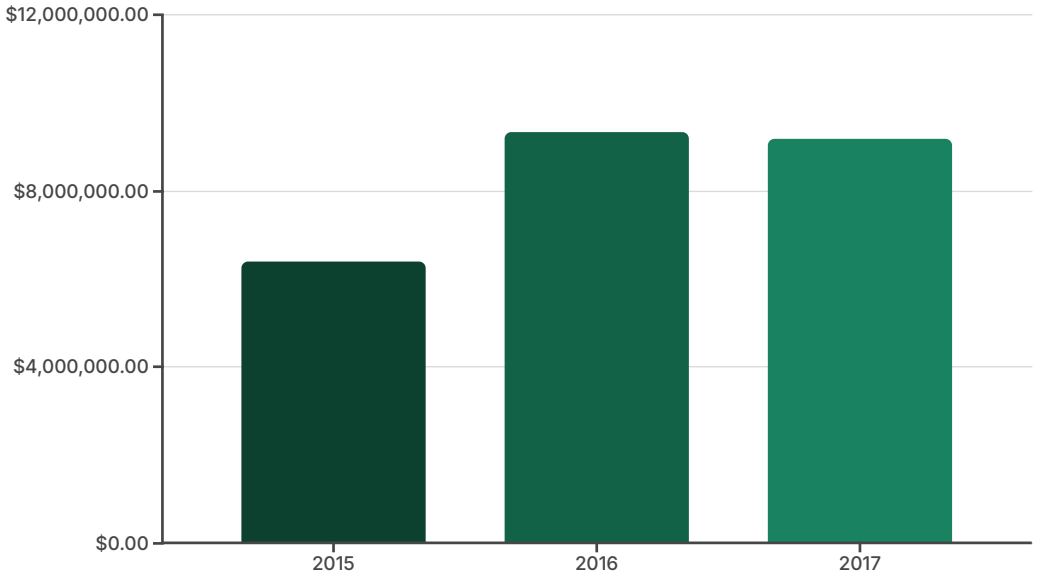
Advanced SQL Analysis – Sales & Operations Intelligence

Extract strategic insights from Adventure Works operational data covering product performance, customer trends, and regional profitability using SQL and direct import analysis.

Annual Revenue Trends

Year-over-Year Growth Analysis

Examining revenue growth patterns and identifying peak performing years across the business cycle.



2630

2015 Orders

Baseline year establishing initial market presence

45.58%

2016 Growth

Exceptional year-over-year expansion

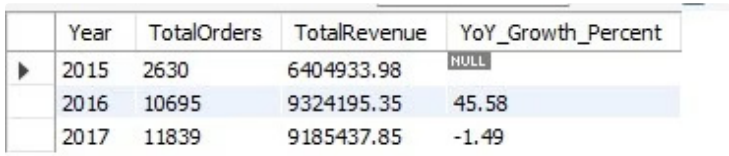
-1.49%

2017 Decline

Slight contraction requiring strategic attention

Query 1: Annual Revenue Trends

```
SELECT
  YEAR(s.OrderDate) AS Year,
  COUNT(DISTINCT s.OrderNumber) AS TotalOrders,
  ROUND(SUM(s.OrderQuantity * p.ProductPrice), 2) AS TotalRevenue,
  ROUND((SUM(s.OrderQuantity * p.ProductPrice) /
    LAG(SUM(s.OrderQuantity * p.ProductPrice))
    OVER (ORDER BY YEAR(s.OrderDate)) - 1) * 100, 2)
    AS YoY_Growth_Percent
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
GROUP BY YEAR(s.OrderDate)
ORDER BY Year;
```

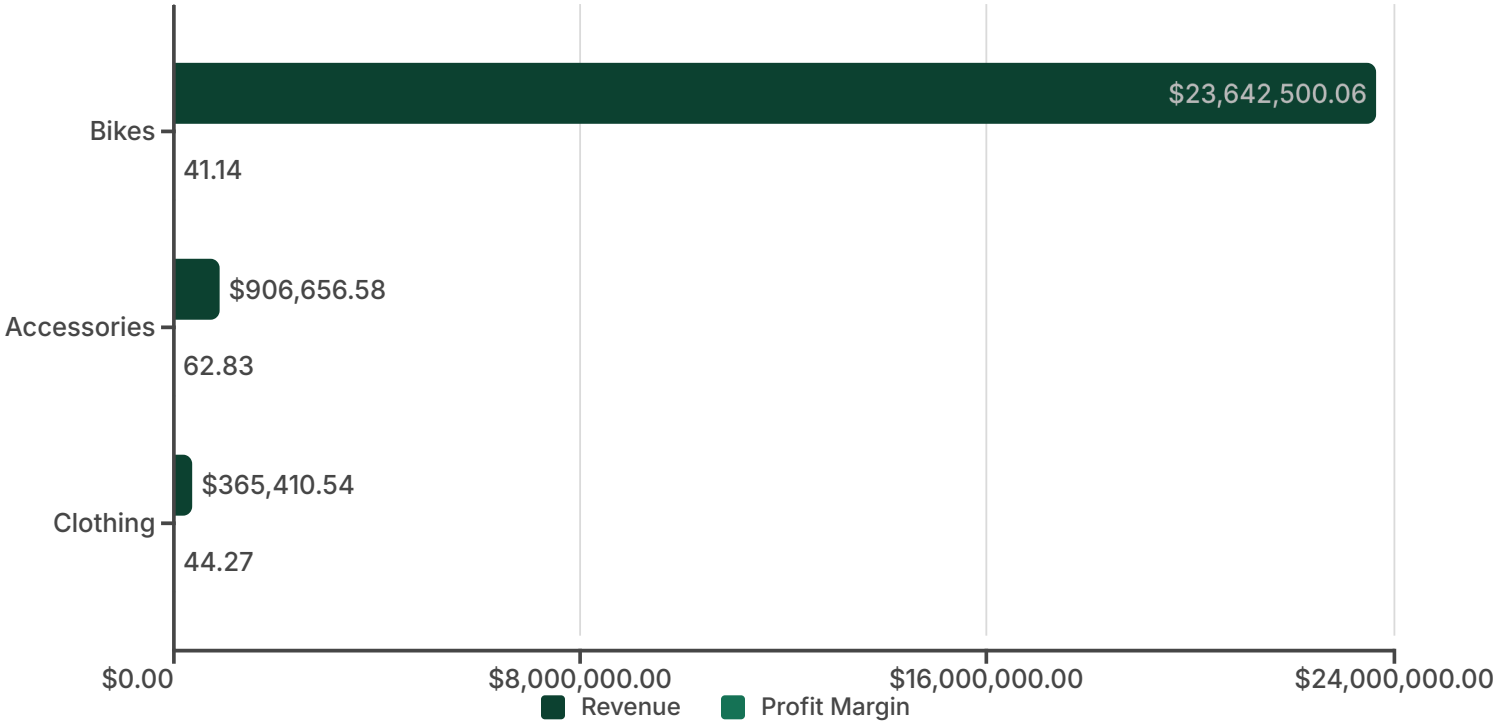


Year	TotalOrders	TotalRevenue	YoY_Growth_Percent
2015	2630	6404933.98	NULL
2016	10695	9324195.35	45.58
2017	11839	9185437.85	-1.49

This query calculates total revenue per year and compares growth year-over-year using LAG function to access previous year's revenue.

Category Performance

Ranking product categories by total sales and comparing profit margins to identify strategic opportunities.



Bikes Dominate Revenue

$23.6M in sales with 13,929 orders, representing the core business driver despite lower margins.

Accessories Lead Margins

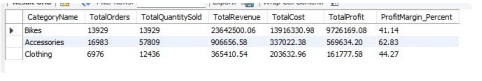
62.83% profit margin on $906K revenue with highest order volume (16,983 orders).

Clothing Balanced Performance

$365K revenue with 44.27% margin, showing steady mid-tier profitability.

Query 2: Category Performance

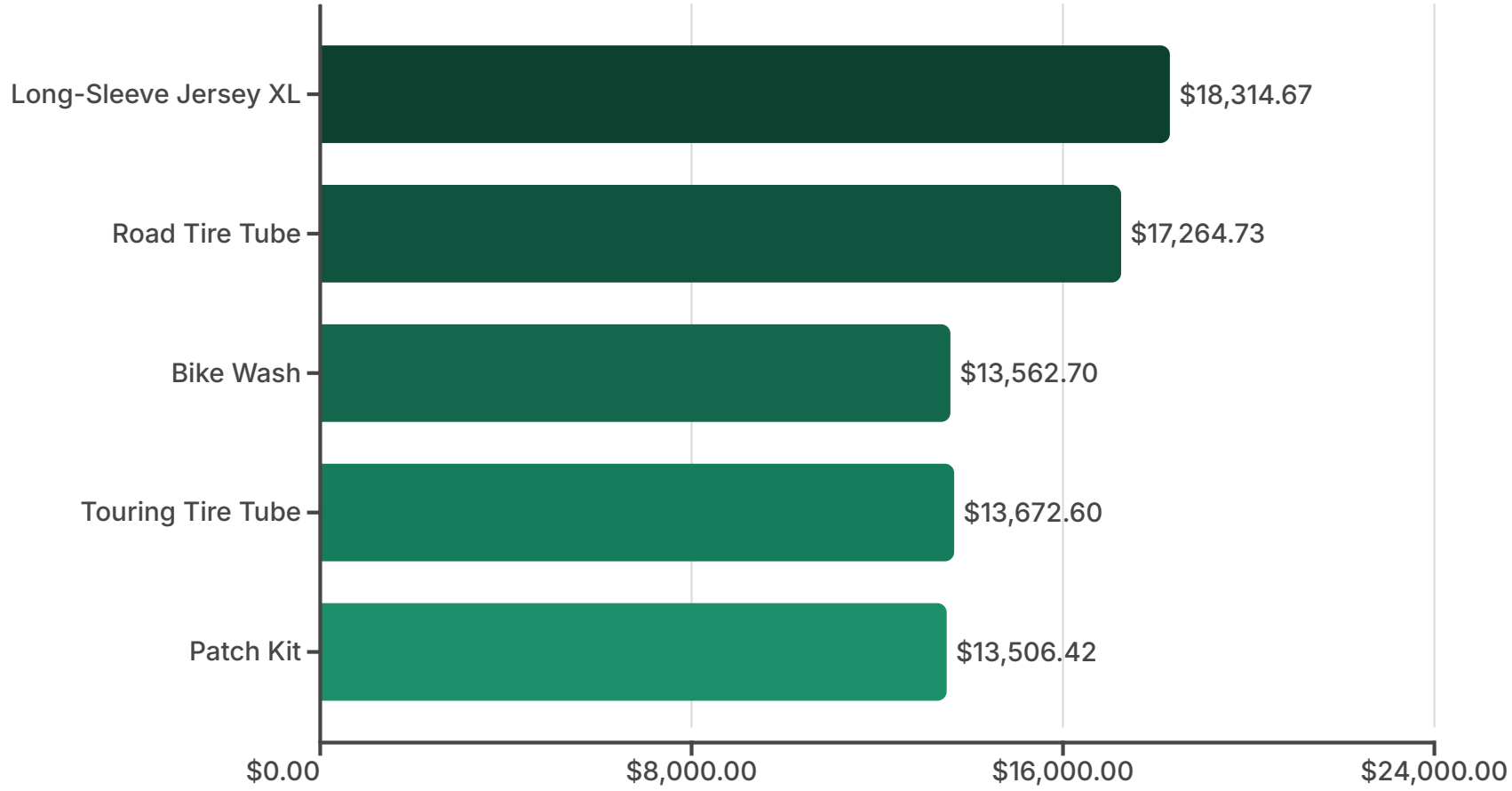
```
SELECT
  pc.CategoryName,
  COUNT(DISTINCT s.OrderNumber) AS TotalOrders,
  SUM(s.OrderQuantity) AS TotalQuantitySold,
  ROUND(SUM(s.OrderQuantity * p.ProductPrice), 2) AS TotalRevenue,
  ROUND(SUM(s.OrderQuantity * p.ProductCost), 2) AS TotalCost,
  ROUND(SUM(s.OrderQuantity * (p.ProductPrice - p.ProductCost)), 2)
    AS TotalProfit,
  ROUND((SUM(s.OrderQuantity * (p.ProductPrice - p.ProductCost)) /
    SUM(s.OrderQuantity * p.ProductPrice)) * 100, 2)
    AS ProfitMargin_Percent
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
JOIN Product_Subcategories ps
  ON p.ProductSubcategoryKey = ps.ProductSubcategoryKey
JOIN Product_Categories pc
  ON ps.ProductCategoryKey = pc.ProductCategoryKey
GROUP BY pc.CategoryName
ORDER BY TotalRevenue DESC;
```



CategoryName	TotalOrders	TotalQuantitySold	TotalRevenue	TotalCost	TotalProfit	ProfitMargin_Percent
Bikes	13929	13929	2364250.06	1916330.98	9726169.08	41.14
Accessories	16983	57809	906656.58	337022.38	569634.20	62.83
Clothing	6976	12436	365410.54	203632.96	161777.58	44.27

Top & Underperforming Products

Identifying best and worst-selling products by quantity sold and revenue generation to optimize inventory strategy.



Query 3: Product Performance Analysis

Query 3A: Top 10 Best-Selling Products

```
SELECT
  p.ProductName,
  p.ProductSKU,
  SUM(s.OrderQuantity) AS TotalQuantitySold,
  ROUND(SUM(s.OrderQuantity * p.ProductPrice), 2) AS TotalRevenue,
  ROUND(SUM(s.OrderQuantity * (p.ProductPrice - p.ProductCost)), 2)
    AS TotalProfit
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
GROUP BY p.ProductKey, p.ProductName, p.ProductSKU
ORDER BY TotalRevenue DESC
LIMIT 10;
```

ProductName	ProductSKU	TotalQuantitySold	TotalRevenue	TotalProfit
Mountain-200 Black, 46	BK-M68B-46	606	1241754.60	571633.74
Mountain-200 Black, 42	BK-M68B-42	602	1233558.20	567860.58
Mountain-200 Silver, 38	BK-M68S-38	586	1213852.12	558786.16
Mountain-200 Silver, 46	BK-M68S-46	571	1182780.82	544482.76
Mountain-200 Black, 38	BK-M68B-38	569	1165937.90	536732.01
Mountain-200 Silver, 42	BK-M68S-42	547	1133066.74	521597.32
Road-250 Black, 52	BK-R89B-52	316	689372.96	272038.08
Road-250 Red, 58	BK-R89R-58	303	661012.68	260846.64
Road-250 Black, 48	BK-R89B-48	294	641378.64	253098.72
Road-150 Red, 48	BK-R93R-48	179	640510.33	251849.42

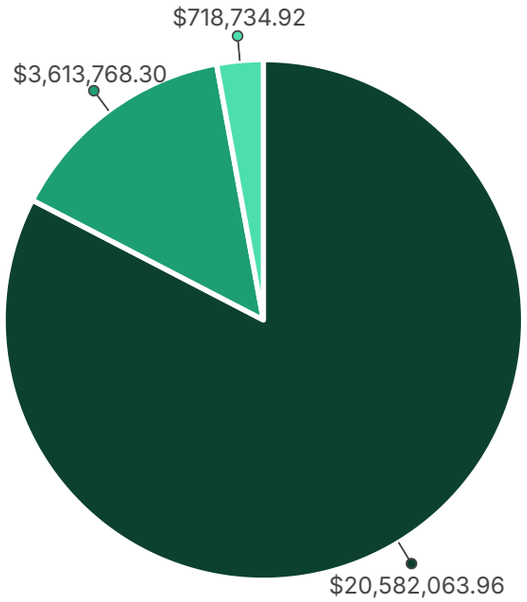
Query 3B: Bottom 10 Worst-Selling Products

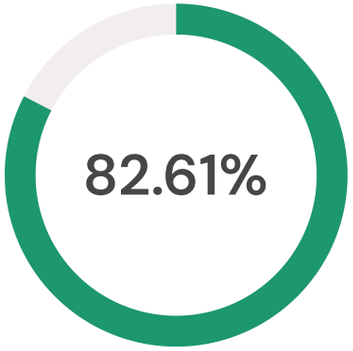
```
SELECT
  p.ProductName,
  p.ProductSKU,
  SUM(s.OrderQuantity) AS TotalQuantitySold,
  ROUND(SUM(s.OrderQuantity * p.ProductPrice), 2) AS TotalRevenue,
  ROUND(SUM(s.OrderQuantity * (p.ProductPrice - p.ProductCost)), 2)
    AS TotalProfit
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
GROUP BY p.ProductKey, p.ProductName, p.ProductSKU
ORDER BY TotalRevenue ASC
LIMIT 10;
```

ProductName	ProductSKU	TotalQuantitySold	TotalRevenue	TotalProfit
Racing Socks, L	SO-R809-L	509	4575.91	2865.67
Racing Socks, M	SO-R809-M	554	4980.46	3119.02
Classic Vest, S	VE-C304-S	157	9969.50	6240.75
Classic Vest, M	VE-C304-M	182	11557.00	7234.50
Classic Vest, L	VE-C304-L	182	11557.00	7234.50
Patch Kit/8 Patches	PK-7098	5898	13506.42	8434.14
Bike Wash - Dissolver	CL-9009	1706	13562.70	8495.88
Touring Tire Tube	TT-T092	2740	13672.60	8548.80
Road Tire Tube	TT-R982	4327	17264.73	10817.50
Long-Sleeve Logo Jersey, XL	LJ-0192-X	381	18314.67	6229.35

Customer Segmentation by Spend

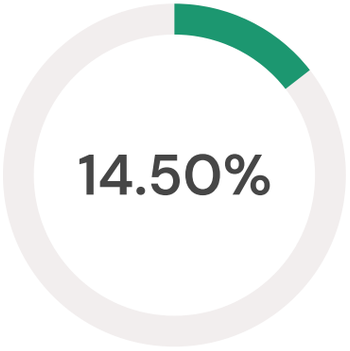
Segmenting customers based on lifetime spend to understand revenue concentration and targeting opportunities.





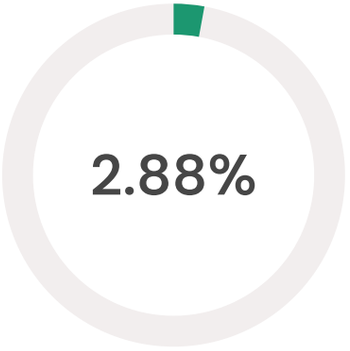
High Spender Revenue

5,371 customers generating majority of revenue at $3,832 average lifetime spend



Mid Spender Contribution

3,458 customers with $1,045 average spend representing growth opportunity

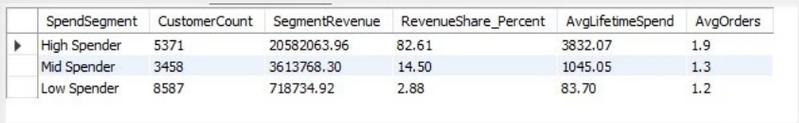


Low Spender Base

8,587 customers at $84 average spend requiring conversion strategies

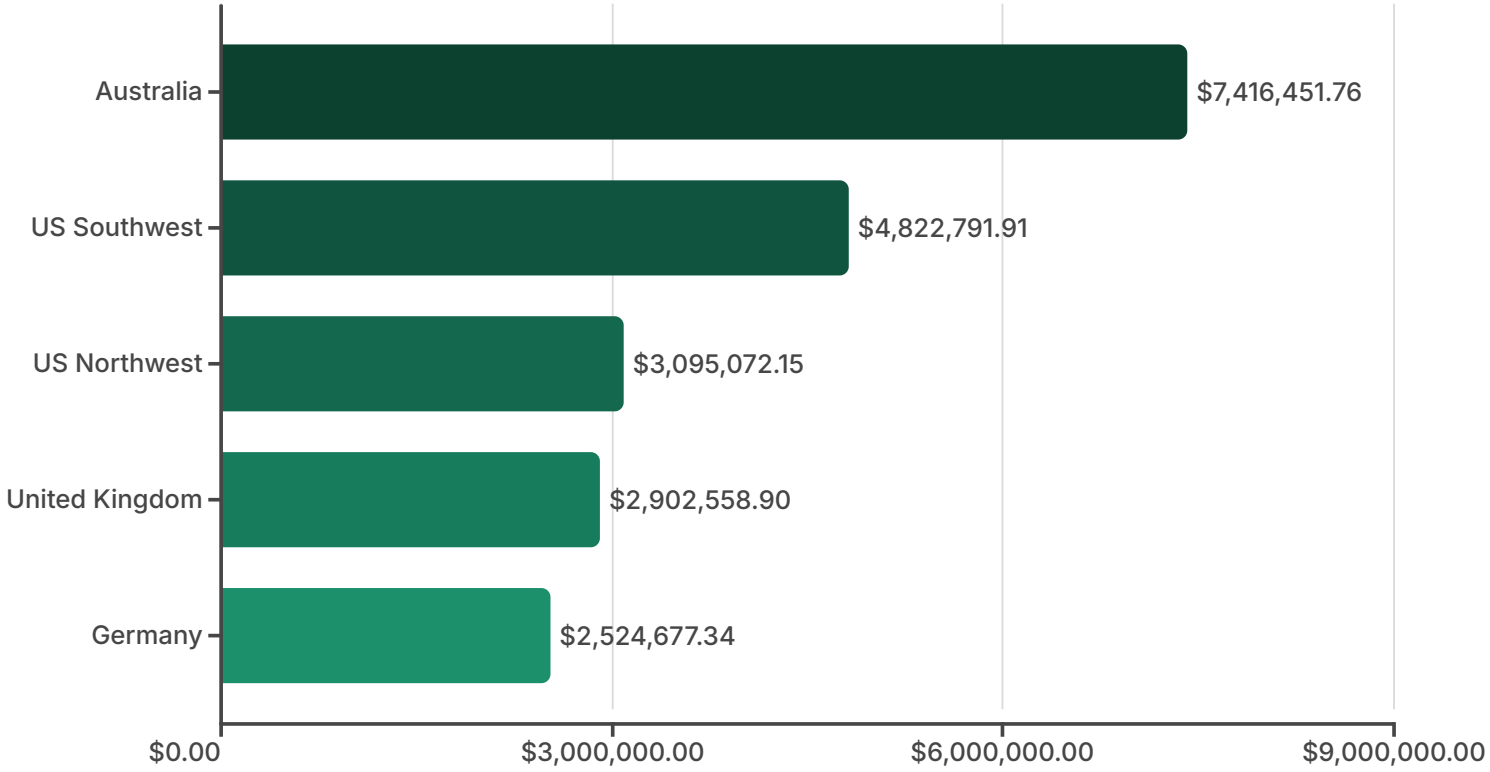
Query 4: Customer Segmentation

```
WITH CustomerSpend AS (
  SELECT
    s.CustomerKey,
    CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName,
    ROUND(SUM(s.OrderQuantity * p.ProductPrice), 2) AS LifetimeSpend,
    COUNT(DISTINCT s.OrderNumber) AS TotalOrders
  FROM Sales s
  JOIN Products p ON s.ProductKey = p.ProductKey
  JOIN Customers c ON s.CustomerKey = c.CustomerKey
  GROUP BY s.CustomerKey, c.FirstName, c.LastName
),
TotalRevenueCalc AS (
  SELECT SUM(LifetimeSpend) AS TotalRevenue FROM CustomerSpend
),
Segments AS (
  SELECT cs.*,
    CASE
      WHEN cs.LifetimeSpend >= 2000 THEN 'High Spender'
      WHEN cs.LifetimeSpend >= 500 THEN 'Mid Spender'
      ELSE 'Low Spender'
    END AS SpendSegment
  FROM CustomerSpend cs
)
SELECT
  SpendSegment,
  COUNT(*) AS CustomerCount,
  ROUND(SUM(LifetimeSpend), 2) AS SegmentRevenue,
  ROUND((SUM(LifetimeSpend) /
    (SELECT TotalRevenue FROM TotalRevenueCalc)) * 100, 2)
    AS RevenueShare_Percent,
  ROUND(AVG(LifetimeSpend), 2) AS AvgLifetimeSpend,
  ROUND(AVG(TotalOrders), 1) AS AvgOrders
FROM Segments
GROUP BY SpendSegment
ORDER BY SegmentRevenue DESC;
```



SpendSegment	CustomerCount	SegmentRevenue	RevenueShare_Percent	AvgLifetimeSpend	AvgOrders
High Spender	5371	20582063.96	82.61	3832.07	1.9
Mid Spender	3458	3613768.30	14.50	1045.05	1.3
Low Spender	8587	718734.92	2.88	83.70	1.2

Geographic Sales Leadership



Australia Leads

$7.4M revenue with highest average order size at $598

US Southwest Strong

$4.8M revenue across 4,992 orders with $421 average

Europe Diversified

UK, Germany, France combine for $7.8M total revenue

Query 5: Geographic Sales Leadership

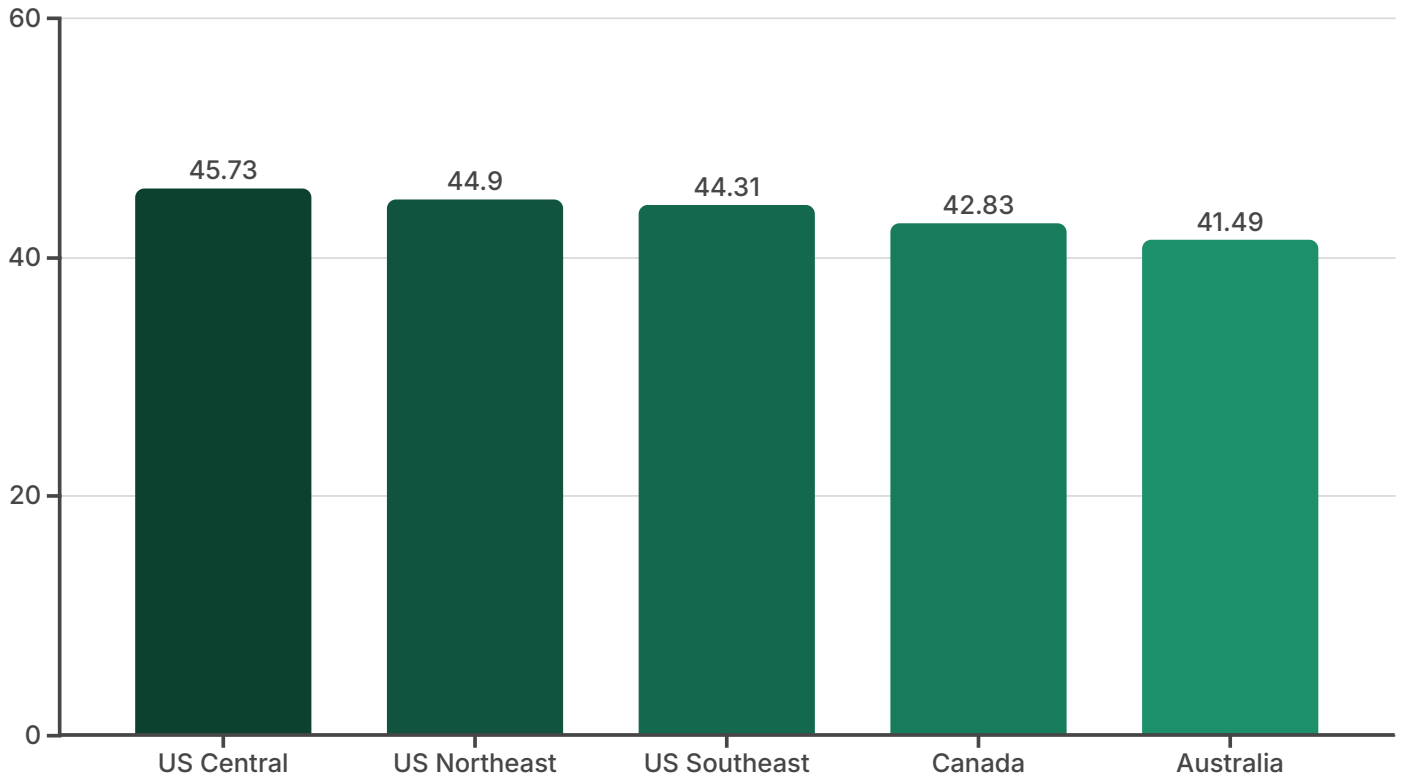
```
SELECT
  t.Country,
  t.Region,
  t.Continent,
  COUNT(DISTINCT s.OrderNumber) AS TotalOrders,
  SUM(s.OrderQuantity) AS TotalQuantity,
  ROUND(SUM(s.OrderQuantity * p.ProductPrice), 2) AS TotalRevenue,
  ROUND(AVG(s.OrderQuantity * p.ProductPrice), 2) AS AvgOrderSize
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
JOIN Territories t ON s.TerritoryKey = t.SalesTerritoryKey
GROUP BY t.Country, t.Region, t.Continent
ORDER BY TotalRevenue DESC;
```

Country	Region	Continent	TotalOrders	TotalQuantity	TotalRevenue	AvgOrderSize
Australia	Australia	Pacific	6060	17951	7416451.76	597.67
United States	Southwest	North America	4992	17191	4822791.91	420.73
United States	Northwest	North America	3675	12513	3095072.15	374.39
United Kingdom	United Kingdom	Europe	2771	9694	2902558.90	451.90
Germany	Germany	Europe	2294	7950	2524677.34	477.34
France	France	Europe	2315	7862	2362641.01	450.97
Canada	Canada	North America	3024	10894	1769243.88	257.34
United States	Southeast	North America	14	49	11585.62	340.75
United States	Northeast	North America	10	40	6401.55	237.09
United States	Central	North America	9	30	3143.06	157.15

This query identifies top countries and regions by total sales and average order size, revealing geographic performance patterns and market opportunities.

Profitability by Territory

Ranking sales territories by profit margin percentage to identify most efficient regions and optimization opportunities.



US Regions Lead Efficiency

Central, Northeast, and Southeast regions achieve 44-46% margins despite smaller revenue bases.

High-Volume Trade-off

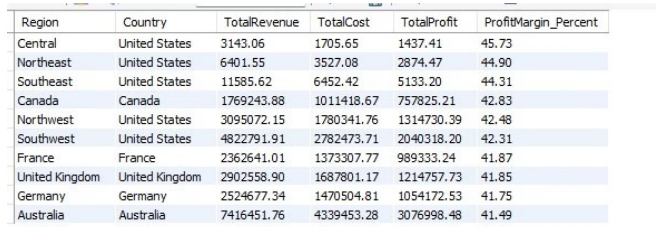
Australia generates highest revenue but operates at 41.49% margin, showing volume-efficiency balance.

European Consistency

France, UK, and Germany cluster around 41-42% margins with strong revenue performance.

Query 6: Profitability by Territory

```
SELECT
  t.Region,
  t.Country,
  ROUND(SUM(s.OrderQuantity * p.ProductPrice), 2) AS TotalRevenue,
  ROUND(SUM(s.OrderQuantity * p.ProductCost), 2) AS TotalCost,
  ROUND(SUM(s.OrderQuantity * (p.ProductPrice - p.ProductCost)), 2)
    AS TotalProfit,
  ROUND((SUM(s.OrderQuantity * (p.ProductPrice - p.ProductCost)) /
    SUM(s.OrderQuantity * p.ProductPrice)) * 100, 2)
    AS ProfitMargin_Percent
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
JOIN Territories t ON s.TerritoryKey = t.SalesTerritoryKey
GROUP BY t.Region, t.Country
ORDER BY ProfitMargin_Percent DESC;
```

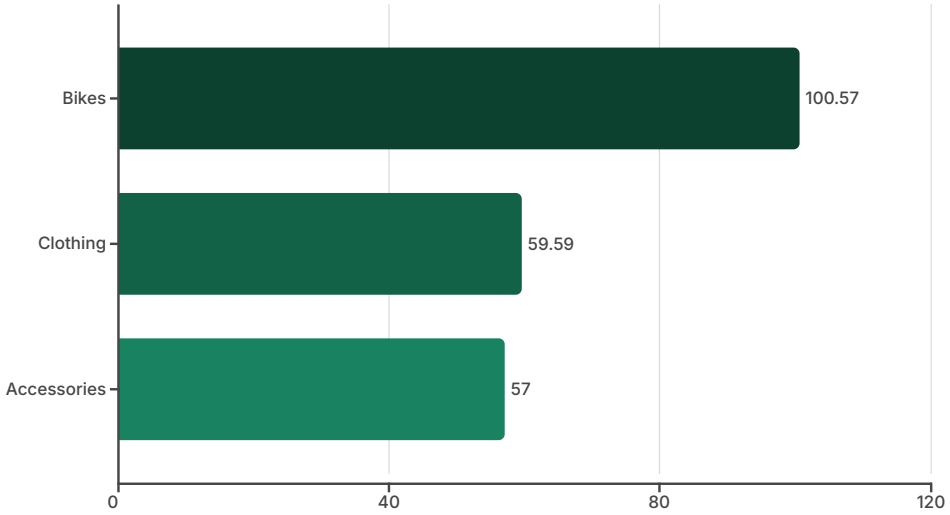


Region	Country	TotalRevenue	TotalCost	TotalProfit	ProfitMargin_Percent
Central	United States	3143.06	1705.65	1437.41	45.73
Northeast	United States	6401.55	3527.08	2874.47	44.90
Southeast	United States	11585.62	6452.42	5133.20	44.31
Canada	Canada	1769243.88	1011418.67	757825.21	42.83
Northwest	United States	3095072.15	1780341.76	1314730.39	42.48
Southwest	United States	4822791.91	2782473.71	2040318.20	42.31
France	France	2362641.01	1373307.77	989333.24	41.87
United Kingdom	United Kingdom	2902558.90	1687801.17	1214757.73	41.85
Germany	Germany	2524677.34	1470504.81	1054172.53	41.75
Australia	Australia	7416451.76	4339453.28	3076998.48	41.49

Ranks territories by profit margin to identify most efficient regions for strategic resource allocation.

Return Analysis: Critical Insights

Return Rate by Category



Top Products with Highest Returns

- **Road-750 Black, 48:** 107.14% return rate
- **Mountain-200 Silver, 38:** 106.25% return rate
- **Sport-100 Helmets (All Colors):** 100% return rate
- **Long-Sleeve Logo Jerseys (All Sizes):** 100% return rate

Critical Business Alert: Bikes category shows 100.57% return rate (more returns than sales), indicating severe quality, sizing, or fulfillment issues. Sport-100 Helmets and Long-Sleeve Logo Jerseys show 100% returns across all variants, requiring immediate investigation and potential product discontinuation.

Query 7: Return Analysis

Query 7A: Return Rate by Category

```
SELECT
  pc.CategoryName,
  SUM(s.OrderQuantity) AS TotalSold,
  COALESCE(SUM(r.ReturnQuantity), 0) AS TotalReturned,
  ROUND((COALESCE(SUM(r.ReturnQuantity), 0) /
    SUM(s.OrderQuantity)) * 100, 2) AS ReturnRate_Percent
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
JOIN Product_Subcategories ps
  ON p.ProductSubcategoryKey = ps.ProductSubcategoryKey
JOIN Product_Categories pc
  ON ps.ProductCategoryKey = pc.ProductCategoryKey
LEFT JOIN Returns r ON s.ProductKey = r.ProductKey
GROUP BY pc.CategoryName
ORDER BY ReturnRate_Percent DESC;
```

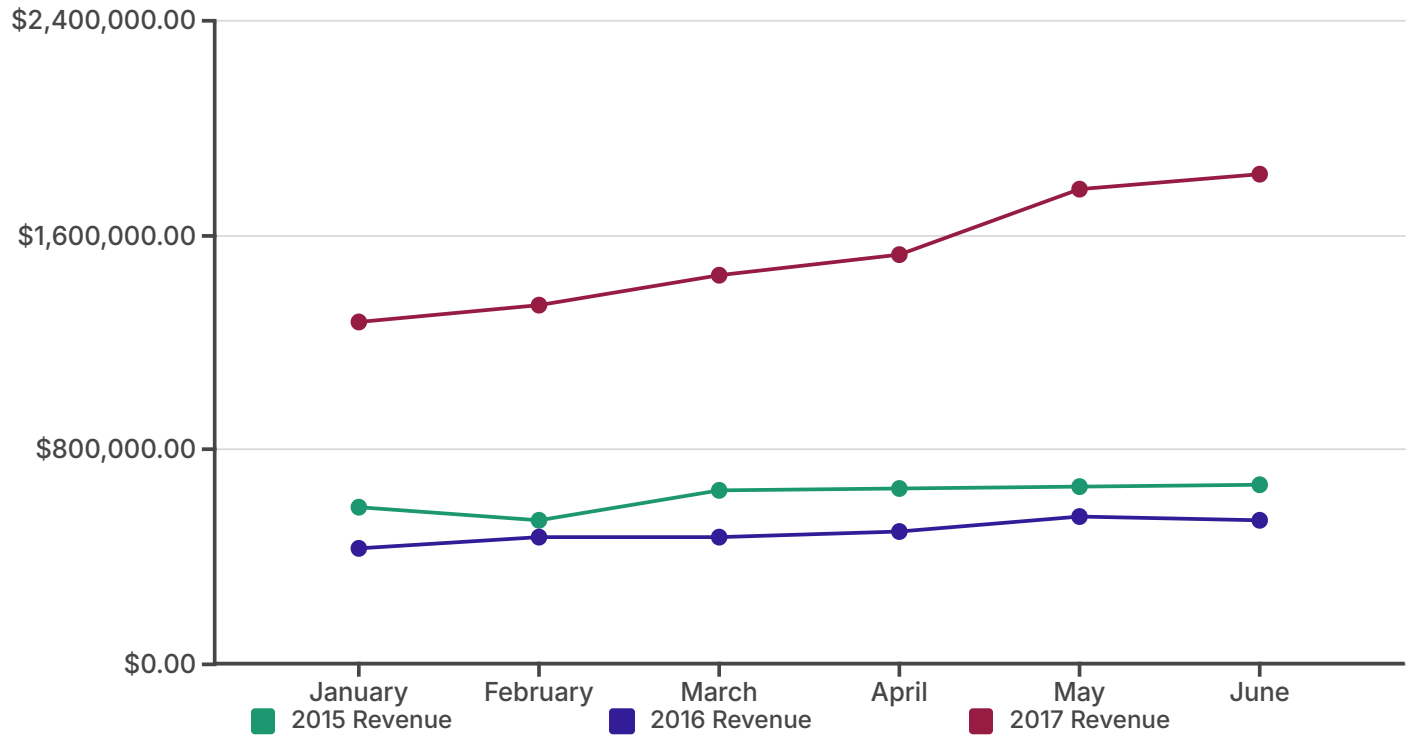
CategoryName	TotalSold	TotalReturned	ReturnRate_Percent
Bikes	120961	121650	100.57
Clothing	293463	174888	59.59
Accessories	4151504	2366328	57.00

Query 7B: Top 10 Products with Highest Returns

```
SELECT
  p.ProductName,
  SUM(s.OrderQuantity) AS TotalSold,
  COALESCE(SUM(r.ReturnQuantity), 0) AS TotalReturned,
  ROUND((COALESCE(SUM(r.ReturnQuantity), 0) /
    SUM(s.OrderQuantity)) * 100, 2) AS ReturnRate_Percent
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
LEFT JOIN Returns r ON s.ProductKey = r.ProductKey
GROUP BY p.ProductKey, p.ProductName
HAVING TotalReturned > 0
ORDER BY ReturnRate_Percent DESC
LIMIT 10;
```

ProductName	TotalSold	TotalReturned	ReturnRate_Percent
Road-750 Black, 48	4970	5325	107.14
Mountain-200 Silver, 38	9376	9962	106.25
Sport-100 Helmet, Red	146930	146930	100.00
Sport-100 Helmet, Black	100880	100880	100.00
Sport-100 Helmet, Blue	131670	131670	100.00
Long-Sleeve Logo Jersey, S	4704	4704	100.00
Long-Sleeve Logo Jersey, M	6120	6120	100.00
Long-Sleeve Logo Jersey, L	6360	6360	100.00
Long-Sleeve Logo Jersey, XL	3810	3810	100.00
Road-150 Red, 62	676	676	100.00

Sales Trends: Monthly & Quarterly Patterns



2015 Baseline

Steady monthly performance establishing market presence

2016 Acceleration

July-December surge with dramatic order volume increase

2017 Peak Performance

Consistent high revenue across all months tracked

Query 8: Sales Trends Analysis

Query 8A: Monthly Sales Trends

```
SELECT
  YEAR(s.OrderDate) AS Year,
  MONTH(s.OrderDate) AS Month,
  MONTHNAME(s.OrderDate) AS MonthName,
  COUNT(DISTINCT s.OrderNumber) AS TotalOrders,
  SUM(s.OrderQuantity) AS TotalQuantity,
  ROUND(SUM(s.OrderQuantity * p.ProductPrice), 2) AS TotalRevenue
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
GROUP BY YEAR(s.OrderDate), MONTH(s.OrderDate),
  MONTHNAME(s.OrderDate)
ORDER BY Year, Month;
```

Year	Month	MonthName	TotalOrders	TotalQuantity	TotalRevenue
2015	1	January	184	184	585312.69
2015	2	February	165	165	532226.28
2015	3	March	198	198	643436.14
2015	4	April	204	204	653364.08
2015	5	May	206	206	659325.94
2015	6	June	212	212	669988.72
2015	7	July	247	247	486114.93
2015	8	August	278	278	536452.77
2015	9	September	196	196	344062.89
2015	10	October	223	223	404276.65
2015	11	November	191	191	326611.22
2015	12	December	326	326	563761.67

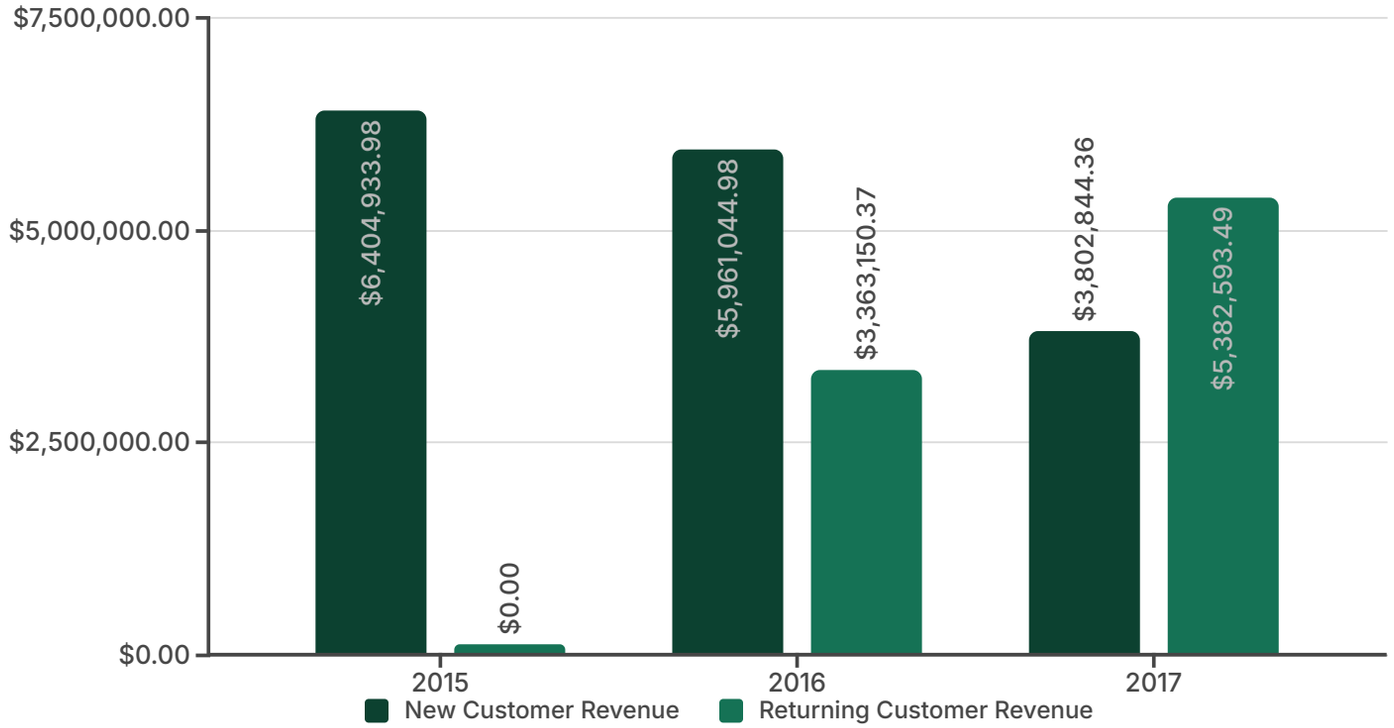
Query 8B: Quarterly Sales Trends

```
SELECT
  YEAR(s.OrderDate) AS Year,
  QUARTER(s.OrderDate) AS Quarter,
  COUNT(DISTINCT s.OrderNumber) AS TotalOrders,
  SUM(s.OrderQuantity) AS TotalQuantity,
  ROUND(SUM(s.OrderQuantity * p.ProductPrice), 2) AS TotalRevenue
FROM Sales s
JOIN Products p ON s.ProductKey = p.ProductKey
GROUP BY YEAR(s.OrderDate), QUARTER(s.OrderDate)
ORDER BY Year, Quarter;
```

Year	Quarter	TotalOrders	TotalQuantity	TotalRevenue
2015	1	547	547	1760975.11
2015	2	622	622	1982678.74
2015	3	721	721	1366630.59
2015	4	740	740	1294649.54
2016	1	775	775	1378550.82
2016	2	931	931	1574317.81
2016	3	3617	13882	2572289.37
2016	4	5372	20642	3799037.35
2017	1	5531	21175	4062210.49
2017	2	6308	24139	5123227.36

New vs. Returning Customers

Analyzing revenue contribution from first-time buyers versus repeat customers to assess retention effectiveness.



2015: All New

100% new customers (2,630) establishing customer base with $6.4M revenue

1

2016: Building Loyalty

36% returning customer revenue ($3.4M) from 2,341 repeat buyers

2

2017: Retention Success

58.6% returning customer revenue ($5.4M) exceeds new customer contribution

3

Query 9: New vs. Returning Customers

```
WITH FirstPurchase AS (
  SELECT
    CustomerKey,
    MIN(OrderDate) AS FirstOrderDate
  FROM Sales
  GROUP BY CustomerKey
),
CustomerType AS (
  SELECT
    s.OrderNumber,
    s.CustomerKey,
    s.OrderDate,
    s.OrderQuantity,
    p.ProductPrice,
    YEAR(s.OrderDate) AS Year,
    CASE
      WHEN s.OrderDate = fp.FirstOrderDate THEN 'New Customer'
      ELSE 'Returning Customer'
    END AS CustomerType
  FROM Sales s
  JOIN Products p ON s.ProductKey = p.ProductKey
  JOIN FirstPurchase fp ON s.CustomerKey = fp.CustomerKey
)
SELECT
  Year,
  CustomerType,
  COUNT(DISTINCT CustomerKey) AS UniqueCustomers,
  COUNT(DISTINCT OrderNumber) AS TotalOrders,
  ROUND(SUM(OrderQuantity * ProductPrice), 2) AS TotalRevenue,
  ROUND((SUM(OrderQuantity * ProductPrice) /
    SUM(SUM(OrderQuantity * ProductPrice))
    OVER (PARTITION BY Year)) * 100, 2) AS RevenueShare_Percent
FROM CustomerType
GROUP BY Year, CustomerType
ORDER BY Year, CustomerType;
```

Year	CustomerType	UniqueCustomers	TotalOrders	TotalRevenue	RevenueShare_Percent
2015	New Customer	2630	2630	6404933.98	100.00
2016	New Customer	7929	7934	5961044.98	63.93
2016	Returning Customer	2341	2761	3363150.37	36.07
2017	New Customer	6857	6860	3802844.36	41.40
2017	Returning Customer	4115	4979	5382593.49	58.60

4115

Strategic Business Conclusions

Revenue Growth Trajectory

45.58% YoY growth in 2016 followed by slight 2017 decline signals need for renewed growth strategies and market expansion.

Product Portfolio Optimization

Bikes drive 95% of revenue but Accessories lead margins at 62.83%. Balance volume and profitability through strategic mix.

Customer Retention Success

Returning customers grew from 36% to 58.6% of revenue by 2017, demonstrating effective loyalty building and repeat purchase patterns.

Geographic Concentration

Australia dominates with $7.4M revenue. Expand US and European presence to diversify geographic risk and capture growth.

Critical Returns Crisis

100%+ return rates in Bikes category and specific products require immediate quality control, sizing accuracy, and fulfillment process review.

High-Value Customer Focus

5,371 high spenders generate 82.61% of revenue. Implement VIP programs and personalized engagement to protect this critical segment.

Next Steps: Address return rate crisis immediately, develop geographic expansion strategy for underperforming regions, optimize product mix to balance volume and margin, and enhance high-value customer retention programs.