NITTE EDUCATION TRUST | N.M.A.M. INSTITUTE OF TECHNOLOGY
(An Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi)
Nitte – 574 110, Karnataka, India

ISO 9001:2015 Certified)
Accredited with 'A' Grade by NAAC

Department of Artificial Intelligence and Machine Learning

Laboratory Manual

DATA VISUALIZATION TECHNIQUES AND TOOLS LAB

21AMA51

Course Outcomes:

At the end of the course the student will be able to

Sl.No	Course Outcome	Bloom's Taxonomy Level (BTL)
CO.1	Comprehensive understanding of data visualization principles and techniques.	2
CO.2	Familiar with popular data visualization tools and software, such as Tableau, Power BI, or Python libraries like Matplotlib and Seaborn.	4
CO.3	Gain proficiency in using the tools to create interactive and visually appealing visualizations.	4
CO.4	Understand the importance of data preparation and exploration in the context of data visualization.	4
CO.5	Able to draw insights from the data and apply their knowledge and skills in real-world projects or case studies.	4

Software used

1. TABLEAU
2. POWER BI

Marks distribution

Internal Evaluation

Evaluation Criteria	Marks
CIE	10
Project*(if any)	20
MSE	20

Evaluation Criteria	Marks
CIE	20
Viva (If No Project)	10
MSE	20

SEE

Evaluation Criteria	Marks
Procedure write up	(5+5)
Experiment execution	(10+20)
Viva-Voce	10

Guidelines for mini project (if applicable)

1. Mini project must be carried out by a team of maximum two members.

2. Mini project must be carried out to address any relevant real world dataset visualisation.

3. Implement the mini project using the Tableau.

4. Evaluation is based on problems addressed, use of the visualisation concepts and the user view of the mini project.

Prepared by:

Name of the faculty	Designation	Unit
Mr. Anirudhan Adukkathayar C	Assistant Professor	UNIT-I, UNIT-II, UNIT III

List of Experiments

*Programs are not restricted to only the below set.

Sl.No.	Title of the experiment
1.	Install the Tableau and familiarise the environment
2.	Using the Sample-superstore data source, create a join between Orders and Returns table.
3.	Using the Sample-superstore data source, make a view by using the fields Ship mode and profit-discount. Calculate profit-discount using tableau numerical Calculations
4.	Using the Sample-superstore data source, find out the sales in the cities, which contain the letter “o”.
5.	Using the Sample-superstore data source, find out the sales volume along with the difference in the date of sales in months from 21st March 2009
6.	Using the Sample-superstore data source, calculate the running total of the profits earned for the data
7.	Using the Sample-superstore data source, apply sorting on the field named discount by using the dimensions order date and Subcategory
8.	Using the Sample-superstore data source, apply dimension filters on the sub-category of products
9.	Using the Sample-superstore data source, apply dimension filters on the average value of the profits.
10.	Using the Sample-superstore data source, create a view with order date in the column shelf and profit in the rows shelf
11.	Using the Sample-superstore data source, find the top 10 Sub-Category of products for the category called Furniture [Context filtering]
12.	Using the Sample-superstore data source, make a Bar chart by considering the fields profit and Sub-Category
13.	Using the Sample-superstore data source, make a Line chart by considering the fields sales and Ship mode
14.	Using the Sample-superstore data source, find the variation of sales and profit figures as the two axes of the Cartesian plane is distributed according to their Sub-Category[Scatter plot]
15.	Using the Sample-superstore data source, find the variation of quantities of different SubCategory of products according to their ship mode over a range of time.[Gantt Chart]
16.	Using the Sample-superstore data source, find the quantities of sales for different regions.[Histogram]
17.	Using the Sample-superstore data source, find the variation of Sales for each Sub-Category of products and make a waterfall chart
18.	Using the Sample-superstore data source, forecast the value of the measure sales for next year.

19.	Using the Sample-superstore data source, find the trend for the value of the measure sales for next year.
20.	Using the charts created in previous experiment create a dash board
21.	Getting Started with Power BI Desktop
23.	Experiment of Data Transformation
24.	Experiment of Building Reports
25	Experiment of Dashboards
26	Experiment of Advanced Visualizations
27.	Experiment of Data Integration with R & Python
28	Experiment of Saving and Publishing

LESSON PLAN

Course Title: **DATA VISUALIZATION TECHNIQUES AND TOOLS**	Course Code: **21AMA51**
Hrs. /Week: **0+0+2+0**	Credits: **01**
Total Contact Hours: ***26***	Duration of SEE: **3 hrs**
SEE Marks: **50**	CIE Marks: **50**
Course Plan Author: Anirudhan Adukkathayar C	
Checked By:	

Sl.No.	Programs	Week wise Plan
1	Install the Tableau and familiarise the environment	Week1
2	Using the Sample-superstore data source, create a join between Orders and Returns table.	Week1
3	Using the Sample-superstore data source, make a view by using the fields Ship mode and profit-discount. Calculate profit-discount using tableau numerical Calculations	Week1
4	Using the Sample-superstore data source, find out the sales in the cities, which contain the letter "o".	Week2
5	Using the Sample-superstore data source, find out the sales volume along with the difference in the date of sales in months from 21st March 2009	Week2
6	Using the Sample-superstore data source, calculate the running total of the profits earned for the data	Week2
7	Using the Sample-superstore data source, apply sorting on the field named discount by using the dimensions order date and Subcategory	Week3
8	Using the Sample-superstore data source, apply dimension filters on the sub-category of products	Week3
9	Using the Sample-superstore data source, apply dimension filters on the average value of the profits.	Week3
10	Using the Sample-superstore data source, create a view with order date in the column shelf and profit in the rows shelf	Week4

11	Using the Sample-superstore data source, find the top 10 Sub-Category of products for the category called Furniture [Context filtering]	Week4
12	Using the Sample-superstore data source, make a Bar chart by considering the fields profit and Sub-Category	Week4
13	Using the Sample-superstore data source, make a Line chart by considering the fields sales and Ship mode	Week5
14	Using the Sample-superstore data source, find the variation of sales and profit figures as the two axes of the Cartesian plane is distributed according to their Sub-Category[Scatter plot]	Week5
15	Using the Sample-superstore data source, find the variation of quantities of different SubCategory of products according to their ship mode over a range of time.[Gantt Chart]	Week5
16	Using the Sample-superstore data source, find the quantities of sales for different regions.[Histogram]	Week6
17	Using the Sample-superstore data source, find the variation of Sales for each Sub-Category of products and make a waterfall chart	Week6
18	Using the Sample-superstore data source, forecast the value of the measure sales for next year.	Week6
19	Using the Sample-superstore data source, find the trend for the value of the measure sales for next year.	Week7
20	Using the charts created by Sample-superstore data source create a dash board	Week7
21	Getting Started with Power BI Desktop	Week7
22	Experiment of Data Transformation	Week8
23	Experiment of Building Reports	Week8
24	Experiment of Dashboards	Week8
25	Experiment of Advanced Visualizations	Week9
26	Experiment of Data Integration with R & Python	Week9
27	Experiment of Saving and Publishing	Week9

Faculty Coordinator **Head-AIML**

1. Install the Tableau and familiarise the environment

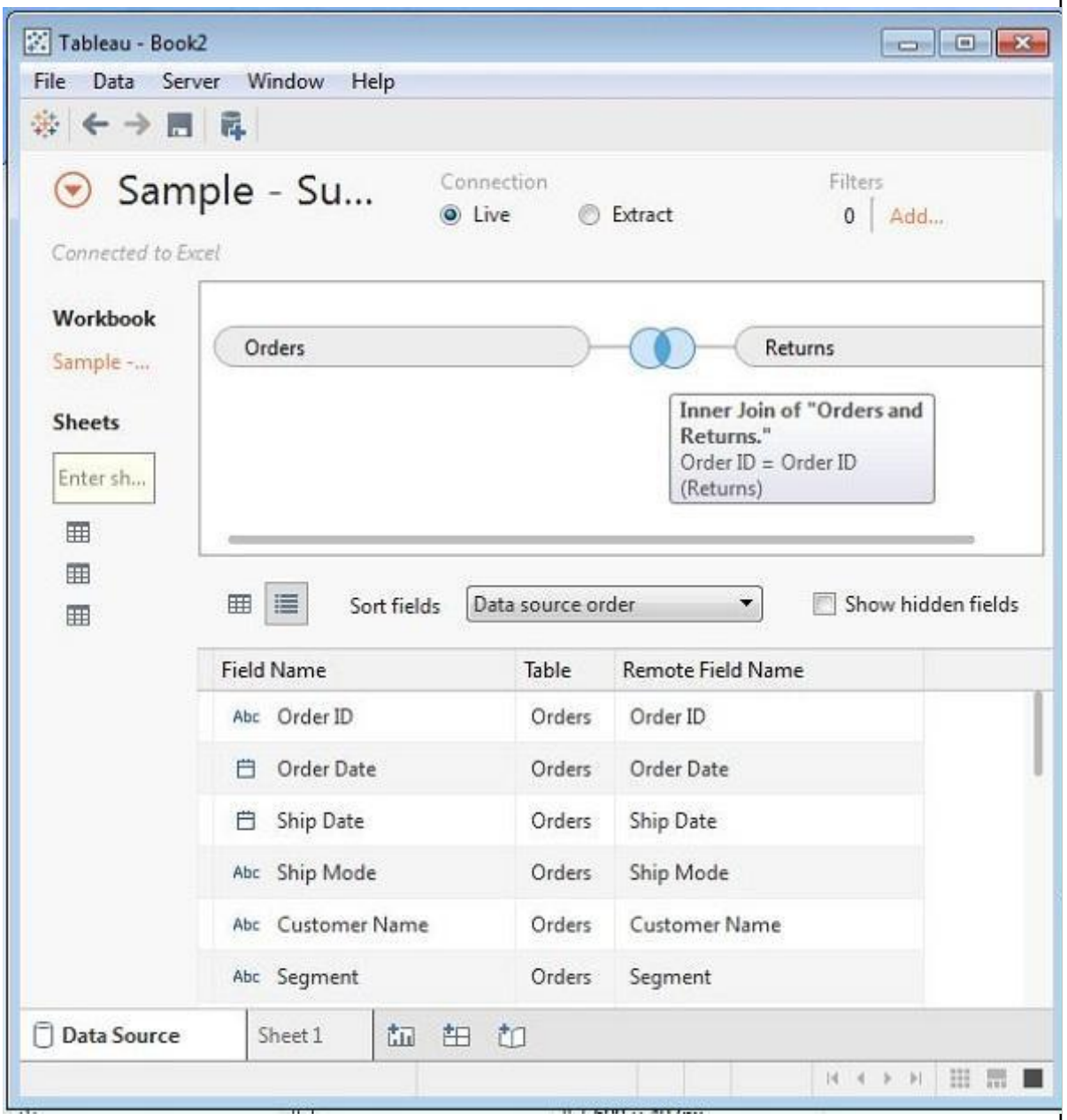
1. System Requirements Check:
    - Before you begin the installation process, make sure your computer meets the system requirements for Tableau. You can find the system requirements on the Tableau website.
2. Download Tableau Desktop or Tableau Server:
    - Go to the Tableau website (https://www.tableau.com/) and navigate to the "Products" section.
    - Choose either Tableau Desktop (for individual use) or Tableau Server (for enterprise use). Click on the appropriate product.
3. Select a Version:
    - Select the version of Tableau you want to install. You may have a choice of different versions, such as Tableau Desktop Personal, Tableau Desktop Professional, or the version of Tableau Server that suits your needs.
4. Provide Your Information:
    - You may be required to provide your information (name, email, company, etc.) to download the software. Fill out the required fields and proceed.
5. Accept the License Agreement:
    - Read and accept the Tableau license agreement and terms of use.
6. Download the Installer:
    - Click on the download button to get the Tableau installer for your operating system (Windows or macOS).
7. Run the Installer:
    - Locate the downloaded installer file on your computer and run it. Follow the on-screen instructions to install Tableau.
8. Activation and Licensing:
    - During the installation process, you will be prompted to enter your Tableau license key or choose a trial version. Follow the instructions for activation.
9. Choose Installation Options:
    - Depending on the Tableau product you're installing, you may be asked to choose installation options, such as the directory where you want to install Tableau and additional components to install. Make your selections accordingly.
10. Finish the Installation:
    - Once you've made your selections and reviewed the installation settings, click "Install" to begin the installation process.

2. **Using the Sample-superstore data source, create a join between Orders and Returns table.**

Steps

1. Go to the Data menu and choose the option Edit Data Source.
2. Drag the two tables, Orders and Returns to the data pane.
3. Depending on the field name and datatype, Tableau will automatically create a join which can be changed later.

Output

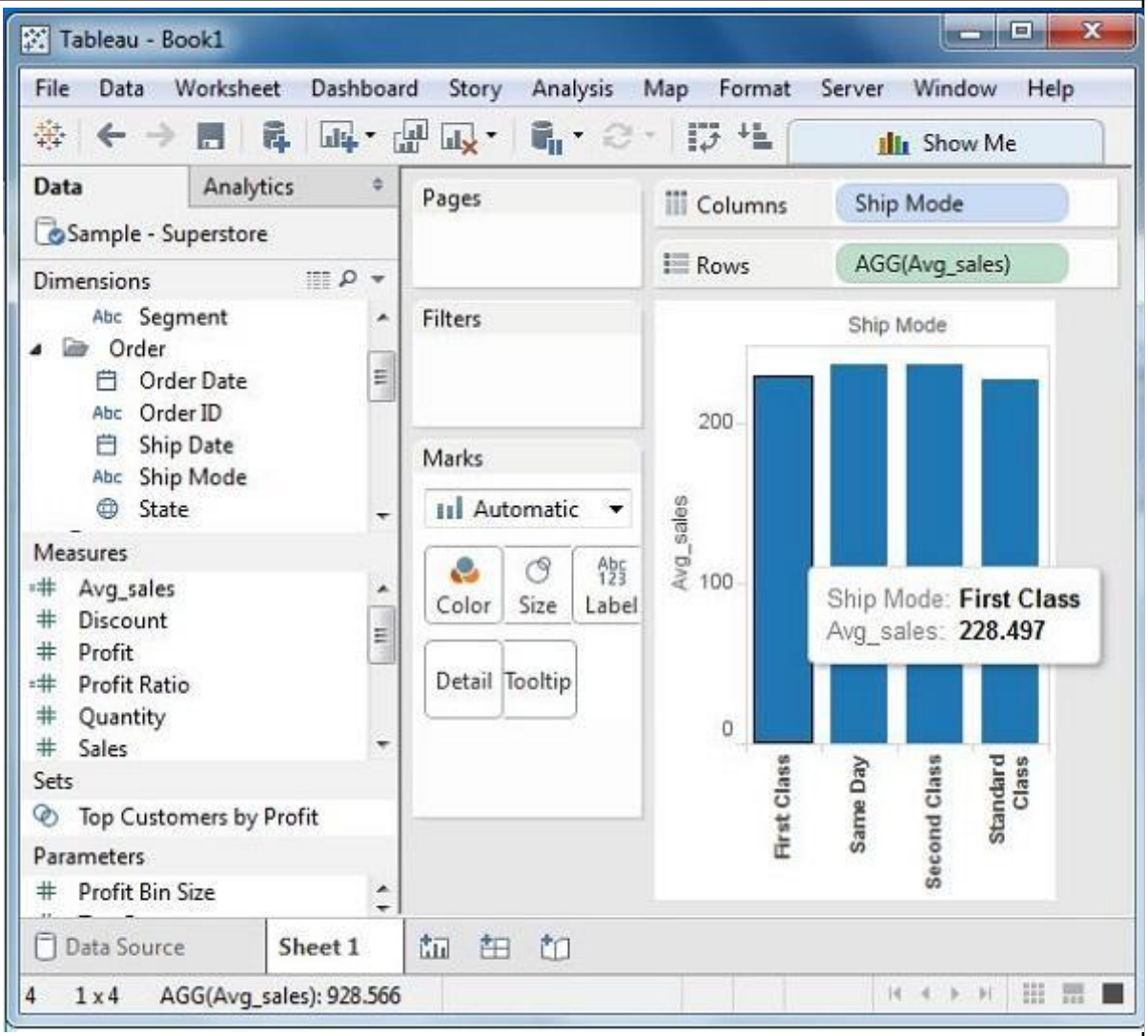


3. Using the Sample-superstore data source, make a view by using the fields Ship mode and profit-discount. Calculate profit-discount using tableau numerical Calculations

Steps

1. Go to the Analysis menu and click 'Create Calculated Field
2. To study the difference between profit and discount for different shipping mode of the products, create a formula subtracting the discount from the profit.
3. Name this field as **profit_n_discount**.
4. The above calculated field can be used in the view by dragging it to the Rows shelf as shown in the following screenshot. It produces a bar chart showing the difference between profit and discount for different shipping modes.

Output

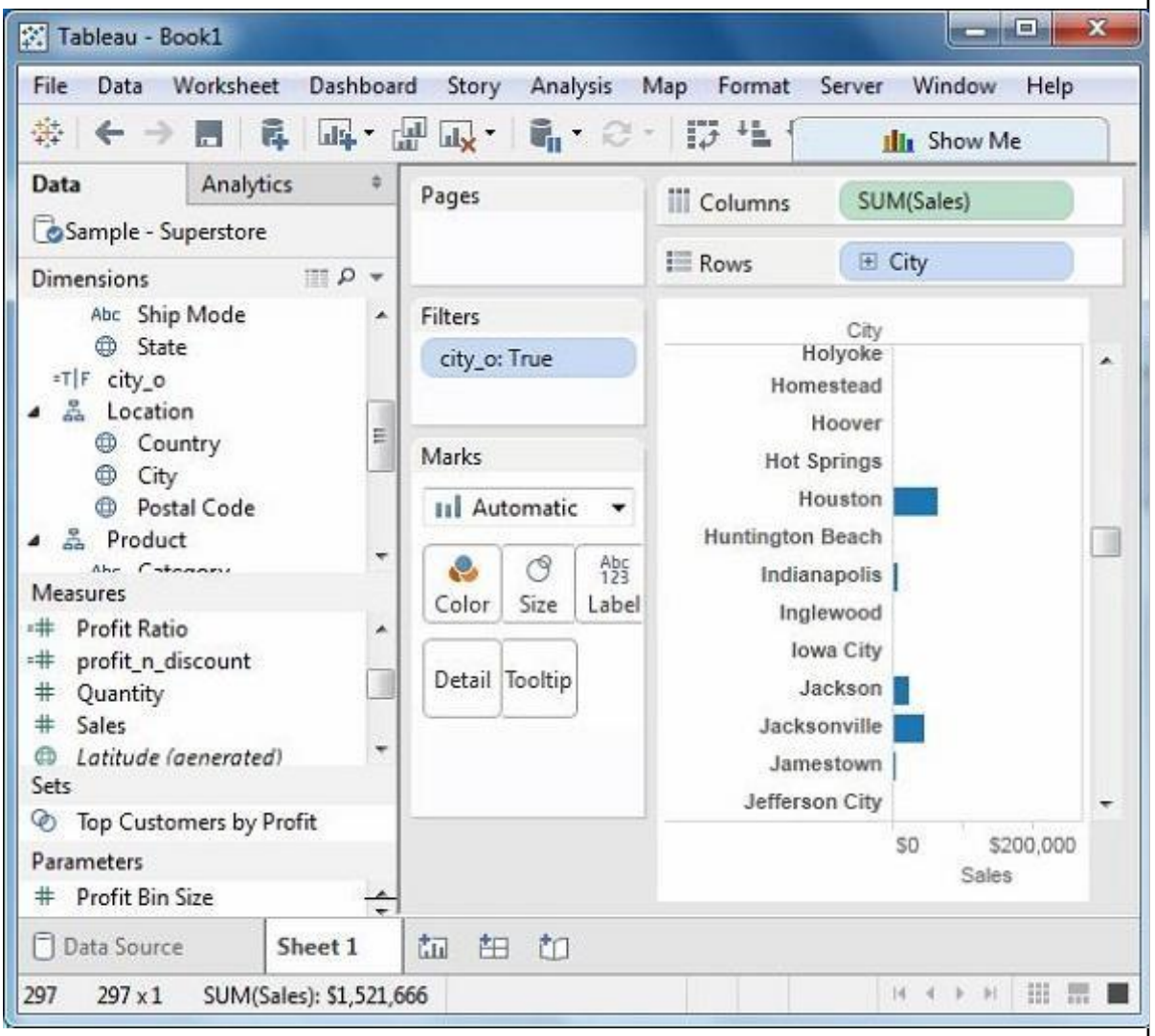


4. Using the Sample-superstore data source, find out the sales in the cities, which contain the letter "o".

Steps

1. Go to the Analysis menu and click 'Create Calculated Field
2. create the formula CONTAINS([city], "o")
3. Name this field as **City_O**.
4. drag **City_O** to the Rows shelf and drag the Sales field to the Columns shelf.

Output

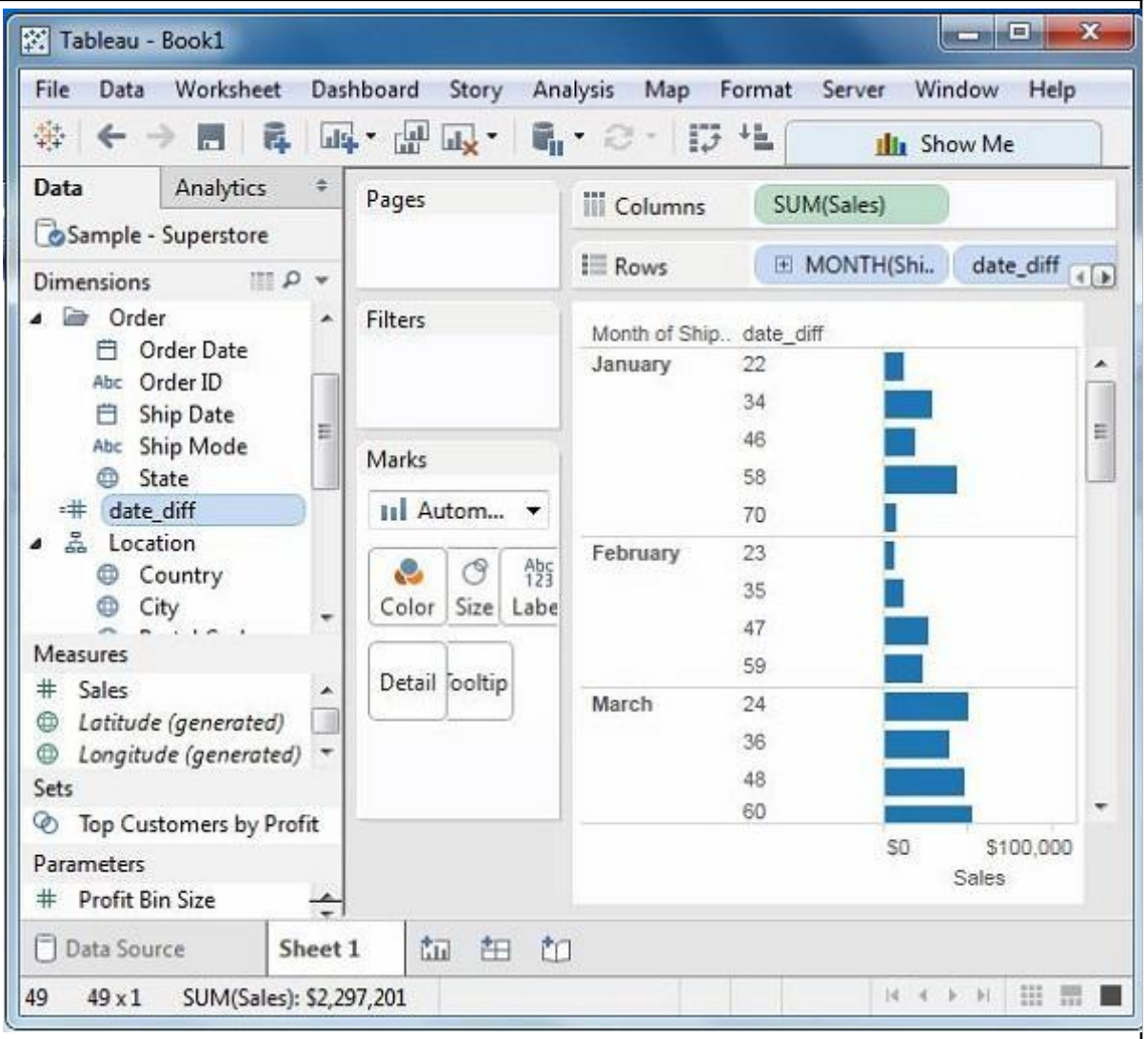


5. Using the Sample-superstore data source, find out the sales volume along with the difference in the date of sales in months from 21st March 2009

Steps

1. Go to the Analysis menu and click 'Create Calculated Field
2. create the formula DATEDIF('month',#2009-03-21#,[ship_date])
3. Name this field as **date_diff**.
4. Drag date_diff to the Rows shelf and drag the Sales field to the Columns shelf.
5. Also drag the ship Date with months.

Output

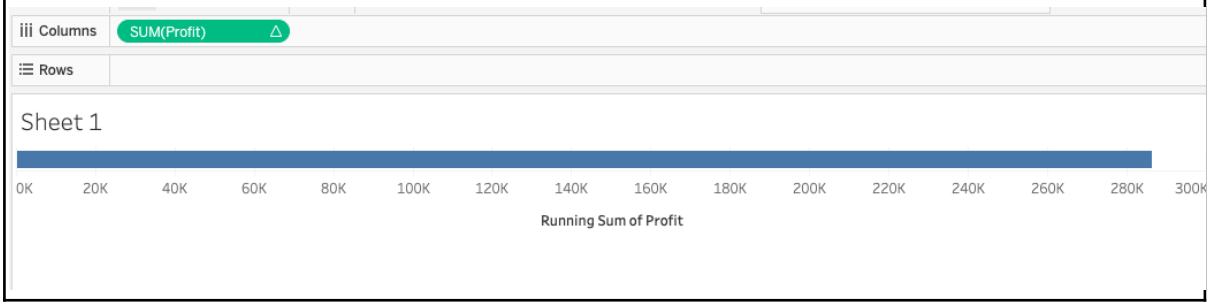


6. Using the Sample-superstore data source, calculate the running total of the profits earned for the data

Steps

1. Select the measure on which the table calculation has to be applied and drag it to column shelf.
2. Right-click the measure and choose the option Quick Table Calculation.
3. Choose running total to be applied on the measure.

Output

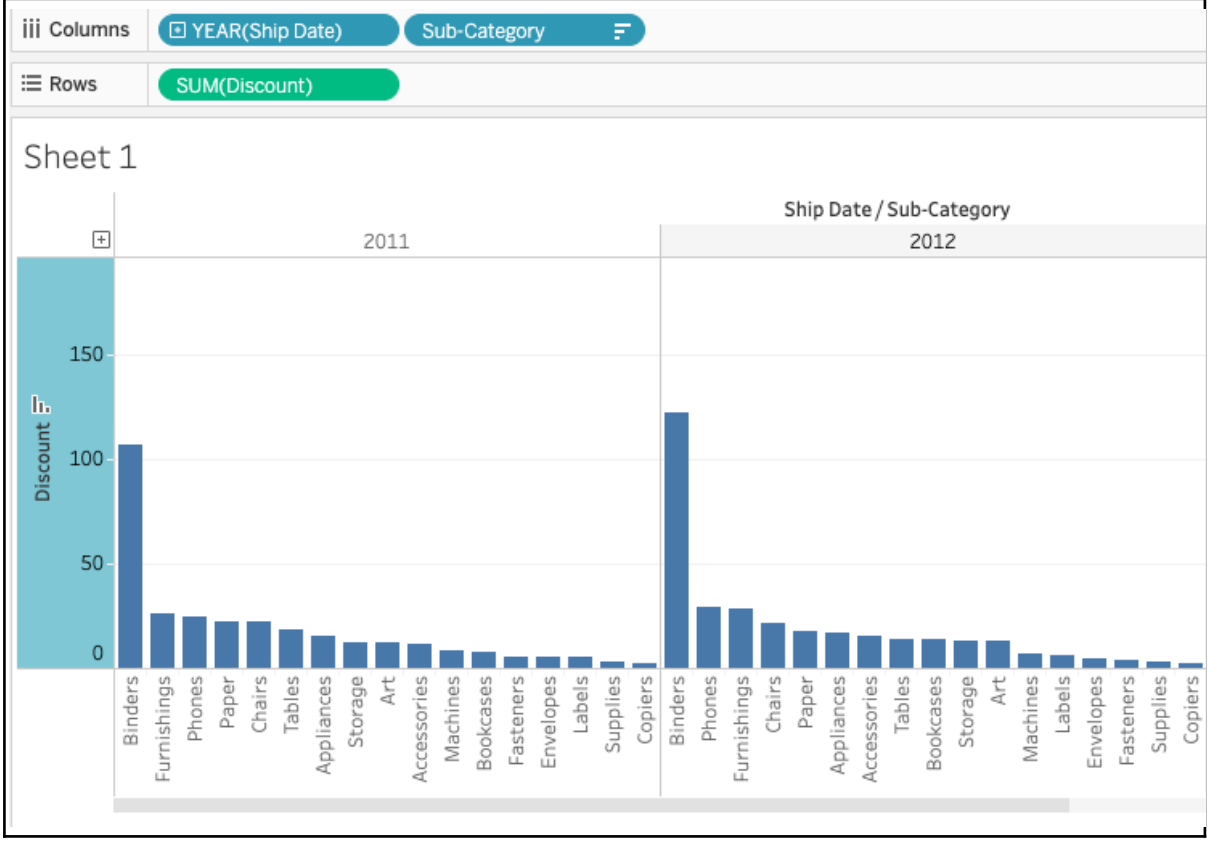


7. Using the Sample-superstore data source, apply sorting on the field named discount by using the dimensions order date and Subcategory

Steps

1. Choosing a field to be sorted
2. Applying the sort using the sort dialog box.
3. Choose the sort order as ascending or descending
4. Choose the field on which to apply the sort.

Output

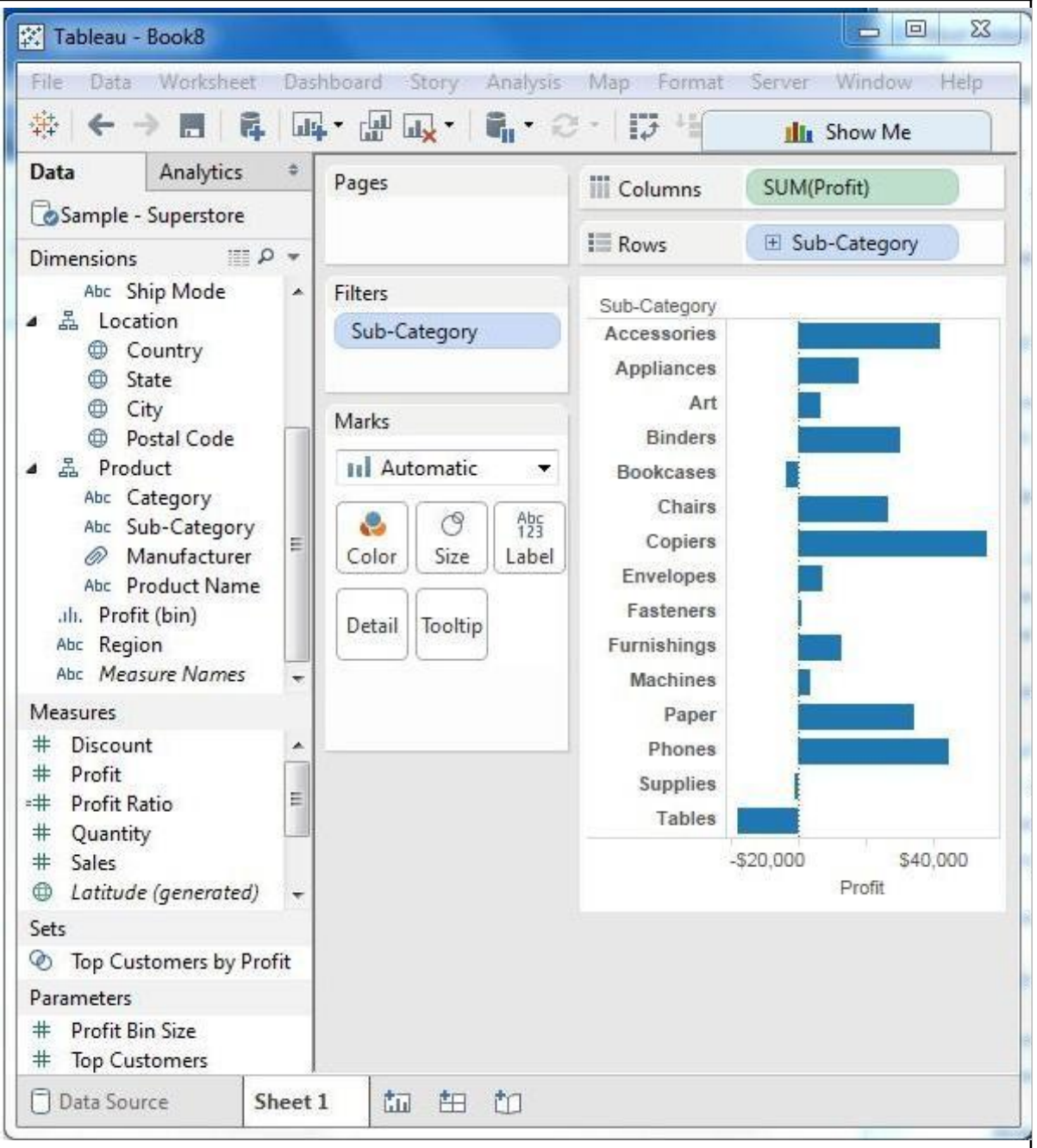


8.Using the Sample-superstore data source, apply dimension filters on the sub-category of products

Steps

1. Create a view for showing profit for each sub-category of products according to their shipping mode.
2. Drag the Sub-Category dimension to the Filters shelf to open the Filter dialog box.
3. Click the None button at the bottom of the list to deselect all segments.
4. Then, select the Exclude option in the lower right corner of the dialog box.
5. Select Labels and Storage and then click OK

Output

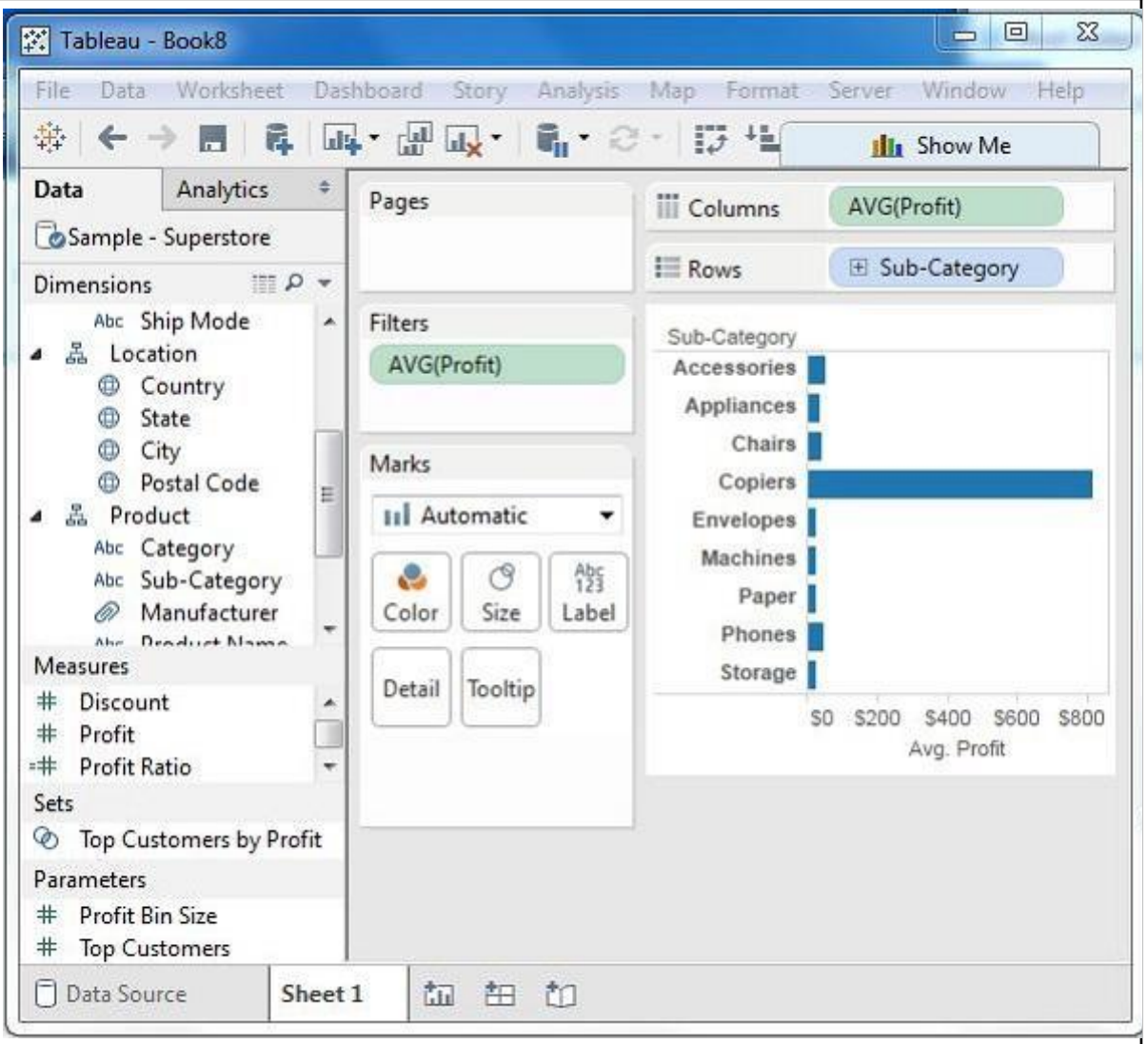


9. Using the Sample-superstore data source, apply dimension filters on the average value of the profits.

Steps

1. Create a view with ship mode and subcategory as dimensions and Average of profit
2. Drag the AVG (profit) value to the filter pane.
3. Choose Average as the filter mode.
4. Choose "At least" and give a value to filter the rows, which meet these criteria.

Output

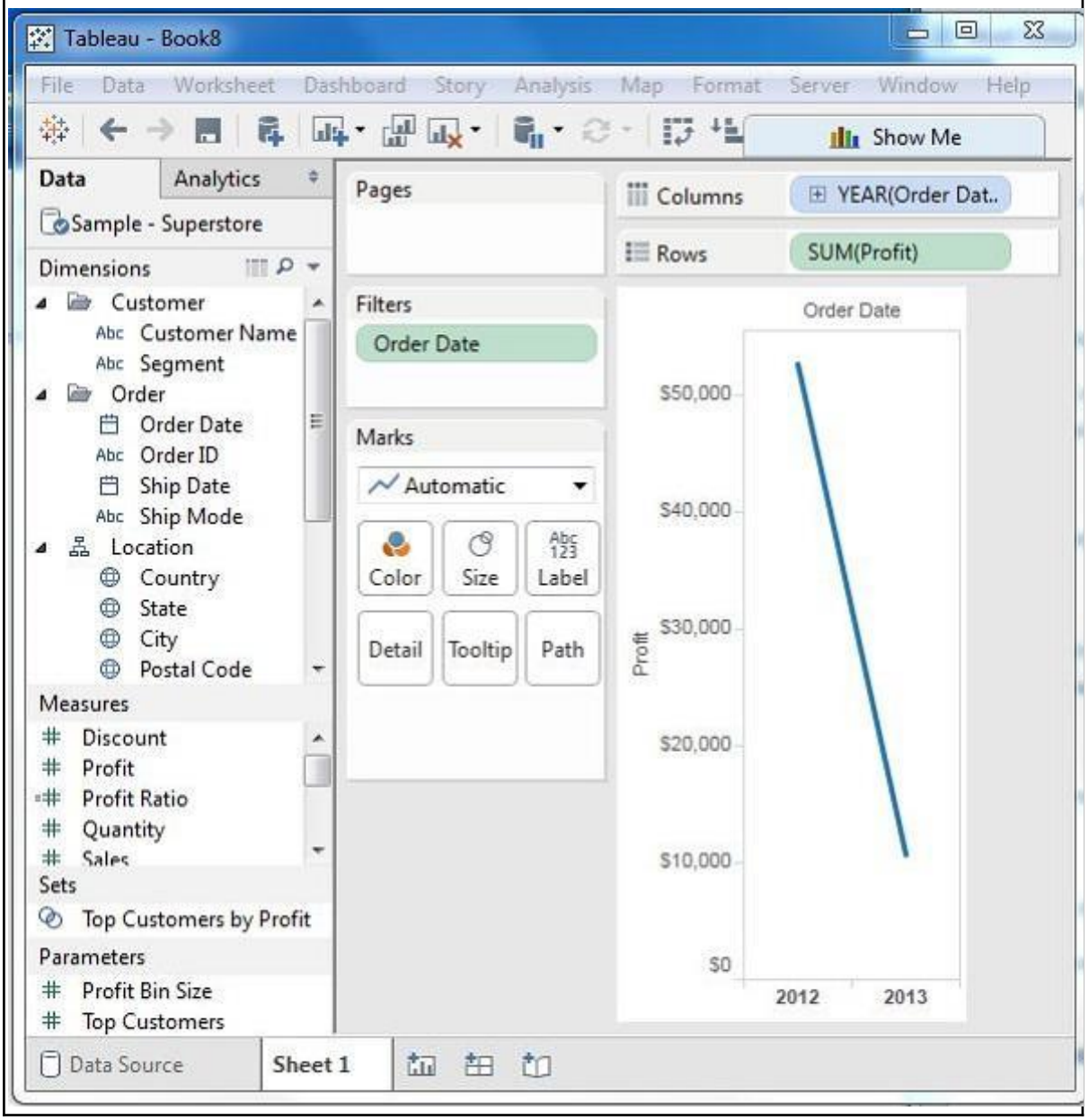


10. Using the Sample-superstore data source, create a view with order date in the column shelf and profit in the rows shelf

Steps

1. create a view with order date in the column shelf and profit in the rows shelf
2. drag the "order date" field to the filter shelf and choose Range of dates in the filter dialog box. Choose the dates as per the requirements
3. Click OK

Output

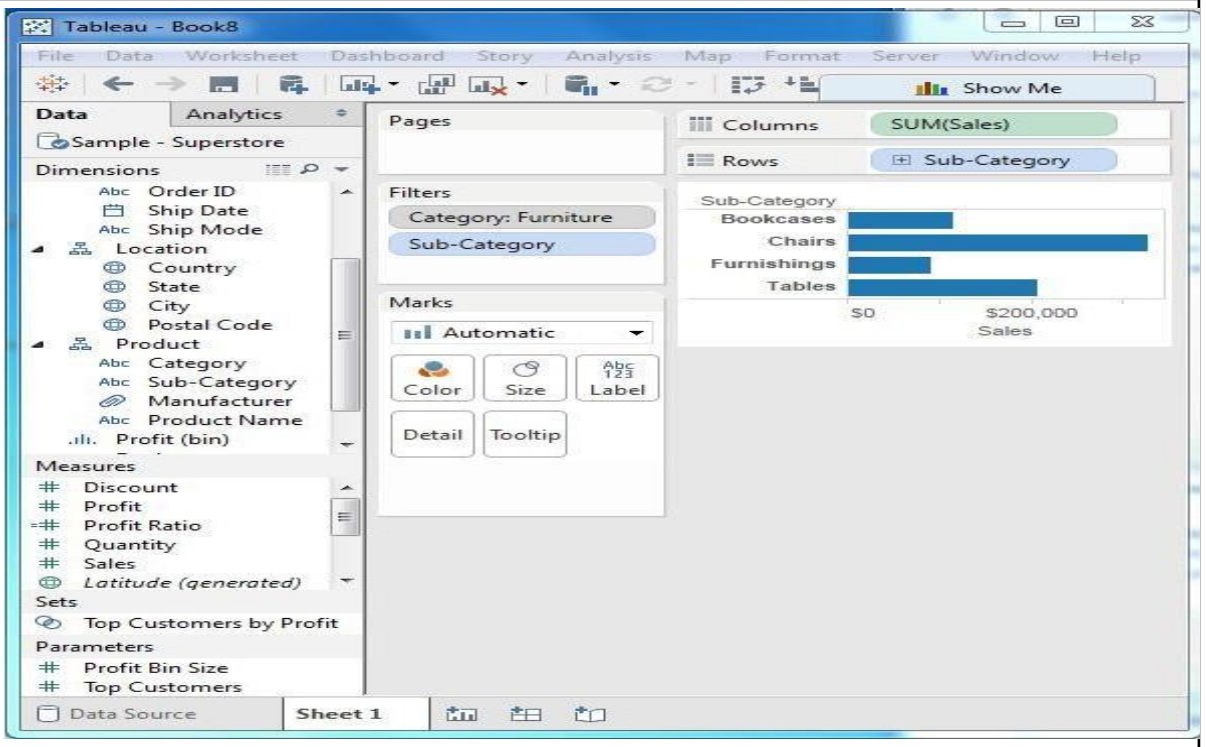


11. Using the Sample-superstore data source, find the top 10 Sub-Category of products for the category called Furniture [Context filtering]

Steps

1. Drag the dimension Sub-Category to the Rows shelf and the measure Sales to the Columns Shelf. Choose the horizontal bar chart as the chart type. Drag the dimension Sub-Category again to the Filters shelf.
2. Right-click on the field Sub-Category in the filter shelf and go the fourth tab named Top. Choose the option by field. From the next drop-down, choose the option Top 10 by Sales Sum
3. Drag the dimension Category to the filter shelf. Right-click to edit and under the general tab choose Furniture from the list. As you can see the result shows three subcategory of products.
4. Right-click the Category: Furniture filter and select the option Add to Context. This produces the final result, which shows the subcategory of products from the category Furniture which are among the top 10 subcategories across all the products

Output

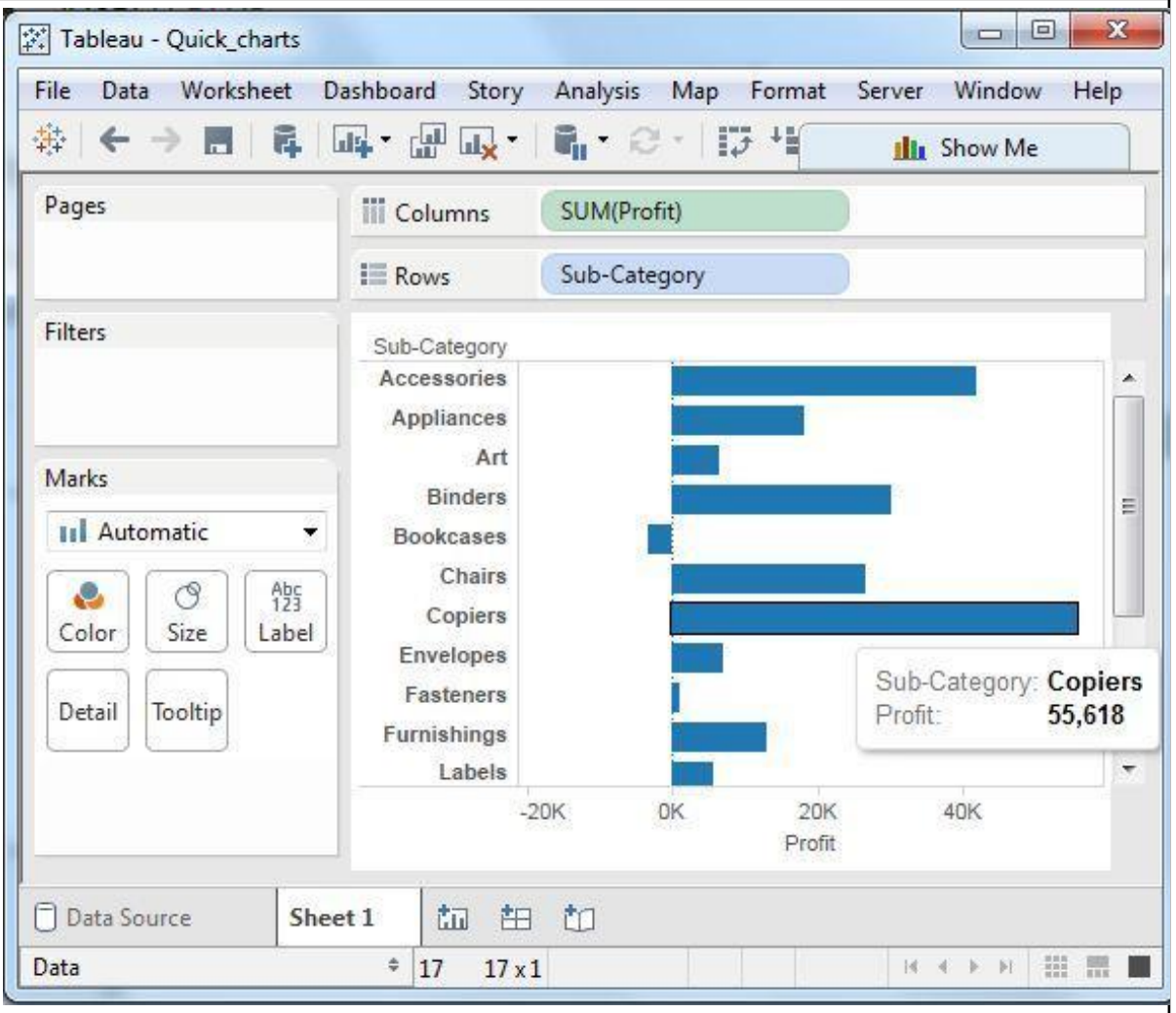


12. Using the Sample-superstore data source, make a Bar chart by considering the fields profit and Sub-Category

Steps

1. Take profit to the columns shelf and Sub-Category to the rows shelf.
2. It automatically produces a horizontal bar chart

Output

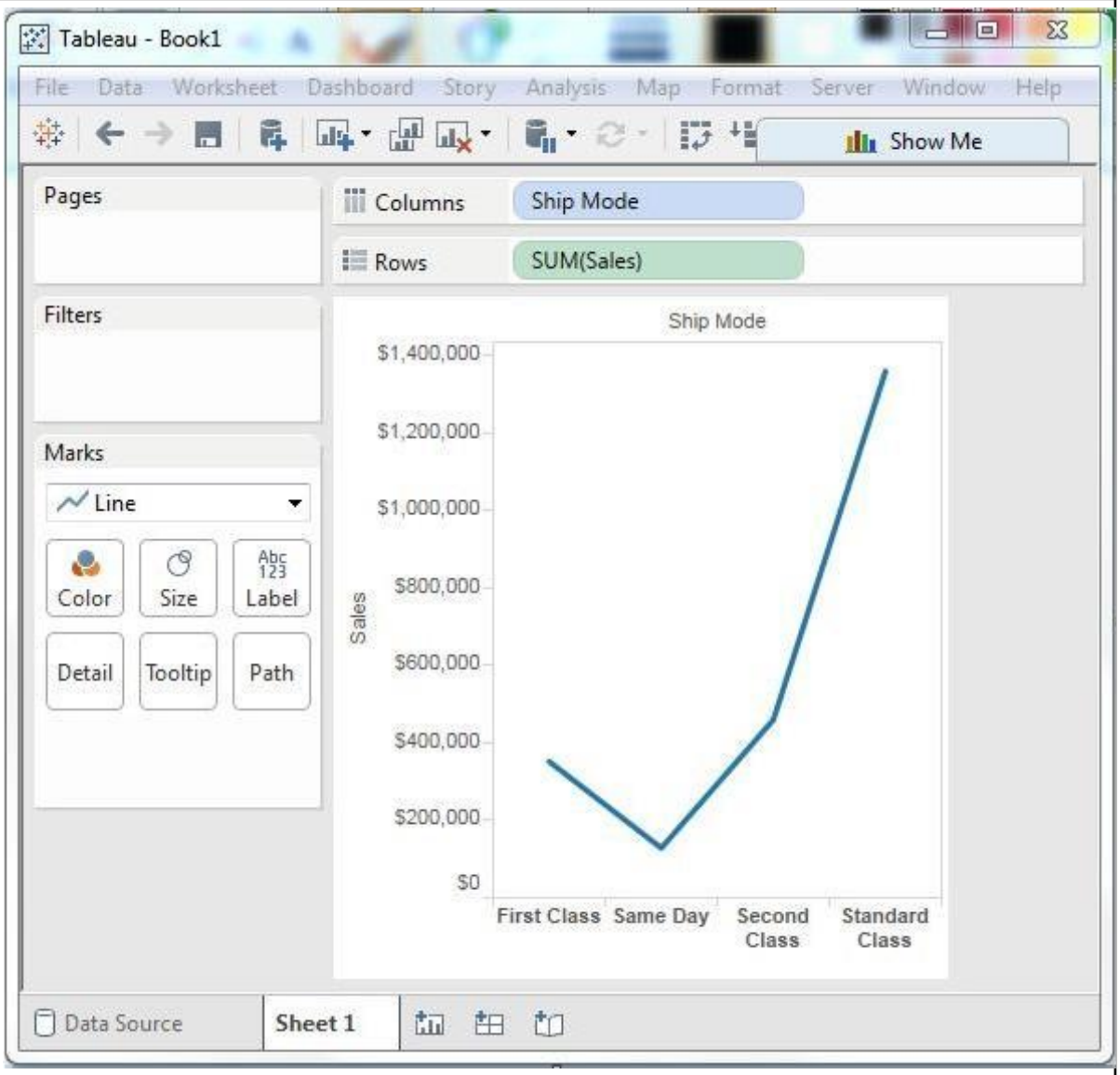


13. Using the Sample-superstore data source, make a Line chart by considering the fields sales and Ship mode

Steps

1. Drag the dimension Ship Mode to Columns Shelf and Sales to the Rows shelf.
2. Choose the Line chart from the Marks card

Output

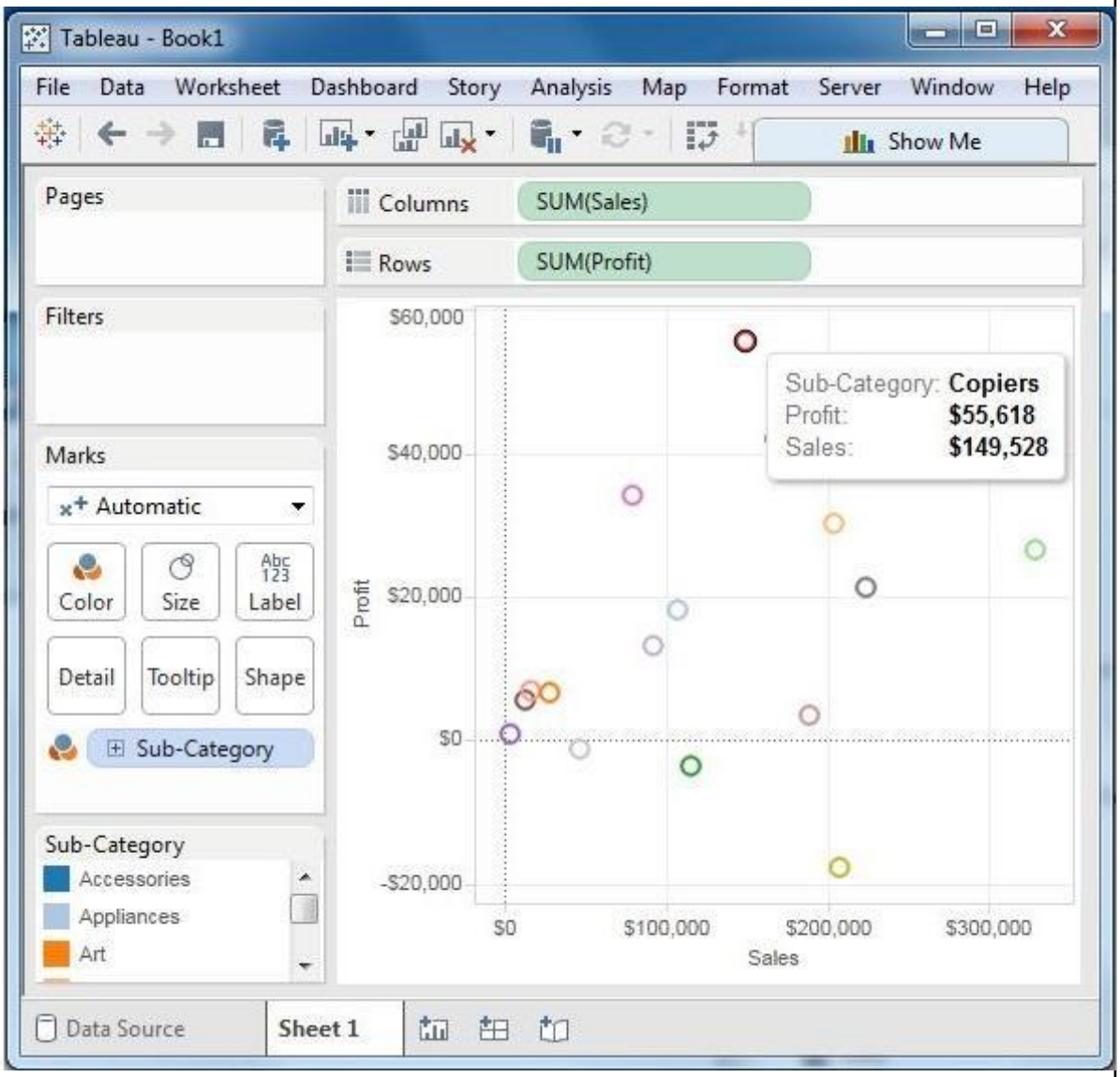


14. Using the Sample-superstore data source, find the variation of sales and profit figures as the two axes of the Cartesian plane is distributed according to their Sub-Category[Scatter plot]

Steps

1. Drag and drop the measure Sales to the Columns shelf.
2. Drag and drop the measure Profit to the Rows shelf.
3. Pull the dimension Sub-Category to the labels Shelf under Marks.

Output

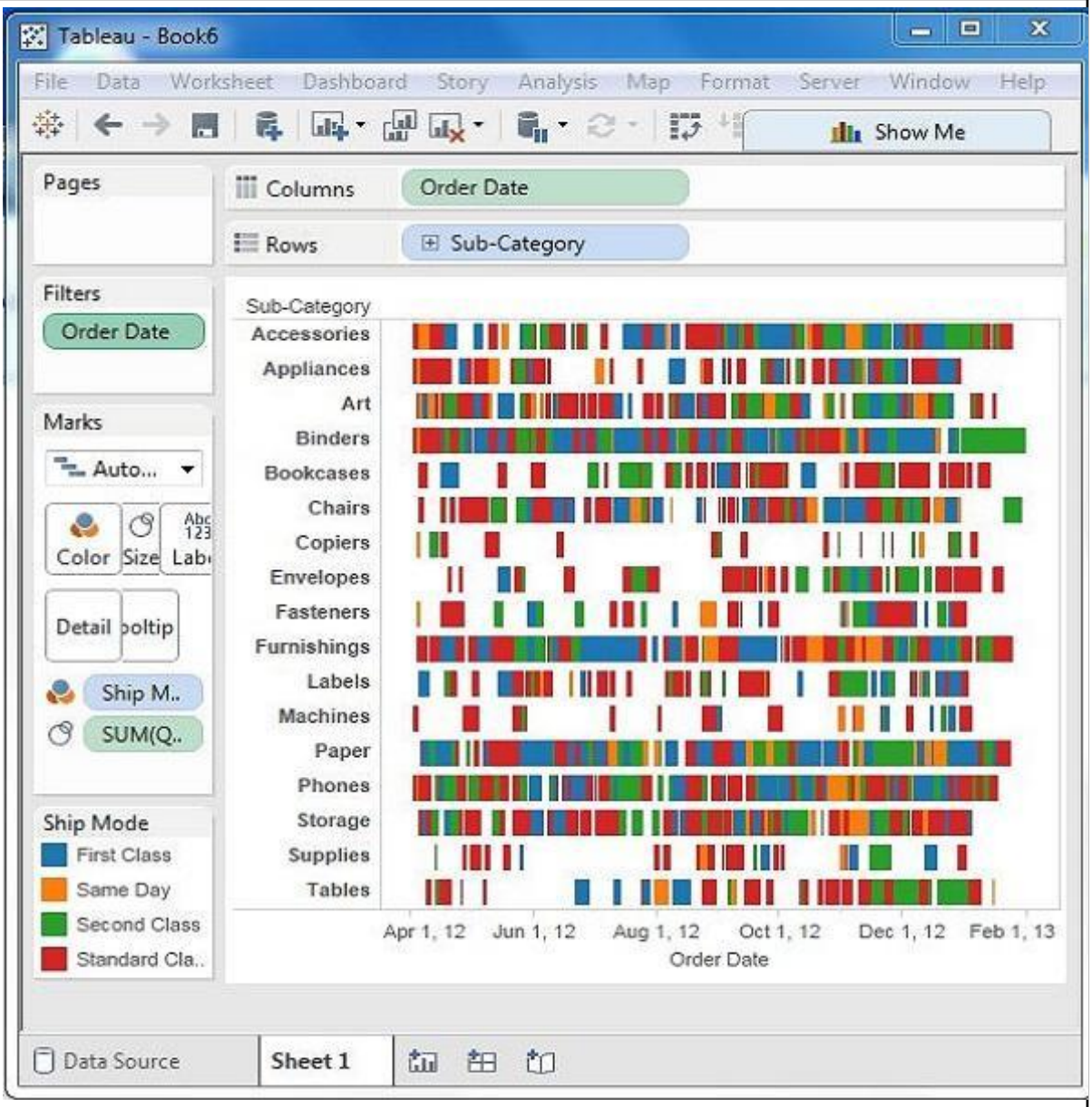


15. Using the Sample-superstore data source, find the variation of quantities of different SubCategory of products according to their ship mode over a range of time.[Gantt Chart]

Steps

1. Drag the dimension order date to the Columns shelf and Sub-Category to the Rows shelf. Next, add the order date to the Filters shelf. Right-click on order date to convert it to the exact date values.
2. Edit the filter condition to select a range of dates. It is because you want individual date values and there is a very large number of dates in the data. The range is created
3. Drag the dimension ship mode to the Color shelf and the measure quantity to the Size shelf under the Marks card. This produces the Gantt chart

Output

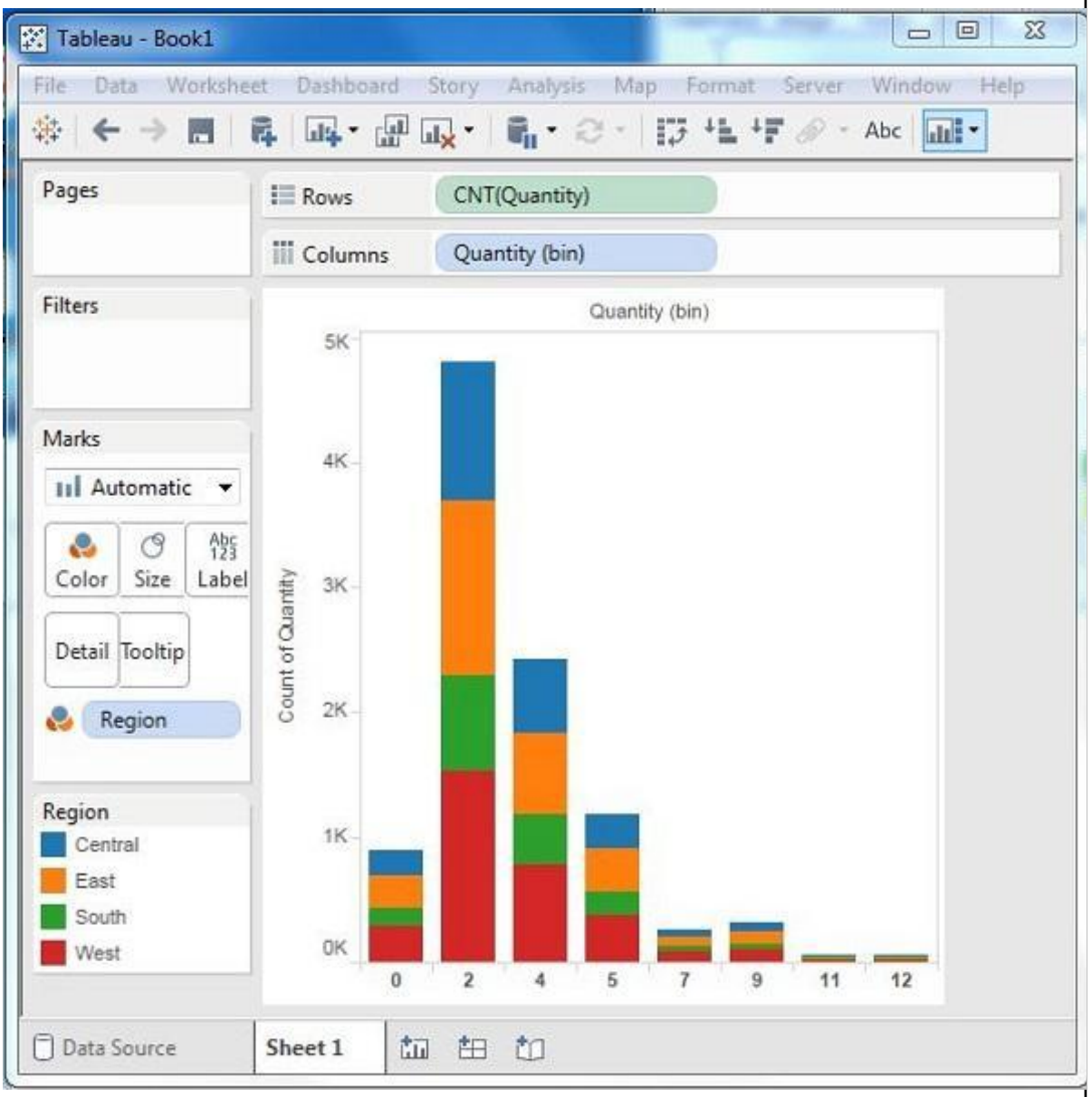


16. Using the Sample-superstore data source, find the quantities of sales for different regions.[Histogram]

Steps

1. Drag the Measure named Quantity to the Rows shelf.
2. Then open Show Me and select the Histogram chart. It shows the quantities automatically bucketed into values ranging from 0 to 4811 and divided into 12 bins.
3. Add the Region Dimension to the color Shelf under Marks Card.

Output

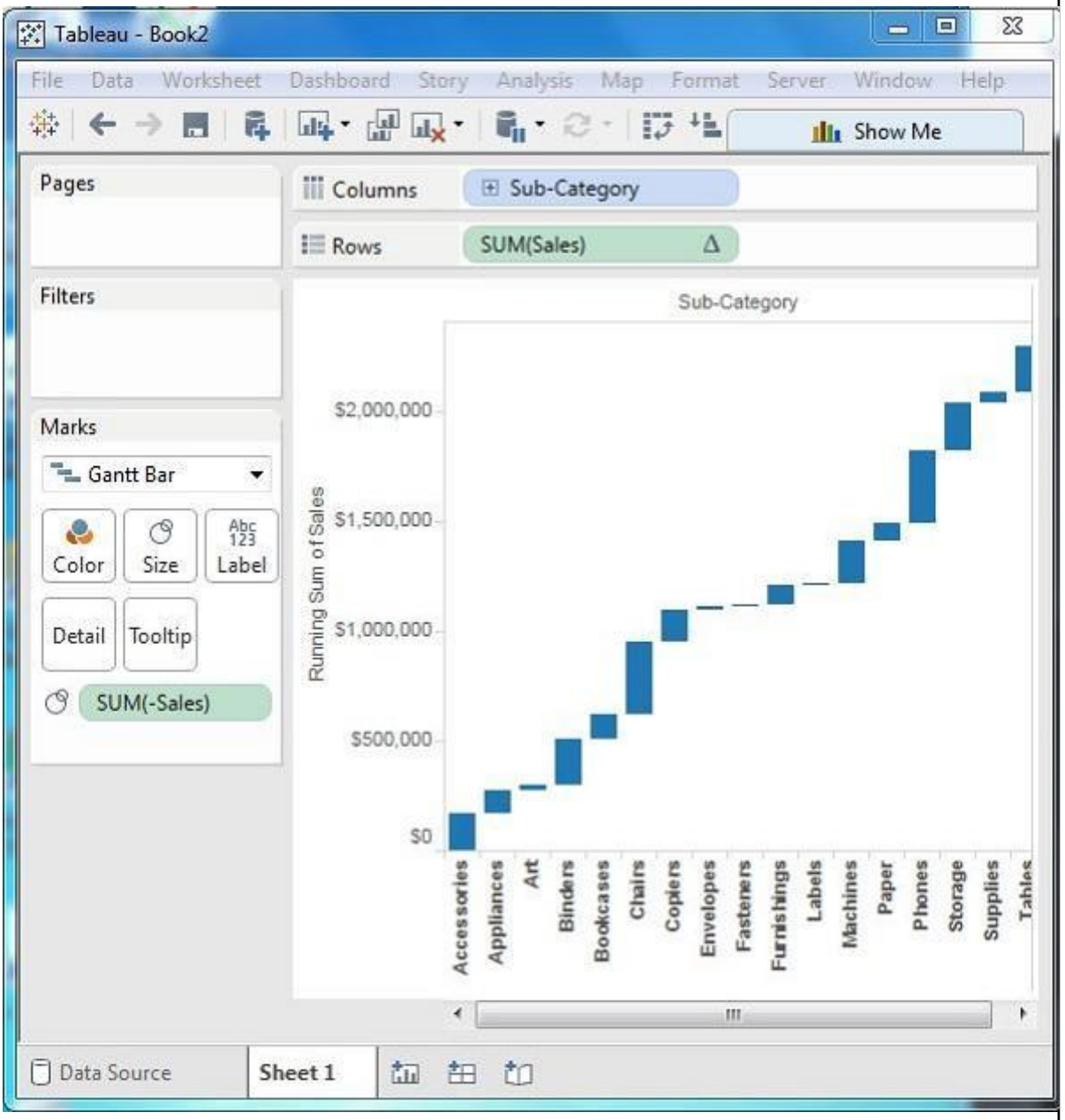


17. Using the Sample-superstore data source, find the variation of Sales for each Sub-Category of products and make a waterfall chart

Steps

1. Drag the Dimension Sub-Category to the Columns shelf and the Measure Sales to the Rows shelf. Sort the data in an ascending order of sales value. For this, use the sort option appearing in the middle of the vertical axis when you hover the mouse over it.
2. Next, right-click on the SUM (Sales) value and select the running total from the table calculation option. Change the chart type to Gantt Bar. The following chart appears
3. Create a calculated field named **-sales** and mention the –[sales] formula for its value.
4. Drag the newly created calculated field **(-sales)** to the size shelf under Marks Card. The chart above now changes to produce the following chart which is a Waterfall chart

Output

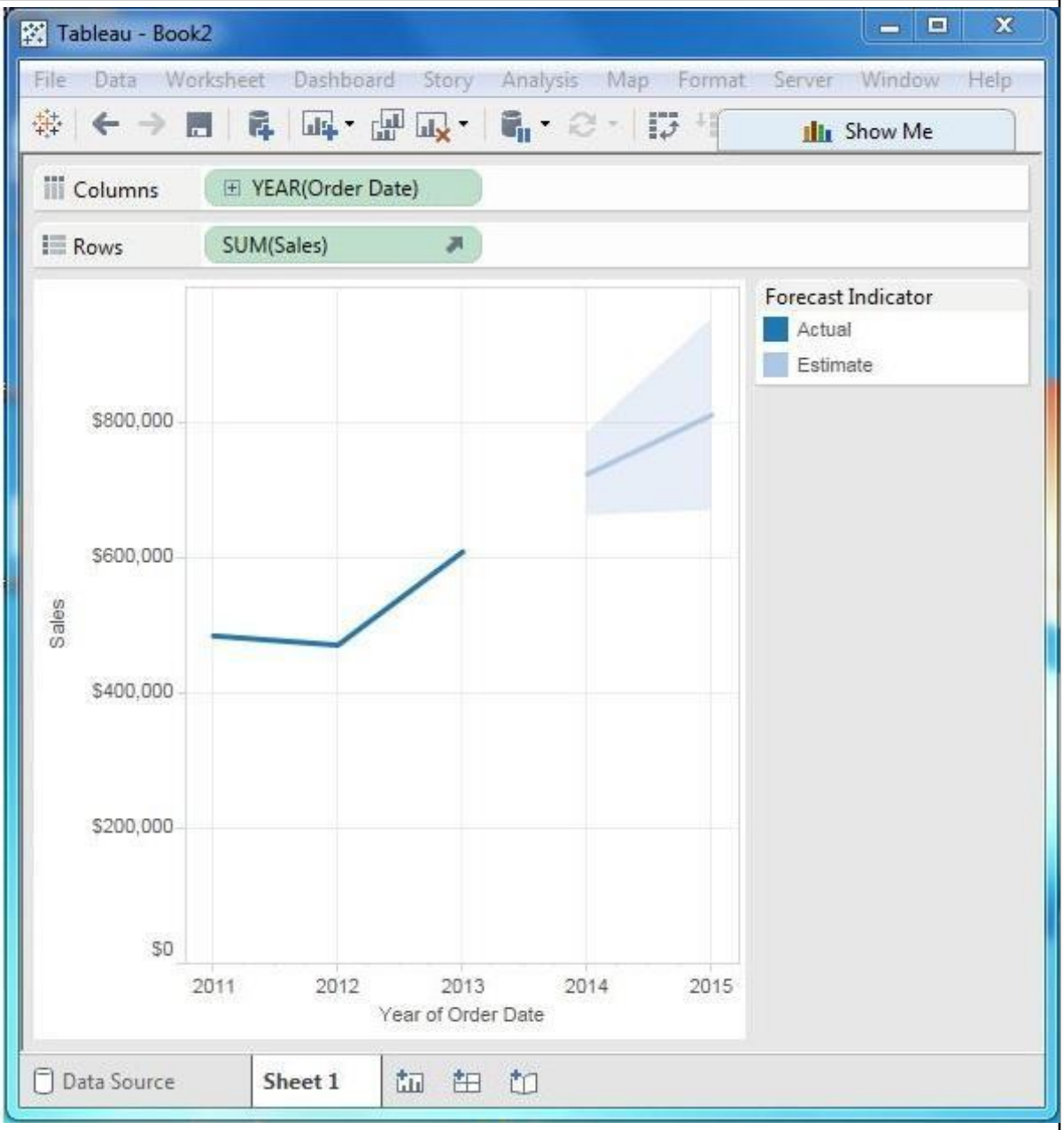


18. Using the Sample-superstore data source, forecast the value of the measure sales for next year.

Steps

1. Create a line chart with Order Date (Year) in the columns shelf and Sales in the Rows shelf. Go to the Analysis tab as shown in the following screenshot and click Forecast under Model category.
2. On completing the above step, you will find the option to set various options for forecast. Choose the Forecast Length as 2 years and leave the Forecast Model to Automatic
3. Click OK, and you will get the final forecast

Output

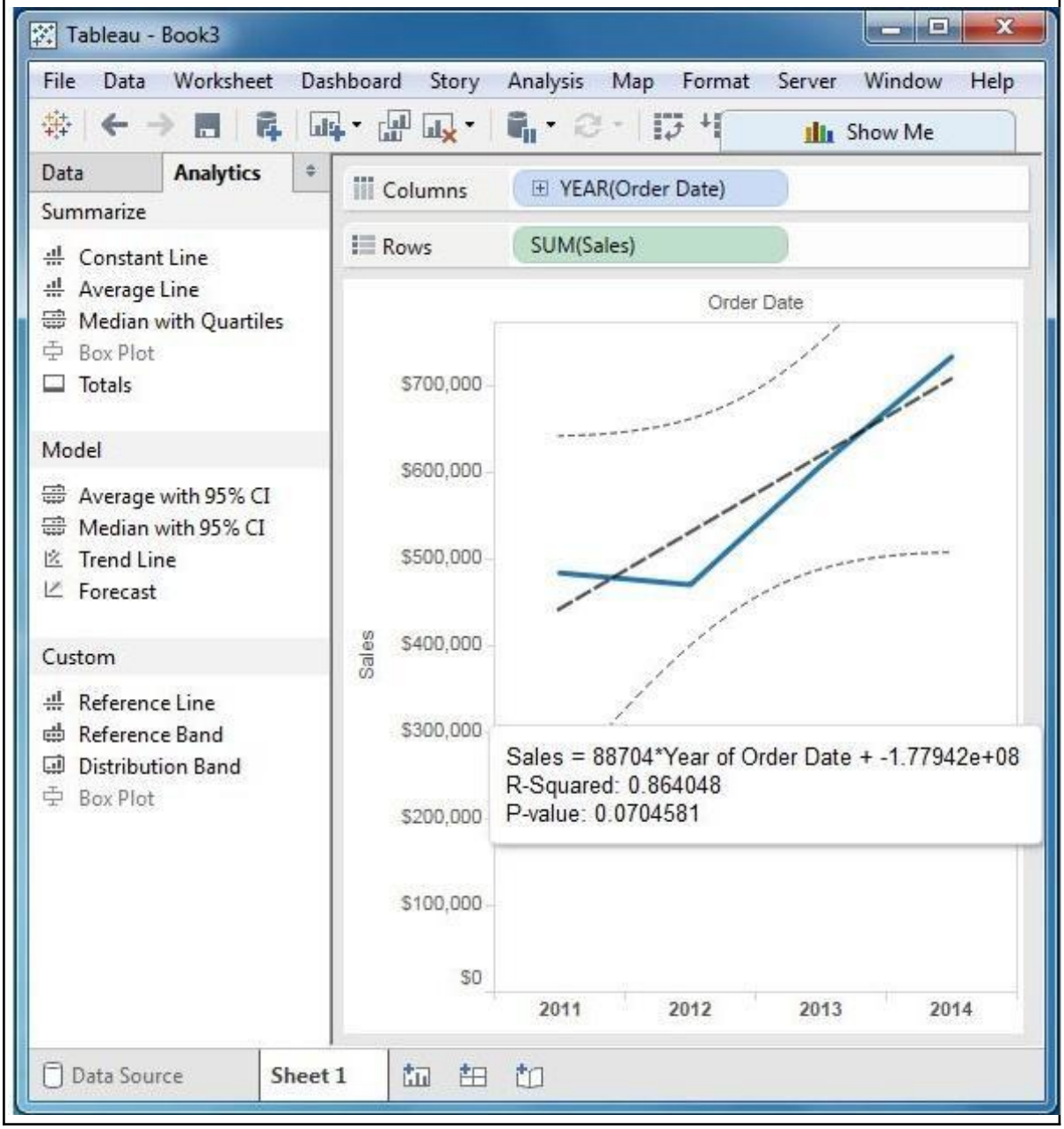


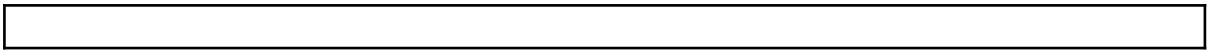
19. Using the Sample-superstore data source, find the trend for the value of the measure sales for next year.

Steps

1. Drag the dimension Order date to the Column shelf and the measure Sales to the Rows shelf.
2. Choose the chart type as Line chart.
3. In the Analysis menu, go to model → Trend Line.
4. Clicking on Trend Line pops up an option showing different types of trend lines that can be added.
5. Choose the linear model
6. On completion of the above step, you will get various trend lines.
7. It also shows the mathematical expression for the correlation between the fields, the P-Value and the R-Squared value.

Output





20. Using the charts created using Superstore data create a dash board

Steps

1. create a blank dashboard by clicking the Create New Dashboard link at the bottom of the workbook.
2. Drag the two worksheets to the dashboard.

Output

21. **Getting Started with Power BI Desktop**

22. Getting Started with Power BI Desktop

23. **Experiment of Data Transformation**

24. Experiment of Building Reports

25. **Experiment of Dashboards**

26. Experiment of Advanced Visualizations

27.Experiment of Data Integration with R & Python

28.Experiment of Saving and Publishing