number of units sold) for each of the products sold on July 1.

6) What was the most popular product sold on July 1? How many units of that product were sold?

7) What percentage of the sandwiches sold during July were Grilled Cheese sandwiches?

8) Which product(s) brought in the most revenue on July 1?

9) How much revenue did the Turkey Club sandwich bring in on July 10?

10) Create a graph that shows the top five products in terms of their percentage of total revenue for the month.

Part 3: Ingredient Usage Per Day

1) Create a table showing the number of each sandwich type sold on July 5. Fill in the missing cells below.

Sandwich	Number Sold
BLT	11
Chicken Salad	
Grilled Cheese	
Ham and Cheese	
Italian Sub	
Meatball Sub	15
Philly Cheesesteak	
Roast Beef	
Tuna Salad	
Turkey Club	16
Vegetarian	

2) Using the information under the Ingredients tab, create a table showing the amount of each ingredient used on July 5. Fill in the missing cells below

Ingredient	**Units**	**Amount Used** July 5
Bacon	OZ	38
Bread (Slice)	EACH	
Cheese	OZ	
Chicken	OZ	
Ham	OZ	
Lettuce	OZ	
Meatballs	OZ	
Onions	OZ	
Peppers	OZ	
Roast Beef	OZ	84
Roll	EACH	
Salami	OZ	54
Sprouts	OZ	
Tomato	OZ	
Tuna	OZ	12
Turkey	OZ	32

Part 4: Ingredient Usage Inventory

1) Create a table showing the number of each sandwich type sold during the 7-day period from July 25-31. Fill in the missing cells below.

Sandwich	Number Sold
BLT	112
Chicken Salad	
Grilled Cheese	
Ham and Cheese	
Italian Sub	
Meatball Sub	78
Philly Cheesesteak	
Roast Beef	
Tuna Salad	
Turkey Club	105
Vegetarian	

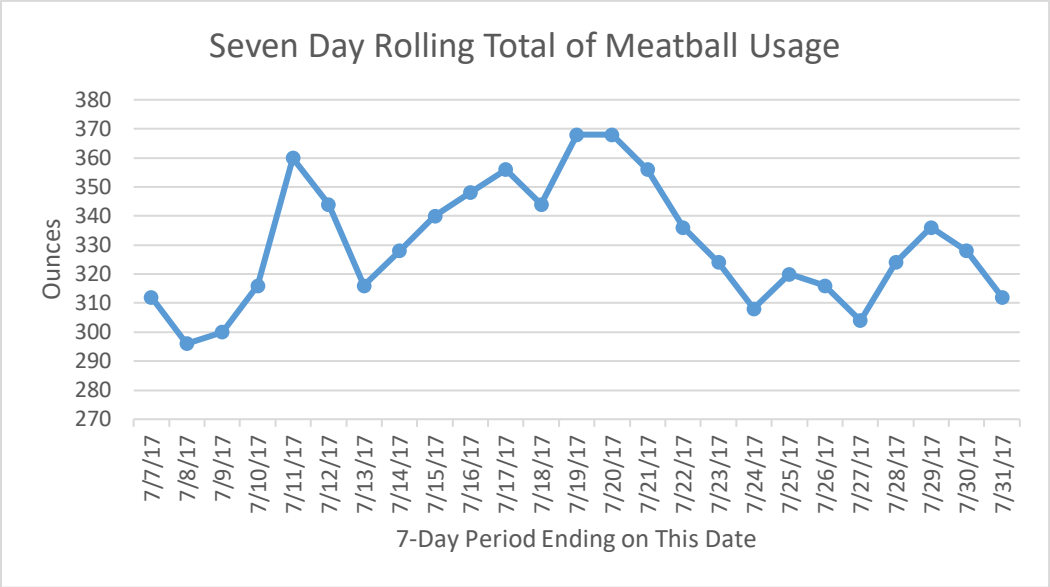
2) Create a table showing the amount of each ingredient used during the 7-day period July 25-31. Then, use those amounts as an estimate (forecast) for the ingredient usage for the subsequent week (August 1-7). From that forecasted usage, calculate how much of each ingredient you would need to order to have enough on hand to meet that forecasted demand. The Current Inventory tab shows the inventory on hand for each ingredient on the morning of August 1. Fill in the missing cells below.

Ingredient	Units	Amount Used July 25-31	Amount To Order
Bacon	OZ		
Bread (Slice)	EACH	1058	
Cheese	OZ	680	480
Chicken	OZ	47	0
Ham	OZ	332	150
Lettuce	OZ	557	377
Meatballs	OZ	312	267
Onions	OZ	335	236
Peppers	OZ		
Roast Beef	OZ		
Roll	EACH		
Salami	OZ		
Sprouts	OZ		
Tomato	OZ		
Tuna	OZ		
Turkey	OZ		

Part 5: Rolling Totals

Ordering based on the last seven days doesn't take into account week-to-week fluctuations. You will look at rolling totals (moving totals) to understand the fluctuations in usage.

Here is a graph that shows the seven-day rolling total of Meatballs usage. The graph shows how many Meatballs were used in orders placed in each seven-day period ending on the listed date. For example, during the period from 7/12 to 7/18, the sandwich shop used 344 ounces of Meatballs.



1) Looking at the chart above, approximately how many ounces of Meatballs were used in the 7-day period ending on 7/10?

2) Create a graph like the one above that shows the 7-day rolling total for usage of Roll.
Hint: For the seven days ending 7/12, 302 ounces were used.

Now you are going to revisit the order quantities you calculated in Part 4 and take into account fluctuations. To do so, use the data on the Current Inventory tab as well as the 7-day rolling totals of usage of all of the ingredients (not just Roll and Meatballs).

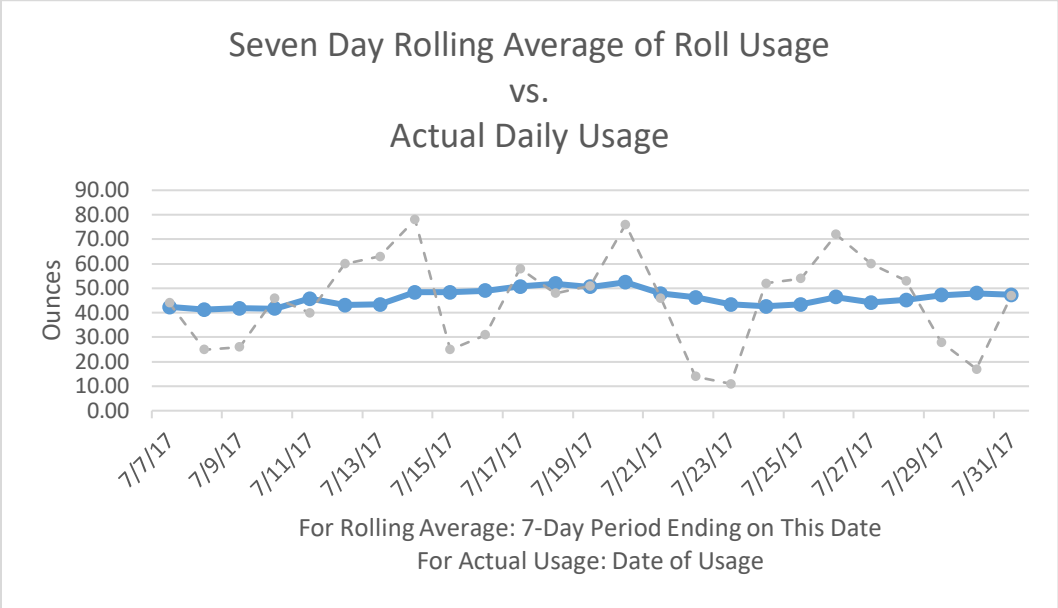
3) How much of each ingredient would you need to order on 8/1 to have enough on hand to meet the **highest** 7-day rolling total in the month of July? Fill in the missing cells below.

Ingredient	**Units**	**Amount To Order to Meet the Highest 7-Day Rolling Total Usage**
Bacon	OZ	194
Bread (Slice)	EACH	818
Cheese	OZ	541
Chicken	OZ	
Ham	OZ	
Lettuce	OZ	
Meatballs	OZ	
Onions	OZ	
Peppers	OZ	
Roast Beef	OZ	
Roll	EACH	
Salami	OZ	
Sprouts	OZ	
Tomato	OZ	
Tuna	OZ	0
Turkey	OZ	150

Part 6: Rolling Averages vs. Daily Actual Usage

In the previous part, you calculated rolling totals: the total usage of each ingredient over a 7-day period. In this part, you will calculate **rolling averages** (moving averages).

Here's a graph that shows the 7-day rolling average for Roll usage *and* the actual daily usage of Roll for 7/7-7/31.



1) Is the dashed line the rolling average or the actual daily usage? How can you tell? Hint: You should be able to answer this question without doing any calculations with the data.

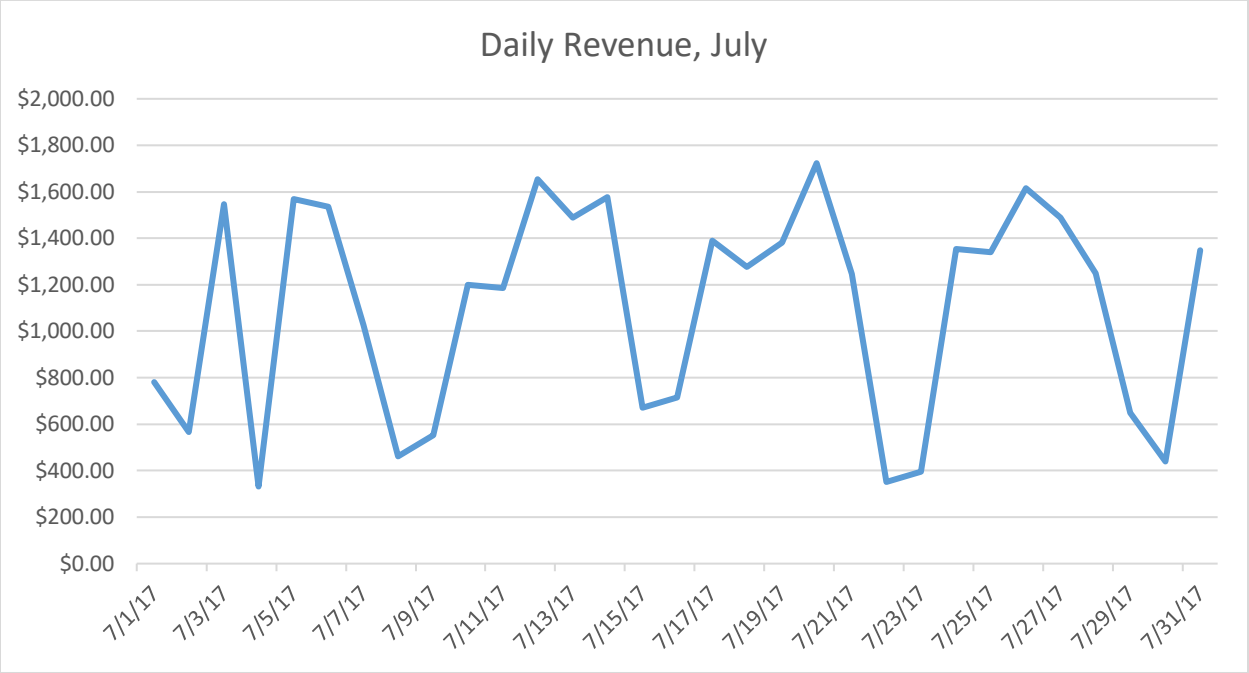
2) Generate the same type of graph for Ham. Hint: for the seven days ending 7/11, 40.86 ounces was the average usage, while actual usage was 47 ounces.

Selected Answers

Part 1

1a) $461.65

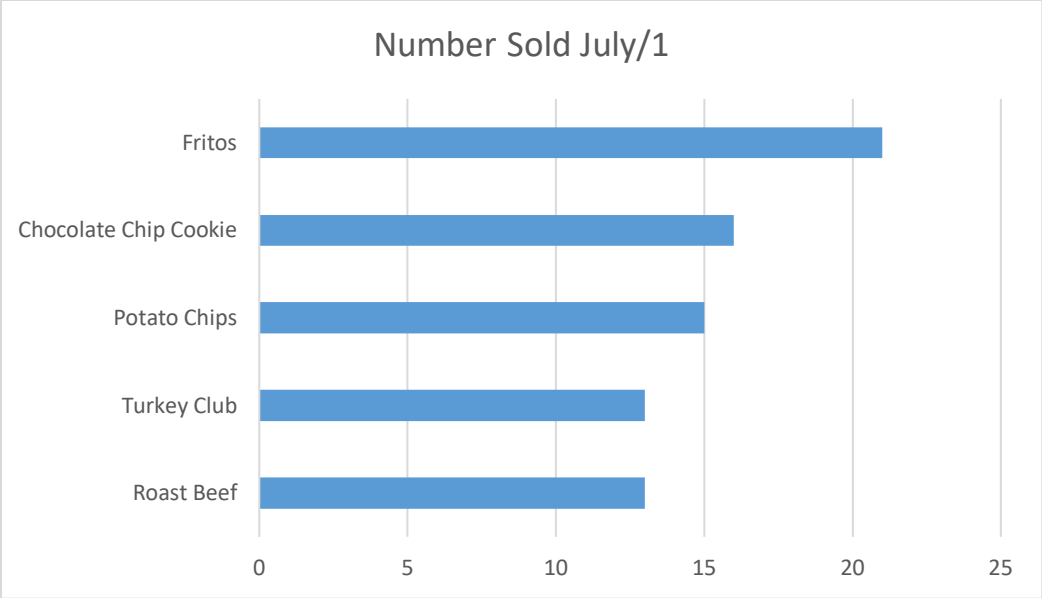
1b)



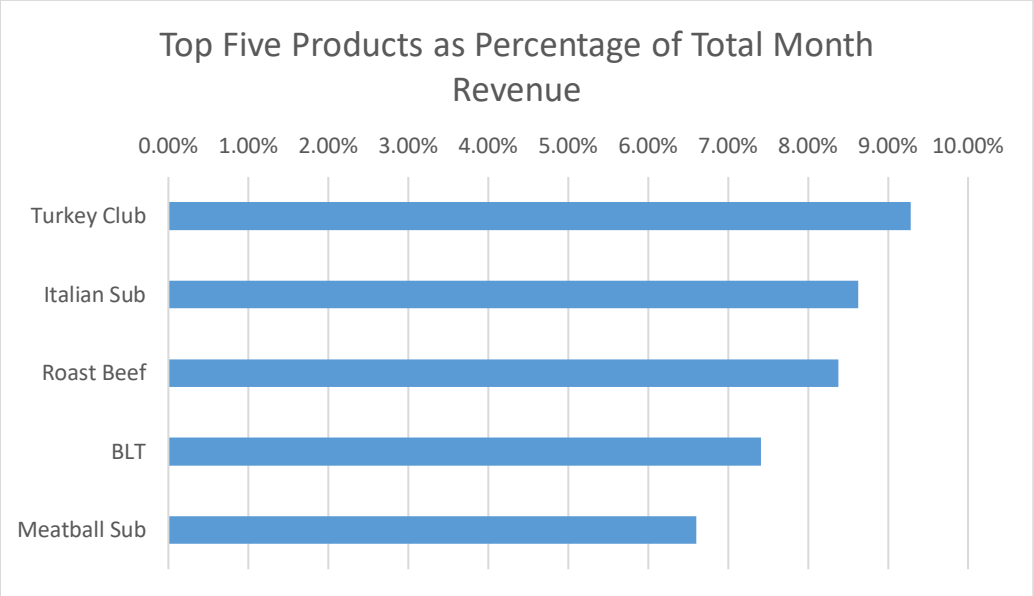
2a) 214

Part 2

1) 4
2) 6
3) 11
4) Philly Cheesesteak
5) The top part of the graph, just showing the top five:



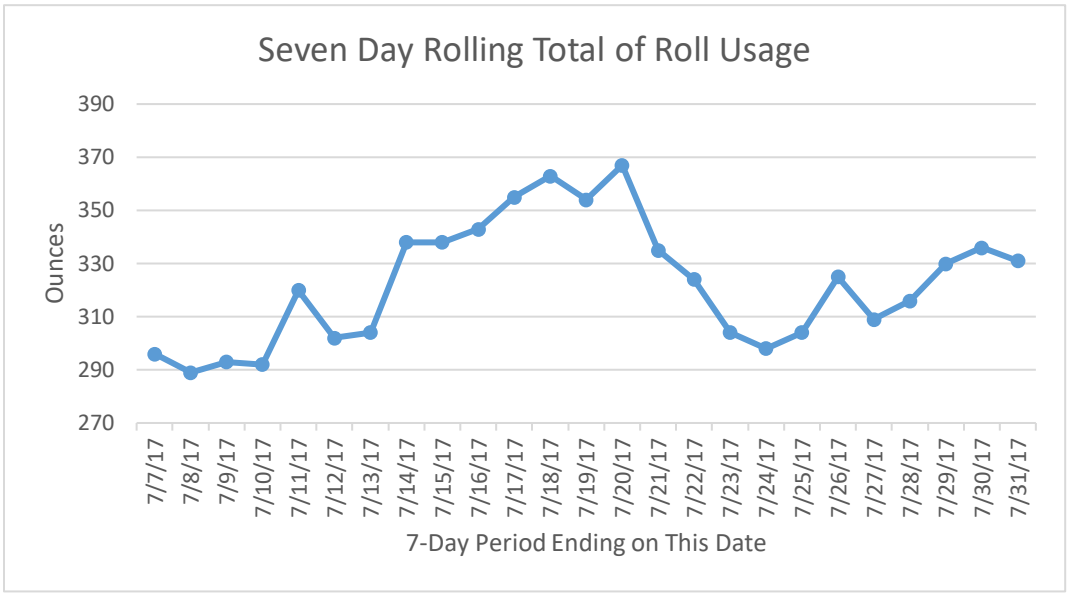
6) Fritos, 21
7) 9.45% of the sandwiches during the month were Grilled Cheese
8) There are multiple products with the most revenue ($90.87).
9) The Turkey Club sandwich brought in $153.78 on July 10.
10) Graph:



Part 5

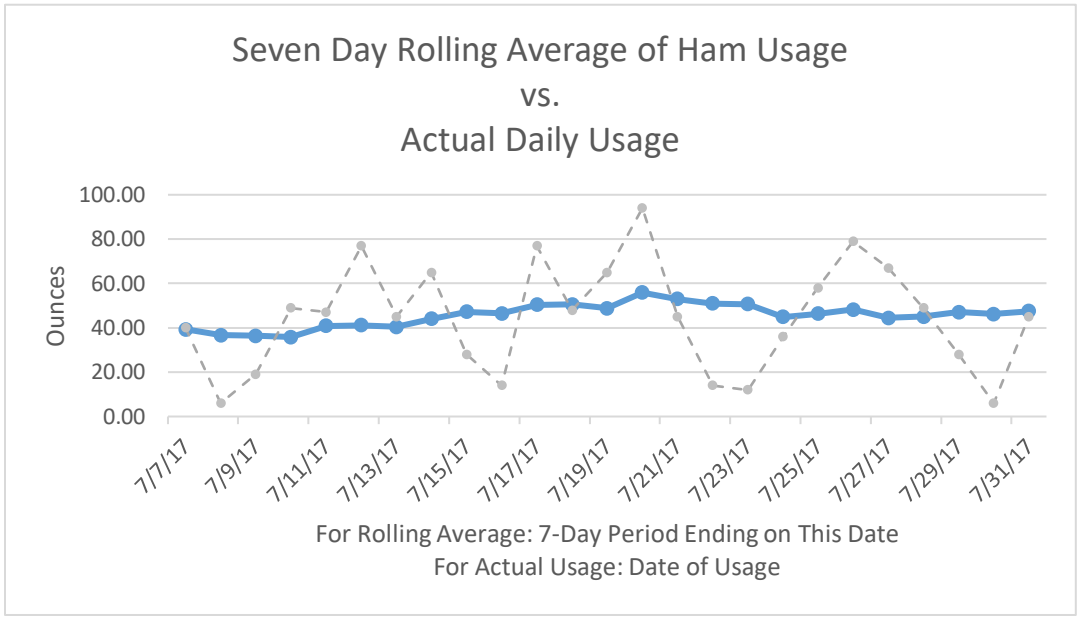
1) The exact answer is 316 ounces.

2)



Part 6

2)



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