IS 665 Data Analysis for Information Systems Technical Assignment 2

Group 8

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Part I. Statistics (60 pts.)

Question 1 : What product sold the least number of units?

Step 1 : Pivot Table was created using the data and Columns, Rows and Values tables were filled accordingly.

Row Labels	Sum of SalesQuantity
⊟ACC	66941
Air Pump	22980
Elbow Pads	1653
First Aid Kit	7877
Knee Pads	1659
Off Road Helmet	3926
Repair Kit	3879
Road Helmet	3961
T-shirt	3883
Water Bottle	3841
Water Bottle Cage	13282
⊟EBI	868
E-Bike Tailwind	868
⊟ORB	38675
Men's Off Road Bike Fully	11693
Men's Off Road Bike Hard Tail (Shimano)	8550
Men's Off Road Bike Hard Tail (SRAM)	13338
Women's Off Road Bike Fully	5094
⊟ROB	29049
Deluxe Road Bike (Shimano)	13365
Deluxe Road Bike (SRAM)	3963
Professional Road Bike (Campagnolo)	1640
Professional Road Bike (Shimano)	8484
Professional Road Bike (SRAM)	1597
⊟TOU	32887
Deluxe Touring Bike (black)	3863
Deluxe Touring Bike (red)	3953
Deluxe Touring Bike (silver)	8356
Professional Touring Bike (black)	4091
Professional Touring Bike (red)	3876
Professional Touring Bike (silver)	8748
⊟TRE	434
City Bike Max	362
Fixed Gear Bike Plus	72
Grand Total	168854

Step 2 : Conditional Formatting feature of Excel was used to highlight the 'Bottom 3 values' from the data.

Step 3 : Hence, from our observation we can see that '**Fixed Gear Bike Plus'** is the least sold product under the '**TRE'** product category.

Question 1 : What product sold the least number of units?

Answer 1 : Fixed Gear Bike Plus (TRE product category)

Question 2 : What product category provided the most revenue in 2011?

Step 1 : Pivot table is created with the relevant rows and values. Year is added as a filter

Step 2 : The year '2011' is selected the values in the pivot table is sorted.

Step 3 : Here we can see the that the product category '**ACC**' provided the most revenue in the 2011

Question 2 : What product category provided the most revenue in 2011?

Answer 2 : Product categore 'ACC' provided the most revenue in 2011

Question 3 : a) What percentage did the off-road bikes contribute to the overall bicycle sales quantity?

Step 1 : Create a pivot table filling in the relevant Pivot table fields i.e. Year, Product category, Descr, Sum of sales quantity

Row Labels	Sum of SalesQuantity
⊞ ACC	66941
⊟ ORB	38675
Men's Off Road Bike Fully	11693
Men's Off Road Bike Hard Tail (Shimano)	8550
Men's Off Road Bike Hard Tail (SRAM)	13338
Women's Off Road Bike Fully	5094
⊟ TOU	32887
Deluxe Touring Bike (black)	3863
Deluxe Touring Bike (red)	3953
Deluxe Touring Bike (silver)	8356
Professional Touring Bike (black)	4091
Professional Touring Bike (red)	3876
Professional Touring Bike (silver)	8748
⊟ ROB	29049
Deluxe Road Bike (Shimano)	13365
Deluxe Road Bike (SRAM)	3963
Professional Road Bike (Campagnolo)	1640
Professional Road Bike (Shimano)	8484
Professional Road Bike (SRAM)	1597
⊟ EBI	868
E-Bike Tailwind	868
⊟ TRE	434
City Bike Max	362
Fixed Gear Bike Plus	72
Grand Total	168854

Step 2 : Right-click on values and select '% of Column Total' to display values in percentage

Step 3 : We can clearly see that Off-Road bike (ORB) contributed almost 23% of the overall sales quantity.

Question 3 : a) What percentage did the off-road bikes contribute to the overall bicycle sales quantity?

Answer 3 : a)   Accessory sales = 40% , Offroad Bike sales = 23%,

Total Bike sales = 100-40 = 60 %

Off-road bike sales contribution to the overall bicycle sales = (23/100)*60 = 14%(approx.)

Question 3 : Part b) In which three cities was this percentage significantly above the average?

Step 1 : The same pivot table is used and 'City' Pivot Field is added in the 'Columns'.

Step 2 : Entire row for 'Off-Road bike' is selected for further analysis

Sum of SalesQuantity	Column Labels																							
Row Labels	Anklam	Atlanta	Berlin	Bochum	Boston	Chicago	Denver	Detroit	Frankfurt	Grand Rapids	Hamburg	Hannover	Heidelberg	Irvine	Leipzig	Magdeburg	München	New York City	Palo Alto	Philadelphia	Seattle	Stuttgart	Washington DC	Grand Total
⊞ ACC	42.01%	40.78%	39.95%	40.65%	40.10%	40.04%	34.95%	39.01%	40.43%	41.20%	41.01%	39.42%	36.61%	41.96%	40.48%	42.18%	33.99%	40.41%	40.54%	40.53%	41.77%	42.20%	40.40%	39.64%
⊟ ORB	22.07%	22.11%	20.28%	20.73%	21.01%	21.43%	33.03%	21.34%	20.94%	21.94%	20.42%	21.95%	28.06%	22.44%	22.00%	20.26%	32.64%	20.22%	20.42%	20.90%	20.57%	21.02%	21.02%	22.90%
Men's Off Road Bike Fully	5.25%	5.81%	5.40%	5.10%	5.75%	5.33%	14.29%	4.81%	5.66%	5.52%	5.05%	5.66%	10.74%	5.71%	5.87%	4.56%	15.32%	4.86%	5.87%	5.75%	4.66%	5.32%	5.10%	6.92%
Men's Off Road Bike Hard Tail (Shimano)	4.79%	5.46%	4.98%	4.96%	5.08%	4.89%	5.08%	6.16%	5.38%	6.04%	5.41%	4.87%	5.25%	5.56%	5.48%	5.07%	3.97%	5.05%	4.38%	5.49%	5.55%	4.80%	5.68%	5.06%
Men's Off Road Bike Hard Tail (SRAM)	9.84%	8.51%	7.30%	8.04%	7.75%	8.83%	6.79%	8.32%	7.56%	8.56%	7.70%	9.20%	7.23%	8.73%	8.81%	8.57%	6.89%	7.91%	7.90%	7.21%	7.79%	8.42%	8.09%	7.90%
Women's Off Road Bike Fully	2.20%	2.33%	2.60%	2.63%	2.43%	2.38%	6.86%	2.05%	2.34%	1.82%	2.25%	2.22%	4.84%	2.44%	1.84%	2.06%	6.45%	2.41%	2.26%	2.45%	2.58%	2.48%	2.14%	3.02%
⊞ TOU	18.47%	19.22%	20.88%	19.57%	20.46%	20.47%	16.67%	20.74%	20.12%	20.24%	19.67%	20.76%	18.15%	19.20%	18.87%	19.07%	16.72%	20.86%	20.91%	20.58%	18.84%	18.83%	20.73%	19.48%
⊞ ROB	16.60%	17.70%	17.48%	17.75%	18.12%	17.89%	15.17%	18.71%	17.50%	16.63%	17.69%	16.66%	15.99%	16.21%	17.47%	17.43%	15.52%	18.23%	17.66%	17.78%	18.64%	16.58%	17.62%	17.20%
⊞ EBI	0.82%	0.00%	1.04%	1.13%	0.00%	0.00%	0.00%	0.00%	0.85%	0.00%	0.95%	0.97%	0.97%	0.00%	0.96%	0.95%	0.77%	0.00%	0.00%	0.00%	0.00%	1.08%	0.00%	0.51%
⊞ TRE	0.03%	0.18%	0.36%	0.17%	0.31%	0.17%	0.19%	0.20%	0.16%	0.00%	0.27%	0.23%	0.21%	0.19%	0.22%	0.11%	0.36%	0.28%	0.47%	0.21%	0.18%	0.30%	0.24%	0.26%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Step 3 : Conditional formatting is used to highlight cells with Above Average percentage values

Step 4 : Hence, we can conclude that 'Denver, Heidelberg and München' are the three cities with percentage above average

| Sum of SalesQuantity | Column Labels | | | | | | | | | | | | | | | | | | | | | | | |
Row Labels	Anklam	Atlanta	Berlin	Bochum	Boston	Chicago	Denver	Detroit	Frankfurt	Grand Rapids	Hamburg	Hannover	Heidelberg	Irvine	Leipzig	Magdeburg	München	New York City	Palo Alto	Philadelphia	Seattle	Stuttgart	Washington DC	Grand Total
⊞ACC	42.01%	40.78%	39.95%	40.65%	40.10%	40.04%	34.95%	39.01%	40.43%	41.20%	41.01%	39.42%	36.61%	41.96%	40.48%	42.18%	33.99%	40.41%	40.54%	40.53%	41.77%	42.20%	40.40%	39.64%
⊟ORB	22.07%	22.11%	20.28%	20.73%	21.01%	21.43%	33.03%	21.34%	20.94%	21.94%	20.42%	21.95%	28.06%	22.44%	22.00%	20.26%	32.64%	20.22%	20.42%	20.90%	20.57%	21.02%	21.02%	22.90%
Men's Off Road Bike Fully	5.25%	5.81%	5.40%	5.10%	5.75%	5.33%	14.29%	4.81%	5.66%	5.52%	5.05%	5.66%	10.74%	5.71%	5.87%	4.56%	15.32%	4.86%	5.87%	5.75%	4.66%	5.32%	5.10%	6.92%
Men's Off Road Bike Hard Tail (Shimano)	4.79%	5.46%	4.98%	4.96%	5.08%	4.89%	5.08%	6.16%	5.38%	6.04%	5.41%	4.87%	5.25%	5.56%	5.48%	5.07%	3.97%	5.05%	4.38%	5.49%	5.55%	4.80%	5.68%	5.06%
Men's Off Road Bike Hard Tail (SRAM)	9.84%	8.51%	7.30%	8.04%	7.75%	8.83%	6.79%	8.32%	7.56%	8.56%	7.70%	9.20%	7.23%	8.73%	8.81%	8.57%	6.89%	7.91%	7.90%	7.21%	7.79%	8.42%	8.09%	7.90%
Women's Off Road Bike Fully	2.20%	2.33%	2.60%	2.63%	2.43%	2.38%	6.86%	2.05%	2.34%	1.82%	2.25%	2.22%	4.84%	2.44%	1.84%	2.06%	6.45%	2.41%	2.26%	2.45%	2.58%	2.48%	2.14%	3.02%
⊞TOU	18.47%	19.22%	20.88%	19.57%	20.46%	20.47%	16.67%	20.74%	20.12%	20.24%	19.67%	20.76%	18.15%	19.20%	18.87%	19.07%	16.72%	20.86%	20.91%	20.58%	18.84%	18.83%	20.73%	19.48%
⊞ROB	16.60%	17.70%	17.48%	17.75%	18.12%	17.89%	15.17%	18.71%	17.50%	16.63%	17.69%	16.66%	15.99%	16.21%	17.47%	17.43%	15.52%	18.23%	17.66%	17.78%	18.64%	16.58%	17.62%	17.20%
⊞EBI	0.82%	0.00%	1.04%	1.13%	0.00%	0.00%	0.00%	0.00%	0.85%	0.00%	0.95%	0.97%	0.97%	0.00%	0.96%	0.95%	0.77%	0.00%	0.00%	0.00%	0.00%	1.08%	0.00%	0.51%
⊞TRE	0.03%	0.18%	0.36%	0.17%	0.31%	0.17%	0.19%	0.20%	0.16%	0.00%	0.27%	0.23%	0.21%	0.19%	0.22%	0.11%	0.36%	0.28%	0.47%	0.21%	0.18%	0.30%	0.24%	0.26%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Question 3 : Part b) In which three cities was this percentage significantly above the average?

Answer 3 : Part b) These are 'Denver, Heidelberg and München'

Question 4 : Bicycles and accessories are more likely to be bought in spring and summer as in fall and winter time. Find which product is an exception to this rule.

Step 1 : Pivot table is created with 'Month' in the 'Columns' field.

A screenshot of an Excel PivotTable with Month in the Columns field.

Row Labels	1	2	3	4	5	6	7	8	9	10	11	12	Grand Total
⊟ACC	47.97%	43.34%	41.38%	38.99%	38.05%	37.70%	38.76%	39.64%	39.54%	42.06%	47.95%	47.90%	39.64%
Air Pump	14.83%	14.07%	13.90%	13.81%	13.50%	13.55%	13.38%	13.41%	13.26%	13.13%	15.18%	13.79%	13.61%
Elbow Pads	0.21%	0.46%	0.78%	1.01%	1.22%	1.19%	1.06%	1.01%	0.87%	0.70%	0.13%	0.19%	0.98%
First Aid Kit	16.38%	10.44%	7.61%	2.85%	2.36%	1.82%	3.88%	4.17%	4.88%	8.30%	17.65%	17.93%	4.66%
Knee Pads	0.29%	0.51%	0.74%	1.11%	1.16%	1.24%	0.98%	0.93%	0.85%	0.70%	0.23%	0.25%	0.98%
Off Road Helmet	1.73%	1.87%	2.06%	2.43%	2.44%	2.47%	2.36%	2.46%	2.30%	2.30%	1.43%	1.62%	2.33%
Repair Kit	1.76%	1.89%	2.01%	2.22%	2.45%	2.50%	2.57%	2.34%	2.26%	1.95%	1.59%	1.54%	2.30%
Road Helmet	1.81%	1.87%	2.33%	2.49%	2.28%	2.62%	2.32%	2.41%	2.43%	2.15%	1.56%	1.48%	2.35%
T-shirt	1.94%	2.17%	2.13%	2.43%	2.52%	2.28%	2.29%	2.46%	2.30%	2.13%	1.30%	1.59%	2.30%
Water Bottle	1.58%	1.77%	2.15%	2.21%	2.51%	2.41%	2.32%	2.42%	2.27%	2.09%	1.56%	1.68%	2.27%
Water Bottle Cage	7.43%	8.29%	7.66%	8.44%	7.61%	7.63%	7.59%	8.02%	8.10%	8.61%	7.33%	7.83%	7.87%
⊟ORB	21.16%	22.75%	23.28%	22.91%	22.97%	23.19%	23.28%	22.86%	23.09%	21.53%	22.87%	21.45%	22.90%
Men's Off Road Bike Fully	5.99%	7.21%	7.53%	6.63%	6.78%	7.22%	7.21%	6.71%	6.64%	6.69%	7.28%	6.67%	6.92%
Men's Off Road Bike Hard Tail (Shimano)	4.65%	5.06%	4.88%	5.45%	5.28%	4.96%	5.35%	4.83%	5.05%	4.33%	4.83%	4.28%	5.06%
Men's Off Road Bike Hard Tail (SRAM)	7.77%	7.68%	7.96%	7.73%	7.85%	7.94%	7.62%	8.29%	8.09%	8.01%	8.24%	7.75%	7.90%
Women's Off Road Bike Fully	2.76%	2.80%	2.90%	3.09%	3.07%	3.07%	3.10%	3.02%	3.32%	2.49%	2.52%	2.75%	3.02%
⊟TOU	16.57%	17.82%	18.83%	19.89%	20.41%	20.50%	19.28%	19.69%	18.97%	18.27%	14.73%	15.87%	19.48%
Deluxe Touring Bike (black)	1.63%	1.82%	2.24%	2.28%	2.44%	2.53%	2.33%	2.28%	2.15%	2.16%	1.48%	1.70%	2.29%
Deluxe Touring Bike (red)	1.97%	1.82%	2.20%	2.44%	2.48%	2.56%	2.29%	2.44%	2.23%	2.04%	1.61%	1.59%	2.34%
Deluxe Touring Bike (silver)	4.59%	5.06%	5.21%	5.10%	5.07%	5.05%	4.81%	4.65%	4.82%	4.83%	4.31%	4.94%	4.95%
Professional Touring Bike (black)	1.81%	1.80%	2.24%	2.28%	2.56%	2.69%	2.55%	2.56%	2.48%	2.34%	1.51%	1.43%	2.42%
Professional Touring Bike (red)	1.73%	2.02%	1.94%	2.42%	2.43%	2.39%	2.52%	2.50%	2.26%	1.92%	1.27%	1.40%	2.30%
Professional Touring Bike (silver)	4.83%	5.30%	5.00%	5.38%	5.43%	5.28%	4.78%	5.26%	5.03%	4.98%	4.55%	4.81%	5.18%
⊟ROB	14.07%	15.59%	15.96%	17.33%	17.69%	17.60%	18.03%	17.17%	17.62%	17.56%	14.09%	14.53%	17.20%
Deluxe Road Bike (Shimano)	7.38%	7.99%	7.39%	7.88%	7.81%	7.77%	8.47%	7.80%	8.35%	8.21%	7.41%	8.32%	7.92%
Deluxe Road Bike (SRAM)	1.42%	1.92%	2.28%	2.47%	2.61%	2.41%	2.22%	2.39%	2.42%	2.43%	1.82%	1.21%	2.35%
Professional Road Bike (Campagnolo)	0.32%	0.50%	0.69%	1.08%	1.04%	1.25%	1.08%	1.00%	0.83%	0.78%	0.18%	0.19%	0.97%
Professional Road Bike (Shimano)	4.80%	4.75%	4.80%	4.81%	5.19%	5.04%	5.23%	4.95%	5.15%	5.49%	4.44%	4.56%	5.02%
Professional Road Bike (SRAM)	0.16%	0.43%	0.80%	1.08%	1.05%	1.15%	1.03%	1.03%	0.86%	0.65%	0.23%	0.25%	0.95%
⊟EBI	0.24%	0.48%	0.52%	0.55%	0.51%	0.57%	0.43%	0.47%	0.65%	0.57%	0.36%	0.25%	0.51%
E-Bike Tailwind	0.24%	0.48%	0.52%	0.55%	0.51%	0.57%	0.43%	0.47%	0.65%	0.57%	0.36%	0.25%	0.51%
⊟TRE	0.00%	0.02%	0.05%	0.33%	0.37%	0.44%	0.23%	0.17%	0.13%	0.02%	0.00%	0.00%	0.26%
City Bike Max	0.00%	0.02%	0.05%	0.29%	0.30%	0.34%	0.21%	0.15%	0.12%	0.02%	0.00%	0.00%	0.21%
Fixed Gear Bike Plus	0.00%	0.00%	0.00%	0.04%	0.06%	0.10%	0.02%	0.03%	0.01%	0.00%	0.00%	0.00%	0.04%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Step 2 : With 'Month' in the column field, we can consider Month 3(March)- Month 8(August) as Spring and Summer and Month 9(September) – Month 2(February) as Fall and Winter. Again we apply conditional formatting to the cells.

Screenshot of SalesdataPivotV01.xlsx in Excel showing a PivotTable with the Conditional Formatting → Color Scales menu open.

Row Labels	1	2	3	4	5	6	7	8	9	10	11	12
⊟ ACC	47.97%	43.34%	41.38%	38.99%	38.05%	37.70%	38.76%	39.64%	39.54%	42.06%	47.95%	
Air Pump	14.83%	14.07%	13.90%	13.81%	13.50%	13.55%	13.38%	13.41%	13.26%	13.13%	15.18%	
Elbow Pads	0.21%	0.46%	0.78%	1.01%	1.22%	1.19%	1.06%	1.01%	0.87%	0.70%	0.13%	
First Aid Kit	16.38%	10.44%	7.61%	2.85%	2.36%	1.82%	3.88%	4.17%	4.88%	8.30%	17.65%	
Knee Pads	0.29%	0.51%	0.74%	1.11%	1.16%	1.24%	0.98%	0.93%	0.85%	0.70%	0.23%	
Off Road Helmet	1.73%	1.87%	2.06%	2.43%	2.44%	2.47%	2.36%	2.46%	2.30%	2.30%	1.43%	
Repair Kit	1.76%	1.89%	2.01%	2.22%	2.45%	2.50%	2.57%	2.34%	2.26%	1.95%	1.59%	
Road Helmet	1.81%	1.87%	2.33%	2.49%	2.28%	2.62%	2.32%	2.41%	2.43%	2.15%	1.56%	
T-shirt	1.94%	2.17%	2.13%	2.43%	2.52%	2.28%	2.29%	2.46%	2.30%	2.13%	1.30%	
Water Bottle	1.58%	1.77%	2.15%	2.21%	2.51%	2.41%	2.32%	2.42%	2.27%	2.09%	1.56%	
Water Bottle Cage	7.43%	8.29%	7.66%	8.44%	7.61%	7.63%	7.59%	8.02%	8.10%	8.61%	7.33%	
⊟ ORB	21.16%	22.75%	23.28%	22.91%	22.97%	23.19%	23.28%	22.86%	23.09%	21.53%	22.87%	22.90%
Men's Off Road Bike Fully	5.99%	7.21%	7.53%	6.63%	6.78%	7.22%	7.21%	6.71%	6.64%	6.69%	7.28%	6.92%
Men's Off Road Bike Hard Tail (Shimano)	4.65%	5.06%	4.88%	5.45%	5.28%	4.96%	5.35%	4.83%	5.05%	4.33%	4.83%	5.06%
Men's Off Road Bike Hard Tail (SRAM)	7.77%	7.68%	7.96%	7.73%	7.85%	7.94%	7.62%	8.29%	8.09%	8.01%	8.24%	7.90%
Women's Off Road Bike Fully	2.76%	2.80%	2.90%	3.09%	3.07%	3.07%	3.10%	3.02%	3.32%	2.49%	2.52%	3.02%
⊟ TOU	16.57%	17.82%	18.83%	19.89%	20.41%	20.50%	19.28%	19.69%	18.97%	18.27%	14.73%	19.48%
Deluxe Touring Bike (black)	1.63%	1.82%	2.24%	2.28%	2.44%	2.53%	2.33%	2.28%	2.15%	2.16%	1.48%	2.29%
Deluxe Touring Bike (red)	1.97%	1.82%	2.20%	2.44%	2.48%	2.56%	2.29%	2.44%	2.23%	2.04%	1.61%	2.34%
Deluxe Touring Bike (silver)	4.59%	5.06%	5.21%	5.10%	5.07%	5.05%	4.81%	4.65%	4.82%	4.83%	4.31%	4.95%
Professional Touring Bike (black)	1.81%	1.80%	2.24%	2.28%	2.56%	2.69%	2.55%	2.56%	2.48%	2.34%	1.51%	2.42%
Professional Touring Bike (red)	1.73%	2.02%	1.94%	2.42%	2.43%	2.39%	2.52%	2.50%	2.26%	1.92%	1.27%	2.30%
Professional Touring Bike (silver)	4.83%	5.30%	5.00%	5.38%	5.43%	5.28%	4.78%	5.26%	5.03%	4.98%	4.55%	5.18%
⊟ ROB	14.07%	15.59%	15.96%	17.33%	17.69%	17.60%	18.03%	17.17%	17.62%	17.56%	14.09%	17.20%
Deluxe Road Bike (Shimano)	7.38%	7.99%	7.39%	7.88%	7.81%	7.77%	8.47%	7.80%	8.35%	8.21%	7.41%	7.92%
Deluxe Road Bike (SRAM)	1.42%	1.92%	2.28%	2.47%	2.61%	2.41%	2.22%	2.39%	2.42%	2.43%	1.82%	2.35%
Professional Road Bike (Campagnolo)	0.32%	0.50%	0.69%	1.08%	1.04%	1.25%	1.08%	1.00%	0.83%	0.78%	0.18%	0.97%
Professional Road Bike (Shimano)	4.80%	4.75%	4.80%	4.81%	5.19%	5.04%	5.23%	4.95%	5.15%	5.49%	4.44%	5.02%
Professional Road Bike (SRAM)	0.16%	0.43%	0.80%	1.08%	1.05%	1.15%	1.03%	1.03%	0.80%	0.65%	0.23%	0.95%
⊟ EBI	0.24%	0.48%	0.52%	0.55%	0.51%	0.57%	0.43%	0.47%	0.65%	0.57%	0.36%	0.51%
E-Bike Tailwind	0.24%	0.48%	0.52%	0.55%	0.51%	0.57%	0.43%	0.47%	0.65%	0.57%	0.36%	0.51%
⊟ TRE	0.00%	0.02%	0.05%	0.33%	0.37%	0.44%	0.23%	0.17%	0.13%	0.02%	0.00%	0.26%
City Bike Max	0.00%	0.02%	0.05%	0.29%	0.30%	0.34%	0.21%	0.15%	0.12%	0.02%	0.00%	0.21%
Fixed Gear Bike Plus	0.00%	0.00%	0.00%	0.04%	0.06%	0.10%	0.02%	0.03%	0.01%	0.00%	0.00%	0.04%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Step 3 : It is clear that 'Air Pump' and 'First Aid Kit' are the two products which have more sales in fall and winter rather than in spring and summer.

| Row Labels	1	2	3	4	5	6	7	8	9	10	11	12	Grand Total
ACC	47.97%	43.34%	41.38%	38.99%	38.05%	37.70%	38.76%	39.64%	39.54%	42.06%	47.95%	47.90%	39.64%
Air Pump	14.83%	14.07%	13.90%	13.81%	13.50%	13.55%	13.38%	13.41%	13.26%	13.13%	15.18%	13.79%	13.61%
Elbow Pads	0.21%	0.46%	0.78%	1.01%	1.22%	1.19%	1.06%	1.01%	0.87%	0.70%	0.13%	0.19%	0.98%
First Aid Kit	16.38%	10.44%	7.61%	2.85%	2.36%	1.82%	3.88%	4.17%	4.88%	8.30%	17.65%	17.93%	4.66%
Knee Pads	0.29%	0.51%	0.74%	1.11%	1.16%	1.24%	0.98%	0.93%	0.85%	0.70%	0.23%	0.25%	0.98%
Off Road Helmet	1.73%	1.87%	2.06%	2.43%	2.44%	2.47%	2.36%	2.46%	2.30%	2.30%	1.43%	1.62%	2.33%
Repair Kit	1.76%	1.89%	2.01%	2.22%	2.45%	2.50%	2.57%	2.34%	2.26%	1.95%	1.59%	1.54%	2.30%
Road Helmet	1.81%	1.87%	2.33%	2.49%	2.28%	2.62%	2.32%	2.41%	2.43%	2.15%	1.56%	1.48%	2.35%
T-shirt	1.94%	2.17%	2.13%	2.43%	2.52%	2.28%	2.29%	2.46%	2.30%	2.13%	1.30%	1.59%	2.30%
Water Bottle	1.58%	1.77%	2.15%	2.21%	2.51%	2.41%	2.32%	2.42%	2.27%	2.09%	1.56%	1.68%	2.27%
Water Bottle Cage	7.43%	8.29%	7.66%	8.44%	7.61%	7.63%	7.59%	8.02%	8.10%	8.61%	7.33%	7.83%	7.87%
ORB	21.16%	22.75%	23.28%	22.91%	22.97%	23.19%	23.28%	22.86%	23.09%	21.53%	22.87%	21.45%	22.90%
Men's Off Road Bike Fully	5.99%	7.21%	7.53%	6.63%	6.78%	7.22%	7.21%	6.71%	6.64%	6.69%	7.28%	6.67%	6.92%
Men's Off Road Bike Hard Tail (Shimano)	4.65%	5.06%	4.88%	5.45%	5.28%	4.96%	5.35%	4.83%	5.05%	4.33%	4.83%	4.28%	5.06%
Men's Off Road Bike Hard Tail (SRAM)	7.77%	7.68%	7.96%	7.73%	7.85%	7.94%	7.62%	8.29%	8.09%	8.01%	8.24%	7.75%	7.90%
Women's Off Road Bike Fully	2.76%	2.80%	2.90%	3.09%	3.07%	3.07%	3.10%	3.02%	3.32%	2.49%	2.52%	2.75%	3.02%
TOU	16.57%	17.82%	18.83%	19.89%	20.41%	20.50%	19.28%	19.69%	18.97%	18.27%	14.73%	15.87%	19.48%
Deluxe Touring Bike (black)	1.63%	1.82%	2.24%	2.28%	2.44%	2.53%	2.33%	2.28%	2.15%	2.16%	1.48%	1.70%	2.29%
Deluxe Touring Bike (red)	1.97%	1.82%	2.20%	2.44%	2.48%	2.56%	2.29%	2.44%	2.23%	2.04%	1.61%	1.59%	2.34%
Deluxe Touring Bike (silver)	4.59%	5.06%	5.21%	5.10%	5.07%	5.05%	4.81%	4.65%	4.82%	4.83%	4.31%	4.94%	4.95%
Professional Touring Bike (black)	1.81%	1.80%	2.24%	2.28%	2.56%	2.69%	2.55%	2.56%	2.48%	2.34%	1.51%	1.43%	2.42%
Professional Touring Bike (red)	1.73%	2.02%	1.94%	2.42%	2.43%	2.39%	2.52%	2.50%	2.26%	1.92%	1.27%	1.40%	2.30%
Professional Touring Bike (silver)	4.83%	5.30%	5.00%	5.38%	5.43%	5.28%	4.78%	5.26%	5.03%	4.98%	4.55%	4.81%	5.18%
ROB	14.07%	15.59%	15.96%	17.33%	17.69%	17.60%	18.03%	17.17%	17.62%	17.56%	14.09%	14.53%	17.20%
Deluxe Road Bike (Shimano)	7.38%	7.99%	7.39%	7.88%	7.81%	7.77%	8.47%	7.80%	8.35%	8.21%	7.41%	8.32%	7.92%
Deluxe Road Bike (SRAM)	1.42%	1.92%	2.28%	2.47%	2.61%	2.41%	2.22%	2.39%	2.42%	2.43%	1.82%	1.21%	2.35%
Professional Road Bike (Campagnolo)	0.32%	0.50%	0.69%	1.08%	1.04%	1.25%	1.08%	1.00%	0.83%	0.78%	0.18%	0.19%	0.97%
Professional Road Bike (Shimano)	4.80%	4.75%	4.80%	4.81%	5.19%	5.04%	5.23%	4.95%	5.15%	5.49%	4.44%	4.56%	5.02%
Professional Road Bike (SRAM)	0.16%	0.43%	0.80%	1.08%	1.05%	1.15%	1.03%	1.03%	0.86%	0.65%	0.23%	0.25%	0.95%
EBI	0.24%	0.48%	0.52%	0.55%	0.51%	0.57%	0.43%	0.47%	0.65%	0.57%	0.36%	0.25%	0.51%
E-Bike Tailwind	0.24%	0.48%	0.52%	0.55%	0.51%	0.57%	0.43%	0.47%	0.65%	0.57%	0.36%	0.25%	0.51%
TRE	0.00%	0.02%	0.05%	0.33%	0.37%	0.44%	0.23%	0.17%	0.13%	0.02%	0.00%	0.00%	0.26%
City Bike Max	0.00%	0.02%	0.05%	0.29%	0.30%	0.34%	0.21%	0.15%	0.12%	0.02%	0.00%	0.00%	0.21%
Fixed Gear Bike Plus	0.00%	0.00%	0.00%	0.04%	0.06%	0.10%	0.02%	0.03%	0.01%	0.00%	0.00%	0.00%	0.04%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Question 4 : Bicycles and accessories are more likely to be bought in spring and summer as in fall and winter time. Find which product is an exception to this rule.

Answer 4 : 'Air Pump and First Aid Kit' are two products which have comparatively higher sales in fall and winter time.
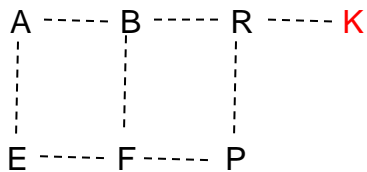
Part II. Data Structure (40 pts.)

In today's class, we reviewed the data structure called stack and queue, and learned about BFS and DFS.
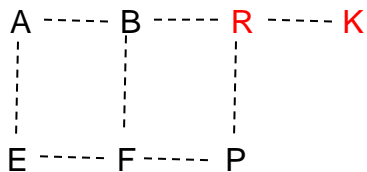
In the following graph, nodes are represented as alphabets.

```
A ---- B ---R ---K

 /     /   /

 /     /   /

E ---- F ---P
```
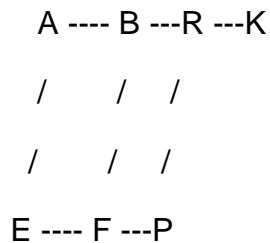
- Please perform a Depth-First-Search (DFS) to find all paths from K to E. Please draw a tree to show your process. (20 points)
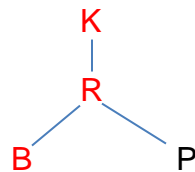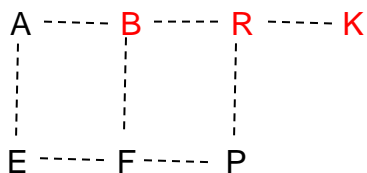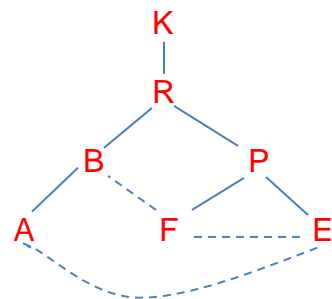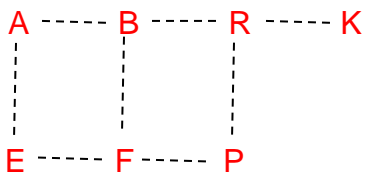- K->R->B->A->P->F->E

```
A ----- B ----- R ----- K              K
:       :       :
:       :       :
:       :       :
E ----- F ----- P
```

```
A ----- B ----- R ----- K              K
:       :       :                      |
:       :       :                      R
:       :       :
E ----- F ----- P
```

```
A ----- B ----- R ----- K              K
:       :       :                      |
:       :       :                      R
:       :       :                     / \
E ----- F ----- P                    B   P
```

A ----- B ----- R ----- K   K
 | | | |
 | | | R
 | | | / \
E ----- F ----- P   B   P
                                                /
                                               A

A ----- B ----- R ----- K   K
 | | | |
 | | | R
 | | | / \
E ----- F ----- P   B   P
                                                /
                                               A

A ----- B ----- R ----- K   K
 | | | |
 | | | R
 | | | / \
E ----- F ----- P   B   P
                                                / :   \
                                               A F

A ----- B ----- R ----- K   K
 | | | |
 | | | R
 | | | / \
E ----- F ----- P   B   P
                                                / :   \
                                               A F ---- E
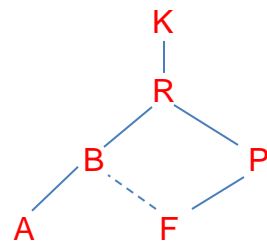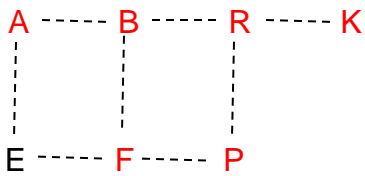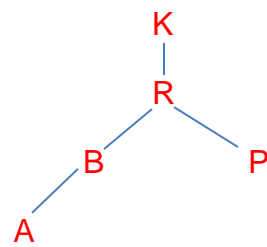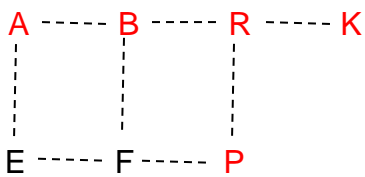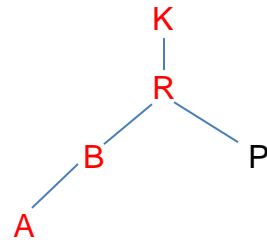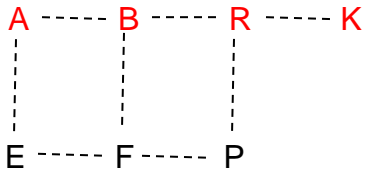
- Please perform a Breadth-First-Search (BFS) to find all paths from K to E. Please draw a tree to show your process. (20 points)

A ----- B ----- R ----- K   K

E ---- F ---- P

A ---- B ---- R ---- K   K
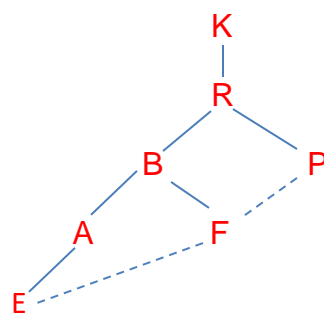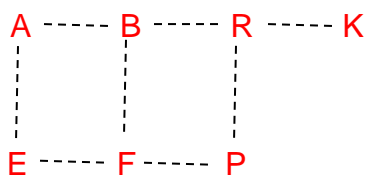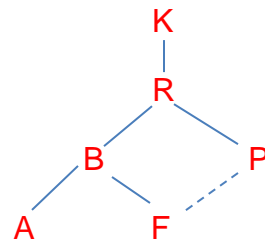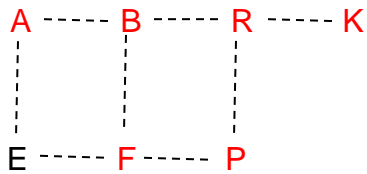| | | |
E ---- F ---- P   R

A ---- B ---- R ---- K   K
| | | |
E ---- F ---- P   R
                                / \
                               B   P

A ---- B ---- R ---- K   K
| | | |
E ---- F ---- P   R
                                / \
                               B   P

A ---- B ---- R ---- K   K
| | | |
E ---- F ---- P   R
                                / \
                               B   P
                              /
                             A

A ---- B ---- R ---- K   K
| | | |
E ---- F ---- P   R
                                / \
                               B   P
                              / \
                             A   F
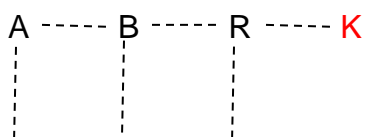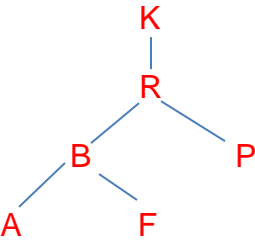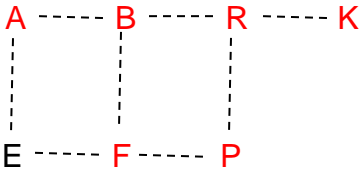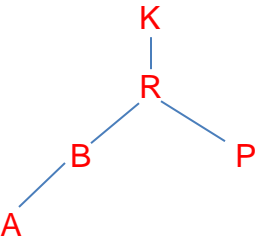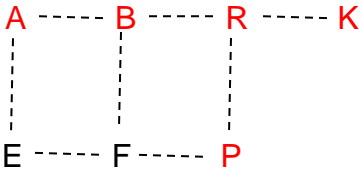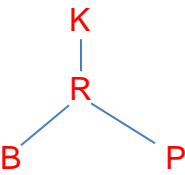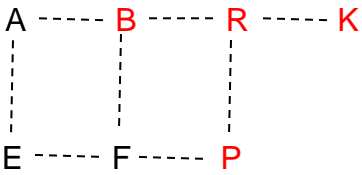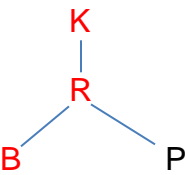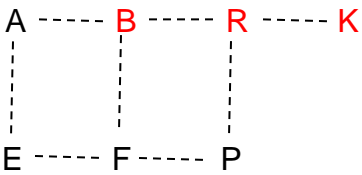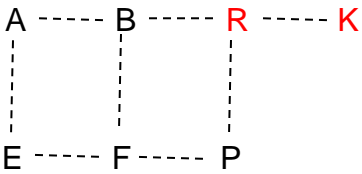
- K->R->B->P->A->F->E
- In BFS, Queue is used to traverse the vertices. It starts with the root node, the traverse through the child node i.e., level one and the traverse through the grandchild node, i.e., level two and so on , until reaches all the nodes

HINT: If logic alone does not help, you could pretend to be a "human stack" or "human queue", follow the algorithm and pseudo code we covered in class and get the results.