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CLUSTERING REPORT

Optimal Number of Clusters (k): 10 based on the Davies-Bouldin Index (DBI).

DB Index Value for Best Clustering: 1.1049
The DBI evaluates the quality of the clustering solution. A lower DBI indicates better clustering, as it reflects well-separated and compact clusters. A DBI of 1.1049 suggests good clustering quality.

The **PCA scatter plot** showed a clear separation of clusters in the reduced 2D space. Each cluster was represented by a distinct color, making it easier to visually identify overlapping or well-separated clusters.

The cluster sizes indicate the number of customers in each cluster, providing insights into how the customers are distributed:
Cluster
3 35
2 26
0 22
4 21
6 19
7 19
5 16
8 15
1 14
9 13
Name: count, dtype: int64

Cluster 3 has the highest number of customers (35), indicating that this segment is the largest group in the dataset.
Clusters **9** and **1** have the smallest number of customers (13 and 14, respectively), representing niche customer groups.
The clusters are reasonably distributed, with no extreme imbalances, which suggests that the clustering is robust.

The centroid output represents the average feature values for each cluster after K-Means clustering. It shows the "central" or typical characteristics of each customer group in terms of:
Region: Geographical differences between clusters.
SignupDays: Age of customer accounts, with positive values indicating recent signups.

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TotalValue: Transaction value, with positive values indicating higher spending.
TransactionCount: Frequency of transactions, with positive values indicating more activity.
UniqueProducts: Product variety purchased, with positive values indicating more diverse shopping habits.