Pet Supply Store eCommerce Analysis

```sql
-- Total number of sales
SELECT COUNT(*) FROM sales
```

count bigint 🔒
24505

```sql
-- Top 5 customers (in terms of sales revenue)
SELECT s.customer_id as customer, SUM(round(sales::numeric,2)) as sales
FROM sales s LEFT JOIN customers c USING (customer_id)
GROUP BY s.customer_id
ORDER BY SUM(sales::numeric) DESC
LIMIT 5;
```

customer 🔒 text	sales 🔒 numeric
15098	42867.00
14646	24417.84
17450	24324.06
18102	21791.64
17511	17716.68

```sql
-- Top 5 customers (in terms of # of sales transactions)
SELECT s.customer_id as customer, COUNT(sales) as no_of_sales
FROM sales s LEFT JOIN customers c USING (customer_id)
GROUP BY s.customer_id
ORDER BY COUNT(sales) DESC
LIMIT 5;
```

customer 🔒 text	no_of_sales 🔒 bigint
17841	277
14911	268
12748	133
13089	129
14096	119

```sql
-- Top 5 products (in terms of sales revenue)
SELECT p.description as product, SUM(sales::numeric) as sales
FROM SALES s JOIN PRODUCTS p USING (stock_code)
GROUP BY p.description
ORDER BY SUM(sales::numeric) DESC
LIMIT 5;
```

product text	sales numeric
Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	264233.58
Memory Foam Pet Beds for Small, Medium, and Large Dogs and Cats	126669.54
Dog and Puppy Pads	116333.10
Earth Rated Dog Poop Bags	107486.22
Litter Slide Multi-Cat Scented Clumping Clay Cat Litter	72180.60

```sql
-- Top 5 products (in terms of # of sales transactions)
SELECT p.description as product, COUNT(sales) as no_of_sales
FROM SALES s JOIN PRODUCTS p USING (stock_code)
GROUP BY p.description
ORDER BY COUNT(sales) DESC
LIMIT 5;
```

product text	no_of_sales bigint
Dog and Puppy Pads	2288
Earth Rated Dog Poop Bags	2110
Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	2036
Memory Foam Pet Beds for Small, Medium, and Large Dogs and Cats	1700
Pet Grooming Brush	1582

```sql
-- What region, state and city had the highest revenue? (Top 5 for state and
city)
SELECT region, SUM(sales::numeric) as sales
FROM sales s LEFT JOIN customers c USING (customer_id)
GROUP BY region
HAVING region IS NOT NULL   --Filtering out guests
ORDER BY SUM(sales) DESC;
```

Filtering guest customers

region text	sales numeric
East	515329.38
Central	389915.28
West	290082.36
Other	10191.66

Without filtering guest customers, we can see guest customers account for a large number of sales. Guest customers region shows as [null] since we don't have their information.

region text	sales numeric
East	515329.38
Central	389915.28
[null]	325508.10
West	290082.36
Other	10191.66

```sql
SELECT order_state as state, SUM(sales::numeric) as sales
FROM sales s LEFT JOIN customers c USING (customer_id)
GROUP BY order_state
HAVING order_state IS NOT NULL   --Filtering out guests
ORDER BY SUM(sales) DESC
LIMIT 5;
```

Filtering guest customers

state text	sales numeric
CA	171149.94
FL	104931.18
TX	96805.02
MA	87851.28
NJ	64759.80

```sql
SELECT order_city as city, order_state as state, SUM(round(sales::numeric,2)) as
sales
FROM sales s LEFT JOIN customers c USING (customer_id)
GROUP BY order_city, order_state
HAVING order_city IS NOT NULL   --Filtering out guests
ORDER BY SUM(sales) DESC
LIMIT 5;
```

Filtering out guest customers

city text	state text	sales numeric
West Newton	MA	42867.00
Chicago	IL	29721.48
Austin	TX	25230.90
Los Angeles	CA	22147.08
Shoreline	WA	21791.64

```sql
-- Which products got more returns?
SELECT DISTINCT(p.description),
SUM(ROUND(sales::numeric,2)) OVER (PARTITION BY p.description) as sales_returns
FROM SALES s JOIN PRODUCTS p USING (stock_code)
WHERE invoice_no = 'return'
ORDER BY sales_returns
LIMIT 5;
```

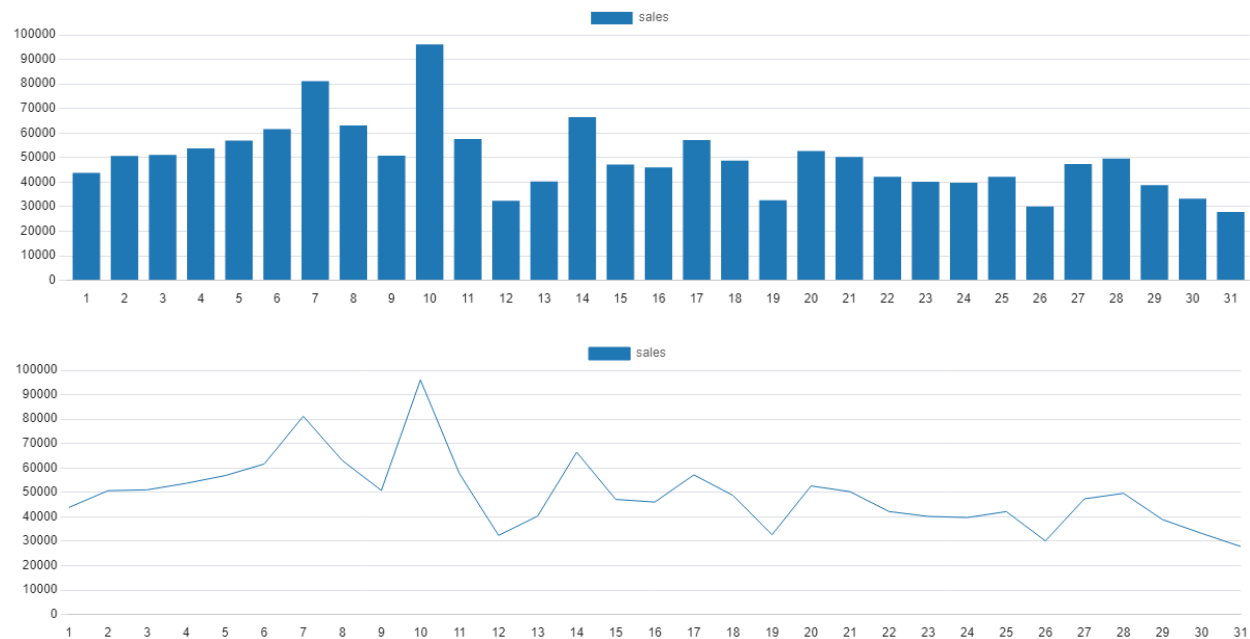| description text	sales_returns numeric
Dog and Puppy Pads	-6479.70
Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	-6130.80
Earth Rated Dog Poop Bags	-1802.76
Purina Pro Plan Adult Sensitive Skin	-1484.82
Litter Slide Multi-Cat Scented Clumping Clay Cat Litter	-1106.40

```sql
-- Which days of the month generate more sales?
SELECT day, SUM(sales::numeric) as sales
FROM sales
GROUP BY day
ORDER BY SUM(sales) DESC
LIMIT 5;
```

day text	sum numeric
10	96032.94
7	81154.02
14	66439.02
8	63024.48
6	61603.50

```sql
-- Which days of the month generate less sales?
SELECT day, SUM(sales::numeric) as sales
FROM sales
GROUP BY day
ORDER BY SUM(sales)
LIMIT 5;
```

day text	sales numeric
31	27823.14
26	30124.92
12	32385.42
19	32658.30
30	33205.32

It seems the days with higher sales are usually in the first half of the month.

```
-- Which days of the week generate more sales?
SELECT day_of_week, SUM(sales::numeric) as sales
FROM sales
GROUP BY day_of_week
ORDER BY SUM(sales) DESC
```

day_of_week text	sales numeric
Wednesday	310612.86
Monday	309464.46
Thursday	290960.22
Tuesday	271604.70
Sunday	237070.68
Saturday	111313.86

We can see weekdays generate more sales than weekends.

```
-- Which months generate more sales?
SELECT month, SUM(sales::numeric) as sales
FROM sales
GROUP BY month
ORDER BY SUM(sales) DESC
```

month text	sales numeric
November	240957.36
December	189022.74
June	154885.98
October	140735.34
May	131795.22
September	122551.14
July	114431.28
August	114203.52
March	100472.16
January	80812.26
April	71401.38
February	69758.40

We can see Nov/Dec (holiday season) as the months with more sales.

```
-- Top 5 highest shipping cost products?
SELECT description as product, weight, shipping_cost_1000_mile
FROM products
ORDER BY shipping_cost_1000_mile DESC
LIMIT 5;
```

product text	weight double precision	shipping_cost_1000_mile double precision
Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	40	20
Memory Foam Pet Beds for Small, Medium, and Large Dogs and Cats	6	12
Purina Pro Plan Adult Sensitive Skin	15	10
Purina ONE SmartBlend Natural Adult Chicken 10lb	10	10
Litter Slide Multi-Cat Scented Clumping Clay Cat Litter	7	9

```
-- Correlation between product weight and shipping cost?
SELECT round(corr(weight, shipping_cost_1000_mile)::numeric,2) as
weight_shipping_corr
FROM products
```

weight_shipping_corr numeric
0.91

As expected, there is a high correlation between the product's weight and shipping cost.

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Market Basket Analysis

As a last step, we'll calculate the product association and confidence taking as guide this very useful article: https://medium.com/@samratjain/explained-market-basket-analysis-using-sql-a7434f30e649

Confidence basically states what is the probability of buying product_A given that you bought product_B and the formula is:

Confidence (A -> B) = Support of A and B / Support of B

Where:

      Support of A= Number of transactions A was bought in
      Support of A and B= Number of transactions A and B was bought together in

*Be aware that C(A -> B) is not the same as C(B -> A)

```sql
-- Product association and confidence of buying product 1 given customer bought
product 2
WITH product_association AS
(
    SELECT product_1, product_2, COUNT(transaction) as transaction_count
    FROM
    (
        SELECT s1.invoice_no as transaction, s1.description as product_1,
s2.description as product_2, s2.invoice_no
        FROM sales s1, sales s2
        WHERE s1.invoice_no = s2.invoice_no
        AND s1.description <> s2.description
        AND s1.description < s2.description
        ORDER BY s1.description
    ) as temp
    GROUP BY product_1, product_2
),
 transactions_per_product AS
(
    SELECT description as product, COUNT(*) as no_of_transactions
    FROM sales
    GROUP BY description
)
SELECT product_1, product_2,
round(transaction_count/no_of_transactions::numeric,2) AS conf_p1_given_p2 --
conf(p1->p2) = support of p1 and p2/support of p2
FROM product_association pa, transactions_per_product tp
WHERE pa.product_2 = tp.product
ORDER BY conf_p1_given_p2 DESC
```

product_1 text	product_2 text	conf_p1_given_p2 numeric
Earth Rated Dog Poop Bags	Milk-Bone MaroSnacks Dog Treats with Real Bone	0.75
Earth Rated Dog Poop Bags	Pet Hair Remover	0.56
Earth Rated Dog Poop Bags	Pet Grooming Brush	0.50
Earth Rated Dog Poop Bags	Rechargeable Pet Nail Grinder	0.45
Memory Foam Pet Beds for Small, Medium, and Lar…	Purina ONE SmartBlend Natural Adult Chicken 10lb	0.45
Earth Rated Dog Poop Bags	Indoor Pet Camera	0.44
Earth Rated Dog Poop Bags	Taste of the Wild High Prairie Grain-Free Dry Dog Fo…	0.42
Rechargeable Pet Nail Grinder	Taste of the Wild High Prairie Grain-Free Dry Dog Fo…	0.42
Memory Foam Pet Beds for Small, Medium, and Lar…	Taste of the Wild High Prairie Grain-Free Dry Dog Fo…	0.41
Earth Rated Dog Poop Bags	Sheba Perfect Portions Paté Wet Cat Food	0.41

Now doing from the other direction:

```sql
-- Product association and confidence of buying product 2 given customer bought
product 1
WITH product_association AS
(
    SELECT product_1, product_2, COUNT(transaction) as transaction_count
    FROM
    (
        SELECT s1.invoice_no as transaction, s1.description as product_1,
s2.description as product_2, s2.invoice_no
        FROM sales s1, sales s2
        WHERE s1.invoice_no = s2.invoice_no
        AND s1.description <> s2.description
        AND s1.description < s2.description
        ORDER BY s1.description
    ) as temp
    GROUP BY product_1, product_2
),
transactions_per_product AS
(
    SELECT description as product, COUNT(*) as no_of_transactions
    FROM sales
    GROUP BY description
)
SELECT product_1, product_2,
round(transaction_count/no_of_transactions::numeric,2) AS conf_p2_given_p1 --
conf(p2->p1) = support of p1 and p2/support of p1
FROM product_association pa, transactions_per_product tp
WHERE pa.product_1 = tp.product
ORDER BY conf_p2_given_p1 DESC
```

product_1 text	product_2 text	conf_p2_given_p1 numeric
Rechargeable Pet Nail Grinder	Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	0.75
Sheba Perfect Portions Paté Wet Cat Food	Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	0.52
Pet Grooming Brush	Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	0.52
Memory Foam Pet Beds for Small, Medium, and Lar...	Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	0.49
Litter Slide Multi-Cat Scented Clumping Clay Cat Lit...	Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	0.46
Earth Rated Dog Poop Bags	Milk-Bone MaroSnacks Dog Treats with Real Bone	0.44
Earth Rated Dog Poop Bags	Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	0.41
Pet Hair Remover	Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	0.39
Earth Rated Dog Poop Bags	Pet Grooming Brush	0.38
Dog and Puppy Pads	Taste of the Wild High Prairie Grain-Free Dry Dog Food 40lb	0.36