Atliq Hardware Business Analysis

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1. Data Exploration using Python Pandas

Connect to database and read dim tables

```
# import necessary libraries
from sqlalchemy import create_engine
import pandas as pd

# Connect with MySql database
engine = create_engine("mysql+pymysql://root:root@localhost:3306/gdb0041")
conn = engine.connect()

# Read in dimension tables
dim_customer = pd.read_sql("dim_customer", conn)
dim_product = pd.read_sql("dim_product", conn)

# Sample rows from dim_customer
dim_customer.sample(3)
```

	customer_code	customer	platform	channel market	sub_zone	region

	customer_code	customer	platform	channel market	sub_zone	region
109	90012040	Fnac-Darty	Brick & Mortar	Retailer	Germany	NE
197	90023024	Sage	Brick & Mortar	Retailer	Canada	NA
121	90014136	Reliance Digital	Brick & Mortar	Retailer	Netherlands	NE

No of unique customers and countries(markets)

```
# No of unique customers and countries
for column in ["customer", "market"]:
    print(f"No of unique {column}s: {dim_customer[column].nunique()}")
```

> No of unique customers: 75

> No of unique markets: 27

What are different platforms, channels, sub_zones, regions

```
# different platforms, channels, sub_zones, regions
for column in ["platform", "channel", "sub_zone", "region"]:
    print(f"{column}s -> {dim_customer[column].unique()}")
```

> platforms -> ['Brick & Mortar' 'E-Commerce']

> channels -> ['Direct' 'Distributor' 'Retailer']

> sub_zones -> ['India' 'ROA' 'ANZ' 'SE' 'NE' 'NA' 'LATAM']

> regions -> ['APAC' 'EU' 'NA' 'LATAM']

```
# sample rows from dim_product table
dim_product = pd.read_sql("dim_product", conn)
dim_product.sample(3)
```

	product_code	division	segment	category	product	variant
218	A4319110304	PC	Notebook	Personal Laptop	AQ Velocity	Plus Grey
380	A6818160202	N & S	Storage	USB Flash Drives	AQ Pen Drive DRC	Plus

> | | product_code | division | segment | category | product | variant |
> |---|---|---|---|---|---|---|
> | 292 | A5318110104 | PC | Notebook | Gaming Laptop | AQ Gamer 1 | Plus Firey Red |

What are different divisions, segments and catogories

```
# Divisions, segments and category
for column in ["division", "segment", "category"]:
    print(f"{column} ({dim_product[column].nunique()}) ->
{dim_product[column].unique()}")
```

> division (3) -> ['P & A' 'PC' 'N & S']

> segment (6) -> ['Peripherals' 'Accessories' 'Notebook' 'Desktop' 'Storage' 'Networking']

> category (14) -> ['Internal HDD' 'Graphic Card' 'Processors' 'MotherBoard' 'Mouse' 'Keyboard' 'Batteries' 'Personal Laptop' 'Business Laptop' 'Gaming Laptop' 'Personal Desktop' 'External Solid State Drives' 'USB Flash Drives' 'Wi fi extender']

```
# no of products per category
dim_product[["category",
"product"]].groupby("category").count().sort_values("product", ascending=False)
```

> | category | product |
> |---|---|
> | Personal Laptop | 61 |
> | Keyboard | 48 |
> | Mouse | 48 |
> | Business Laptop | 44 |
> | Gaming Laptop | 40 |
> | Graphic Card | 36 |
> | Batteries | 20 |
> | MotherBoard | 20 |
> | Processors | 18 |
> | Personal Desktop | 16 |
> | External Solid State Drives | 15 |
> | USB Flash Drives | 12 |
> | Internal HDD | 10 |

> | category | product |
> |---|---|
> | Wi fi extender | 9 |

Read in all the fact tables and give column names and no of rows for each table

```
# Read in fact tables in database
fact_sales_monthly = pd.read_sql("fact_sales_monthly", conn)
fact_forecast_monthly = pd.read_sql("fact_forecast_monthly", conn)
fact_freight_cost = pd.read_sql("fact_freight_cost", conn)
fact_gross_price = pd.read_sql("fact_gross_price", conn)
fact_manufacturing_cost = pd.read_sql("fact_manufacturing_cost", conn)
fact_pre_invoice_deductions = pd.read_sql("fact_pre_invoice_deductions", conn)
fact_post_invoice_deductions = pd.read_sql("fact_post_invoice_deductions", conn)

# Dictionary of tables and tables names
dict_of_tables = {"fact_sales_monthly": fact_sales_monthly,
"fact_forecast_monthly": fact_forecast_monthly,
                 "fact_freight_cost": fact_freight_cost, "fact_gross_price":
fact_gross_price,
                 "fact_manufacturing_cost": fact_manufacturing_cost,
"fact_pre_invoice_deductions": fact_pre_invoice_deductions,
                 "fact_post_invoice_deductions": fact_post_invoice_deductions}

# A function to print column names and no of rows
def give_columns_nrows(df, name):
    print(name)
    print(f"columns -> {list(df.columns)}")
    print(len(df))
    print("---------------------------------------------------\n")

for key, value in dict_of_tables.items():
    give_columns_nrows(value, key)
```

```
fact_sales_monthly
columns -> ['date', 'product_code', 'customer_code', 'sold_quantity']
1425706
---------------------------------------------------

fact_forecast_monthly
columns -> ['date', 'fiscal_year', 'product_code', 'customer_code',
'forecast_quantity']
1885941
---------------------------------------------------

fact_freight_cost
columns -> ['market', 'fiscal_year', 'freight_pct', 'other_cost_pct']
135
---------------------------------------------------
```

```
fact_gross_price
columns -> ['product_code', 'fiscal_year', 'gross_price']
1182
---------------------------------------------------

fact_manufacturing_cost
columns -> ['product_code', 'cost_year', 'manufacturing_cost']
1182
---------------------------------------------------

fact_pre_invoice_deductions
columns -> ['customer_code', 'fiscal_year', 'pre_invoice_discount_pct']
1045
---------------------------------------------------

fact_post_invoice_deductions
columns -> ['customer_code', 'product_code', 'date', 'discounts_pct',
'other_deductions_pct']
2063076
---------------------------------------------------
```

2. Finance Analytics

Task 1: Generate a report of individual product sales for Croma India

Generate a report of individual product sales (aggregated on a monthly basis at the product code level) for Croma India customer for FY=2021. Atliq's fiscal year starts in September. The report should have the following fields.

1. Month
2. Product Name
3. Variant
4. Sold Quantity
5. Gross Price per Item
6. Gross Price total

```
-- User defined function to get fiscal year
CREATE FUNCTION `get_fiscal_year` (calendar_date DATE)
    RETURNS INTEGER
DETERMINISTIC
BEGIN
    DECLARE fiscal_year INT;
    SET fiscal_year = YEAR(DATE_ADD(calendar_date, INTERVAL 4 MONTH));
    RETURN fiscal_year;
END

-- filter fact_monthly_sales by customer_id of croma india
WITH cte AS(
    SELECT customer_code
    FROM dim_customer
    WHERE customer LIKE '%croma%' AND market LIKE '%india%'
)
SELECT
    MONTH(s.date) AS month, p.product, p.variant, s.sold_quantity,
    ROUND(g.gross_price, 2) AS gross_price,
    ROUND(s.sold_quantity*g.gross_price, 2) AS gross_price_total
FROM fact_sales_monthly s JOIN dim_product p
ON s.product_code = p.product_code
JOIN fact_gross_price g
ON  g.product_code = s.product_code AND
g.fiscal_year = get_fiscal_year(s.date)
WHERE
    customer_code = (SELECT * FROM cte) AND
    get_fiscal_year(date) = 2021
ORDER BY date ASC;
```

> | month | product | variant | sold_quantity | gross_price | gross_price_total |
> |---|---|---|---|---|---|
> | 9 | AQ Dracula HDD – 3.5 Inch SATA 6 Gb/s 5400 RPM 256 MB Cache | Standard | 202 | 19.06 | 3849.57 |
> | 9 | AQ Dracula HDD – 3.5 Inch SATA 6 Gb/s 5400 RPM 256 MB Cache | Plus | 162 | 21.46 | 3475.95 |
> | 9 | AQ Dracula HDD – 3.5 Inch SATA 6 Gb/s 5400 RPM 256 MB Cache | Premium | 193 | 21.78 | 4203.44 |
> | ... | ... | ... | ... | ... | ... |

> Table exported to a csv file `croma_2021_all_txn.csv`

Task 2: Aggregated monthly gross sales report for Croma

Create aggregated monthly gross sales report for Croma India customer. The report should have following fields.

1. Month
2. Total gross sales amount to chroma india in that month

```
WITH cte AS(
    SELECT customer_code
    FROM dim_customer
    WHERE customer LIKE '%croma%' AND market LIKE '%india%'
)
SELECT
    DATE_FORMAT(s.date, '%m-%Y') AS month,
    SUM(s.sold_quantity*g.gross_price) AS gross_price_total
FROM fact_sales_monthly s JOIN fact_gross_price g
```

```
ON  g.product_code = s.product_code AND
    g.fiscal_year = get_fiscal_year(s.date)
WHERE
    customer_code = (SELECT * FROM cte)
GROUP BY month;
```

> | month | gross_price_total |
> |---|---|
> | 09-2017 | 122407.5582 |
> | 10-2017 | 162687.5716 |
> | 12-2017 | 245673.8042 |
> | ... | ... |

> Table exported to a csv file `croma_monthly_total_sales.csv`

Task 3: Generate a yearly report for Croma India

Generate a yearly report for Croma India where there are two columns

1. Fiscal Year
2. Total Gross Sales amount In that year from Croma

```
WITH cte AS(
    SELECT customer_code
    FROM dim_customer
    WHERE customer LIKE '%croma%' AND market LIKE '%india%'
)
SELECT
    get_fiscal_year(s.date) AS fiscal_year,
    SUM(s.sold_quantity*g.gross_price) AS gross_price_total
FROM fact_sales_monthly s JOIN fact_gross_price g
ON  g.product_code = s.product_code AND
    g.fiscal_year = get_fiscal_year(s.date)
WHERE
    customer_code = (SELECT * FROM cte)
GROUP BY fiscal_year;
```

> | fiscal_year | gross_price_total |
> |---|---|
> | 2018 | 1324097.4432 |
> | 2019 | 3555079.0199 |
> | 2020 | 6502181.9143 |
> | 2021 | 23216512.2215 |
> | 2022 | 44638198.9219 |

> Table exported to a csv file `croma_yearly_total_sales.csv`

Task 4: Stored procedure to get monthly gross sales report

Create a stored procedure to get monthly gross sales report for any customer

```
CREATE PROCEDURE `get_monthly_gross_sales_for_customer` (c_code INT)
BEGIN
    SELECT
        DATE_FORMAT(s.date, '%m-%Y') AS month,
        ROUND(SUM(s.sold_quantity*g.gross_price),2) AS gross_price_total
    FROM fact_sales_monthly s JOIN fact_gross_price g
    ON  g.product_code = s.product_code AND
        g.fiscal_year = get_fiscal_year(s.date)
    WHERE
        customer_code = c_code
        GROUP BY month
        ORDER BY month ASC;
END
```

Task 5: Stored procedure to determine the market badge

Create a stored procedure that can determine the market badge based on the following logic.

If *total_sold_quantity* > *5 million* that market is considered *Gold* else it is *Silver*

Input to the stored proc will be:

- market
- fiscal_year

Output

- market_badge

```
CREATE PROCEDURE `get_market_badge`(
    IN in_market VARCHAR(45),
    IN in_fiscal_year YEAR,
    OUT out_badge VARCHAR(20)
)
BEGIN
    DECLARE qty INT DEFAULT 0;

    # set default market to be india
    IF in_market = "" THEN
        SET in_market = "india";
    END IF;

    # retrieve total qty for a given market + fyear
    SELECT SUM(sold_quantity) INTO qty
    FROM fact_sales_monthly s JOIN dim_customer c
    ON s.customer_code = c.customer_code
    WHERE
        get_fiscal_year(s.date) = in_fiscal_year AND
        c.market = in_market
    GROUP BY c.market;

    # determine market badge
    IF qty > 5000000 THEN
        SET out_badge = "Gold";
       ELSE
        SET out_badge = "Silver";
    END IF;
END
```

3. Top Customers, Products, Markets

Task 1: Create a generated column `fiscal_year`

Add a generated column `fiscal_year` to `fact_sales_monthly` table for query optimization and performance improvement.

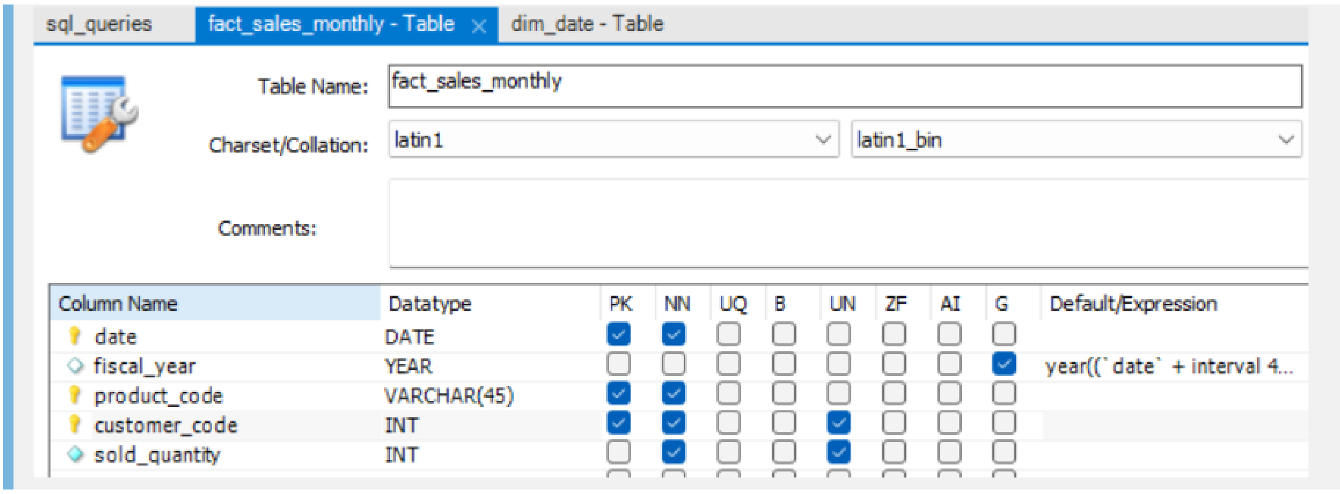


Table Name: fact_sales_monthly

Charset/Collation: latin1 latin1_bin

Comments:

Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
date	DATE	☑	☑	□	□	□	□	□	□	
fiscal_year	YEAR	□	□	□	□	□	□	□	☑	year((`date` + interval 4...
product_code	VARCHAR(45)	☑	☑	□	□	□	□	□	□	
customer_code	INT	☑	☑	□	□	☑	□	□	□	
sold_quantity	INT	□	☑	□	□	☑	□	□	□	

Task 2: Create `database views`

Create following `database views`.

- `sales_preinv_discount`
- `sales_postinv_discount`
- `net_sales`

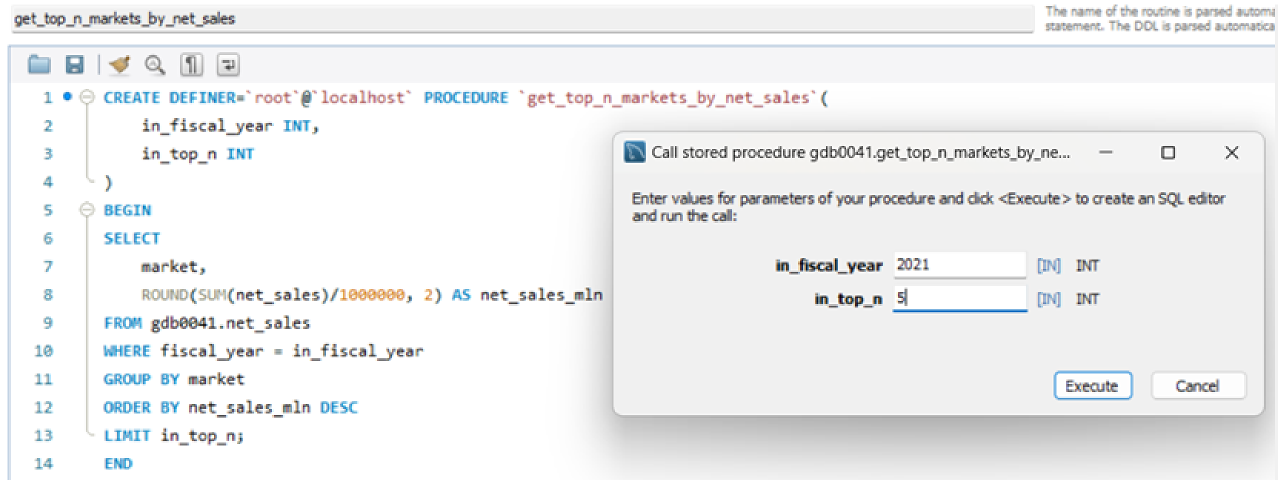
```
-- database view #sales_preinv_discount
CREATE VIEW `sales_preinv_discount` AS
SELECT
    s.date, s.fiscal_year,
    s.customer_code, s.market, s.product_code,
    p.product, p.variant,
    s.sold_quantity,
    g.gross_price AS gross_price_per_item,
    ROUND(s.sold_quantity * g.gross_price, 2) AS gross_price_total,
    pre.pre_invoice_discount_pct
FROM fact_sales_monthly s
JOIN dim_customer c
    ON s.customer_code = c.customer_code
JOIN dim_product p
    ON s.product_code = p.product_code
JOIN fact_gross_price g
    ON g.fiscal_year = s.fiscal_year
    AND g.product_code = s.product_code
JOIN fact_pre_invoice_deductions AS pre
    ON pre.customer_code = s.customer_code
    AND pre.fiscal_year = s.fiscal_year

-- database view #sales_postinv_discount
CREATE VIEW sales_postinv_discount AS
SELECT
    s.date, s.fiscal_year,
    s.customer_code, s.market,
    s.product_code, s.product,
    s.variant, s.sold_quantity,
    s.gross_price_total,
    s.pre_invoice_discount_pct,
    (s.gross_price_total - (s.pre_invoice_discount_pct * s.gross_price_total)) AS
net_invoice_sales,
    (po.discounts_pct + po.other_deductions_pct) AS post_invoice_discount_pct
FROM
    sales_preinv_discount s
    JOIN fact_post_invoice_deductions po
        ON po.customer_code = s.customer_code
        AND po.product_code = s.product_code
        AND po.date = s.date

-- database view # net_sales
CREATE VIEW `net_sales` AS
SELECT *,
    (1 - post_invoice_discount_pct)*net_invoice_sales as net_sales
FROM sales_postinv_discount;
```

Task 3: Query top 5 markets by net sales in fy 2021

```
SELECT
    market,
    ROUND(SUM(net_sales)/1000000, 2) AS net_sales_mln
FROM gdb0041.net_sales
WHERE fiscal_year = 2021
GROUP BY market
ORDER BY net_sales_mln DESC
LIMIT 5
```

market	net_sales_mln
India	210.67
USA	132.05
South Korea	64.01
Canada	45.89
United Kingdom	44.73

Also a stored procedure was created which will query *top n markets* in given *fiscal year*



get_top_n_markets_by_net_sales

The name of the routine is parsed automa statement. The DDL is parsed automatica

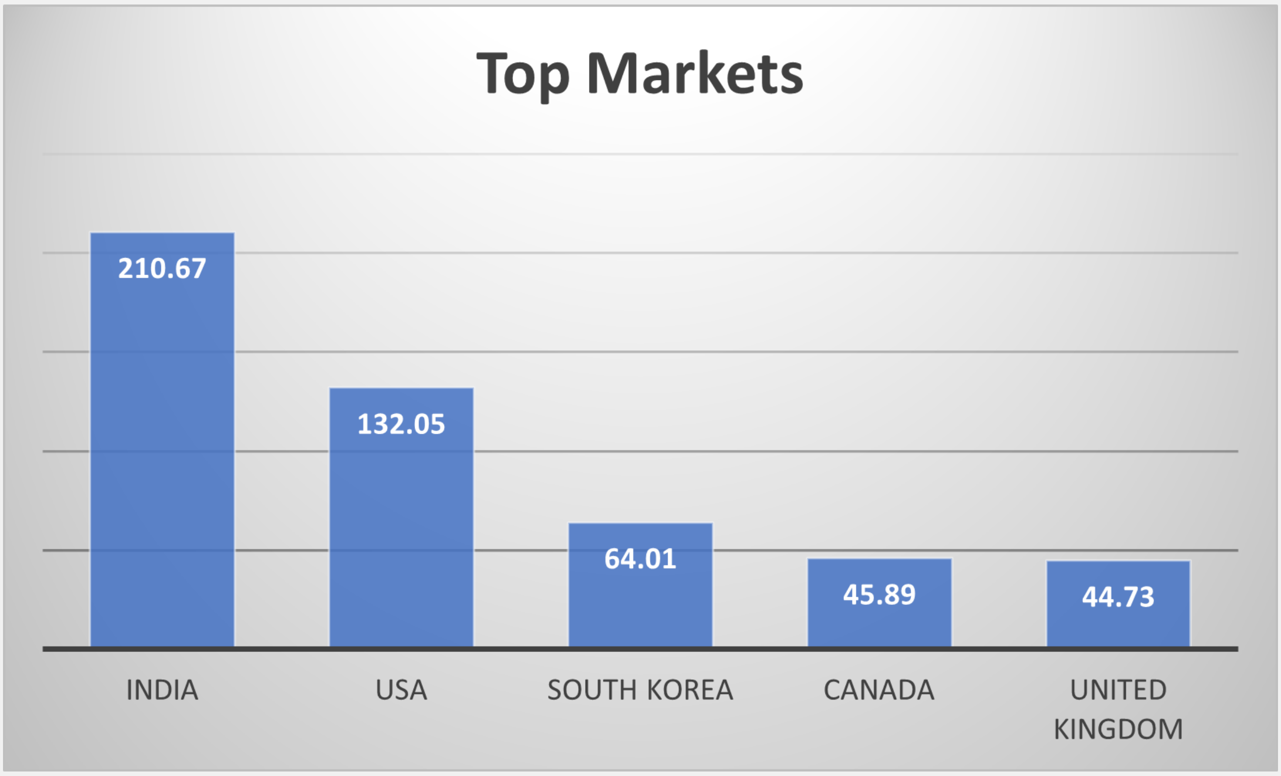
```
CREATE DEFINER=`root`@`localhost` PROCEDURE `get_top_n_markets_by_net_sales`(
    in_fiscal_year INT,
    in_top_n INT
)
BEGIN
SELECT
    market,
    ROUND(SUM(net_sales)/1000000, 2) AS net_sales_mln
FROM gdb0041.net_sales
WHERE fiscal_year = in_fiscal_year
GROUP BY market
ORDER BY net_sales_mln DESC
LIMIT in_top_n;
END
```

Call stored procedure gdb0041.get_top_n_markets_by_ne...

Enter values for parameters of your procedure and click <Execute> to create an SQL editor and run the call:

in_fiscal_year 2021 [IN] INT

in_top_n 5 [IN] INT



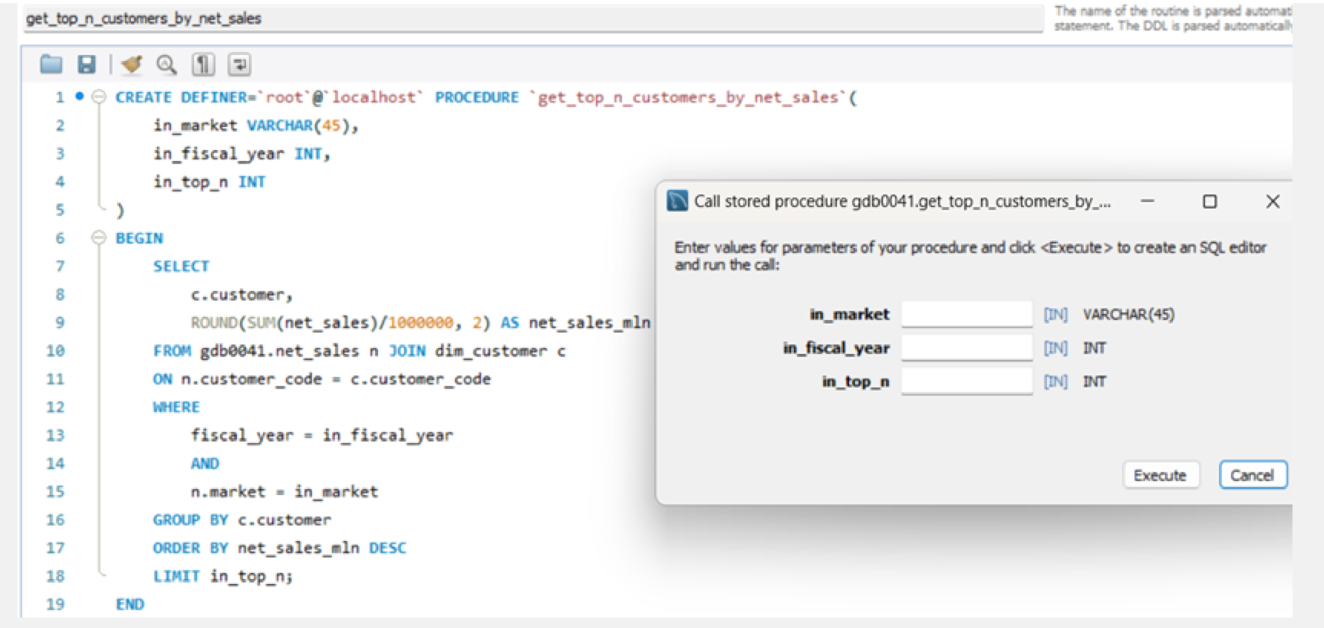
Task 4: Top 5 customers by net_sales for fy 2021

```
SELECT c.customer, ROUND(SUM(net_sales)/1000000, 2) AS net_sales_mln
FROM gdb0041.net_sales n JOIN dim_customer c
ON n.customer_code = c.customer_code
```

```
WHERE fiscal_year = 2021
GROUP BY c.customer
ORDER BY net_sales_mln DESC
LIMIT 5;
```

customer	net_sales_mln
Amazon	109.03
Atliq Exclusive	79.92
Atliq e Store	70.31
Sage	27.07
Flipkart	25.25

Also a stored procedure was created which will query *top n customers* in given *fiscal year* & *market*



get_top_n_customers_by_net_sales
The name of the routine is parsed automat
statement. The DDL is parsed automaticall

```
CREATE DEFINER=`root`@`localhost` PROCEDURE `get_top_n_customers_by_net_sales`(
    in_market VARCHAR(45),
    in_fiscal_year INT,
    in_top_n INT
)
BEGIN
    SELECT
        c.customer,
        ROUND(SUM(net_sales)/1000000, 2) AS net_sales_mln
    FROM gdb0041.net_sales n JOIN dim_customer c
    ON n.customer_code = c.customer_code
    WHERE
        fiscal_year = in_fiscal_year
        AND
        n.market = in_market
    GROUP BY c.customer
    ORDER BY net_sales_mln DESC
    LIMIT in_top_n;
END
```

Call stored procedure gdb0041.get_top_n_customers_by_...

Enter values for parameters of your procedure and click <Execute> to create an SQL editor and run the call:

in_market		[IN]	VARCHAR(45)
in_fiscal_year		[IN]	INT
in_top_n		[IN]	INT

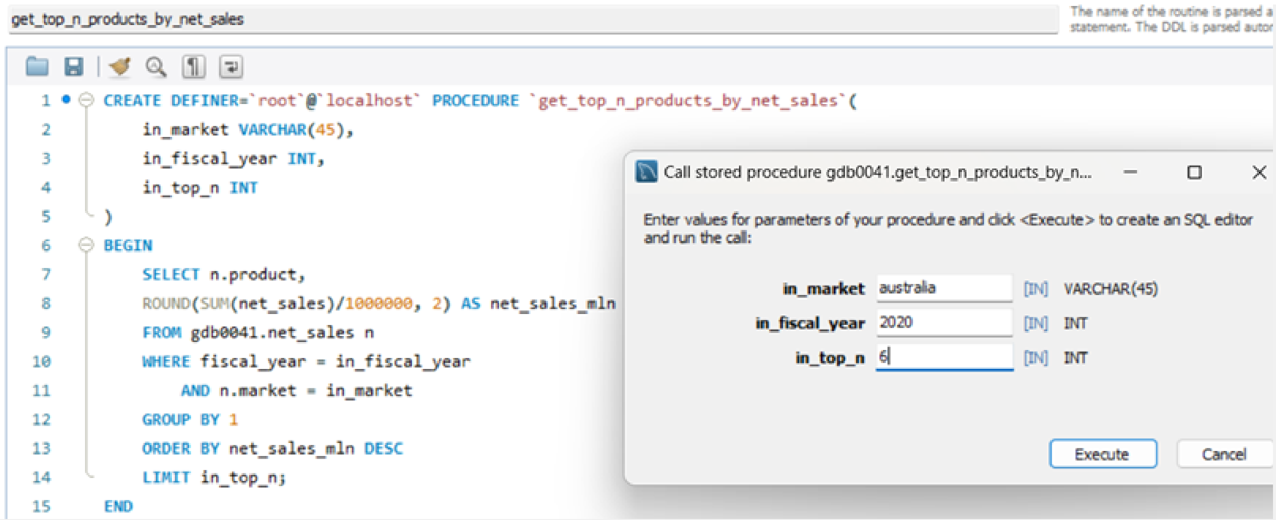
Task 5: Top 5 products by net_sales for fy 2021

```
SELECT product, ROUND(SUM(net_sales)/1000000, 2) AS net_sales_mln
FROM gdb0041.net_sales
WHERE fiscal_year = 2021
GROUP BY product
ORDER BY net_sales_mln DESC
LIMIT 5;
```

product	net_sales_mln
AQ BZ Allin1	33.75
AQ Qwerty	27.84

product	net_sales_mln
AQ Trigger	26.95
AQ Gen Y	23.58
AQ Maxima	22.32

Also a stored procedure was created which will query *top n products* in given *fiscal year* & *market*



get_top_n_products_by_net_sales

The name of the routine is parsed a statement. The DDL is parsed autor

```
CREATE DEFINER=`root`@`localhost` PROCEDURE `get_top_n_products_by_net_sales`(
    in_market VARCHAR(45),
    in_fiscal_year INT,
    in_top_n INT
)
BEGIN
    SELECT n.product,
    ROUND(SUM(net_sales)/1000000, 2) AS net_sales_mln
    FROM gdb0041.net_sales n
    WHERE fiscal_year = in_fiscal_year
        AND n.market = in_market
    GROUP BY 1
    ORDER BY net_sales_mln DESC
    LIMIT in_top_n;
END
```

Call stored procedure gdb0041.get_top_n_products_by_n...

Enter values for parameters of your procedure and click <Execute> to create an SQL editor and run the call:

in_market	australia	[IN]	VARCHAR(45)
in_fiscal_year	2020	[IN]	INT
in_top_n	6	[IN]	INT

Task 6:Top 10 customers by for net sales %

```
WITH cte AS(
SELECT
   c.customer,
   ROUND(SUM(net_sales)/1000000,2) AS net_sales_mln
FROM dim_customer c
JOIN net_sales s
ON c.customer_code=s.customer_code
WHERE s.fiscal_year=2021
GROUP BY c.customer)

SELECT
*,
net_sales_mln*100/SUM(net_sales_mln) OVER() AS pct
FROM cte
ORDER BY net_sales_mln DESC
LIMIT 10;
```

customer	net_sales_mln	pct
Amazon	109.03	13.233402
Atliq Exclusive	79.92	9.70020
Atliq e Store	70.31	8.53380

> | customer | net_sales_mln | pct |
> |---|---|---|
> | Sage | 27.07 | 3.285593 |
> | Flipkart | 25.25 | 3.064692 |
> | Leader | 24.52 | 2.976089 |
> | Neptune | 21.01 | 2.550067 |
> | Ebay | 19.88 | 2.412914 |
> | Electricalsocity | 16.25 | 1.972327 |
> | Synthetic | 16.1 | 1.954121 |

Task 7: Region-wise breakdown of net sales by customers

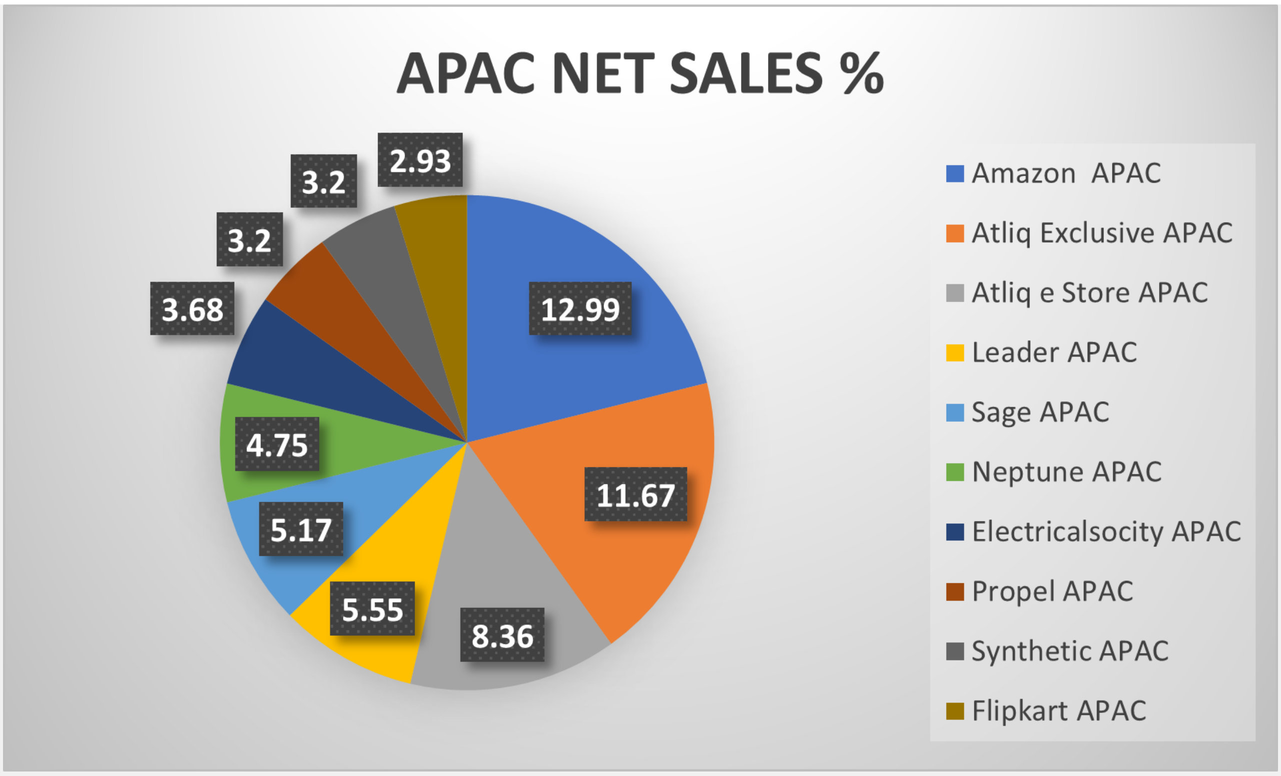
Create region wise (APAC, EU, LTAM etc) % net sales breakdown by customers in a respective region so regional analysis can be performed.

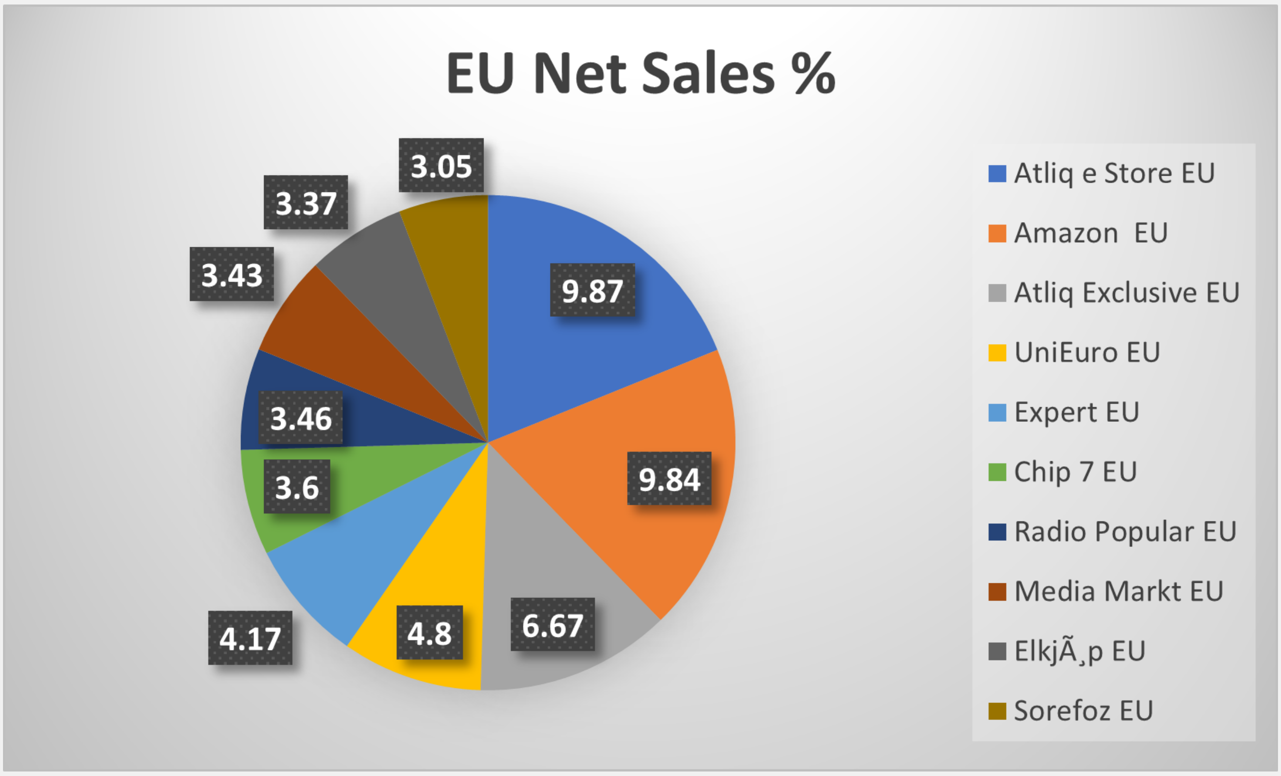
The end result should be Pie Chart in the following format for fy 2021. Build a reusable asset that we can use to conduct this analysis for any financial year.

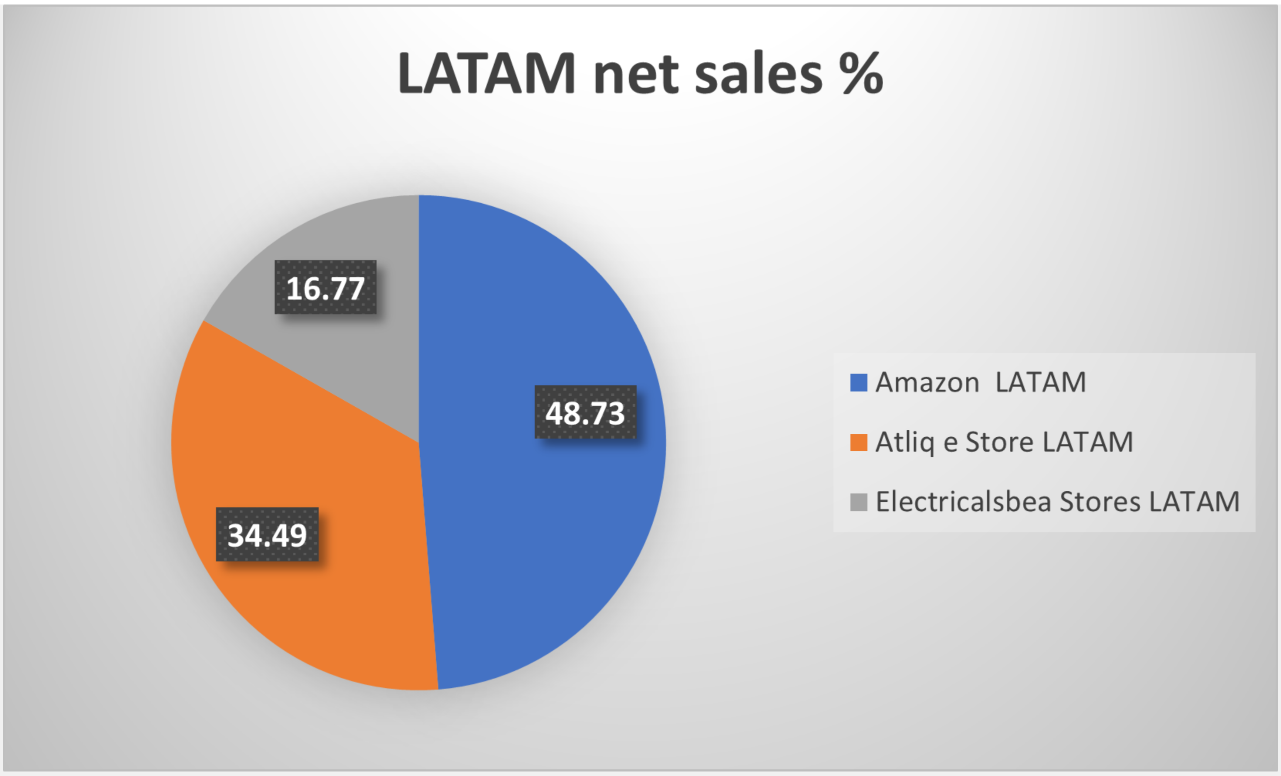
```
WITH cte AS(
SELECT c.customer,c.region,
ROUND(SUM(net_sales)/1000000,2) AS net_sales_mln
FROM dim_customer c
JOIN net_sales s
ON c.customer_code=s.customer_code
WHERE s.fiscal_year=2021
GROUP BY c.region,c.customer)

SELECT *,
net_sales_mln*100/SUM(net_sales_mln) OVER(PARTITION BY region) AS pct
FROM cte
ORDER BY region,net_sales_mln DESC;
```

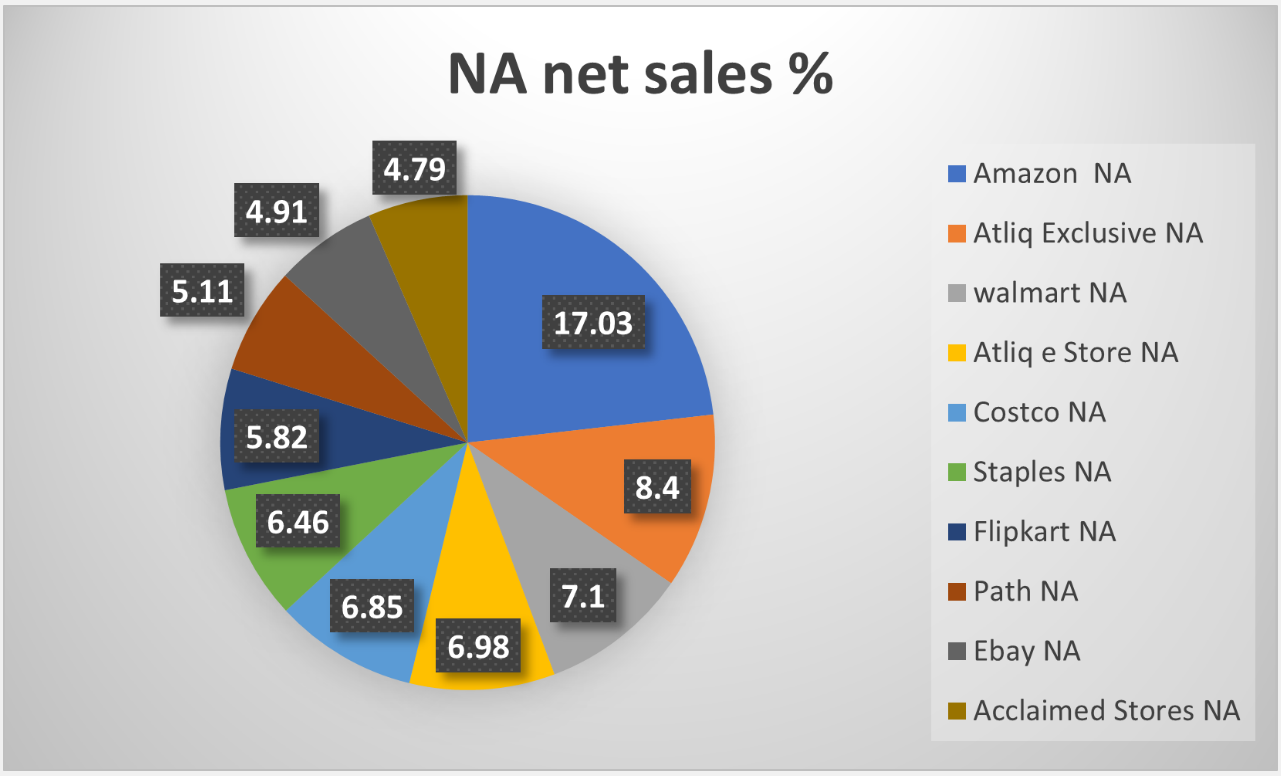
> | customer | region | net_sales_mln | pct_share_region |
> |---|---|---|---|
> | Amazon | APAC | 57.41 | 12.988688 |
> | Atliq Exclusive | APAC | 51.58 | 11.669683 |
> | Atliq e Store | APAC | 36.97 | 8.364253 |
> | Leader | APAC | 24.52 | 5.547511 |
> | ... | ... | ... | ... |

> This report was exported to excel to create charts


APAC NET SALES %
12.99
11.67
8.36
5.55
5.17
4.75
3.68
3.2
3.2
2.93
Amazon APAC
Atliq Exclusive APAC
Atliq e Store APAC
Leader APAC
Sage APAC
Neptune APAC
Electricalsocity APAC
Propel APAC
Synthetic APAC
Flipkart APAC


EU Net Sales %
9.87
9.84
6.67
4.8
4.17
3.6
3.46
3.43
3.37
3.05
Atliq e Store EU
Amazon EU
Atliq Exclusive EU
UniEuro EU
Expert EU
Chip 7 EU
Radio Popular EU
Media Markt EU
ElkjÃ¸p EU
Sorefoz EU





Task 8: Retrieve the top 2 markets in every region by their gross sales amount in FY 2021

```
WITH cte1 AS(
SELECT c.market,c.region,
ROUND(SUM(gross_price_total)/1000000,2) AS gross_sales_mln
FROM gross_sales s
JOIN dim_customer c
ON s.customer_code=c.customer_code
WHERE s.fiscal_year = 2021
GROUP BY c.market,c.region
ORDER BY gross_sales_mln DESC),
cte2 AS(SELECT *,
DENSE_RANK() OVER(PARTITION BY region ORDER BY gross_sales_mln DESC) AS drnk
FROM cte1)

SELECT * FROM cte2 WHERE drnk<=2;
```

> | market | region | gross_sales_mln | rn |
> |---|---|---|---|
> | India | APAC | 455.05 | 1 |
> | South Korea | APAC | 131.86 | 2 |
> | United Kingdom | EU | 78.11 | 1 |
> | France | EU | 67.62 | 2 |
> | Mexico | LATAM | 2.30 | 1 |
> | Brazil | LATAM | 2.14 | 2 |
> | USA | NA | 264.46 | 1 |
> | Canada | NA | 89.78 | 2 |

Task 9: Retrieve the top 3 products in every division by their gross sales amount in FY=2021

```
WITH cte1 AS(SELECT
p.division,
p.product,
SUM(sold_quantity) AS total_qty
FROM fact_sales_monthly s
JOIN dim_product p
ON p.product_code=s.product_code
WHERE fiscal_year=2021
GROUP BY p.product,p.division),

cte2 AS(SELECT *,
DENSE_RANK() OVER(PARTITION BY division ORDER BY total_qty DESC) AS drnk
FROM cte1)

SELECT * FROM cte2 WHERE drnk<=3;
```

division	product	total_qty	drnk
N & S	AQ Pen Drive DRC	2034569	1
N & S	AQ Digit SSD	1240149	2
N & S	AQ Clx1	1238683	3
P & A	AQ Gamers Ms	2477098	1

division	product	total_qty	drnk
P & A	AQ Maxima Ms	2461991	2
P & A	AQ Master wireless x1 Ms	2448784	3
PC	AQ Digit	135092	1
PC	AQ Gen Y	135031	2
PC	AQ Elite	134431	3

4. Ad-hoc Queries, Data Visualization & Business Insights (using Python Pandas)

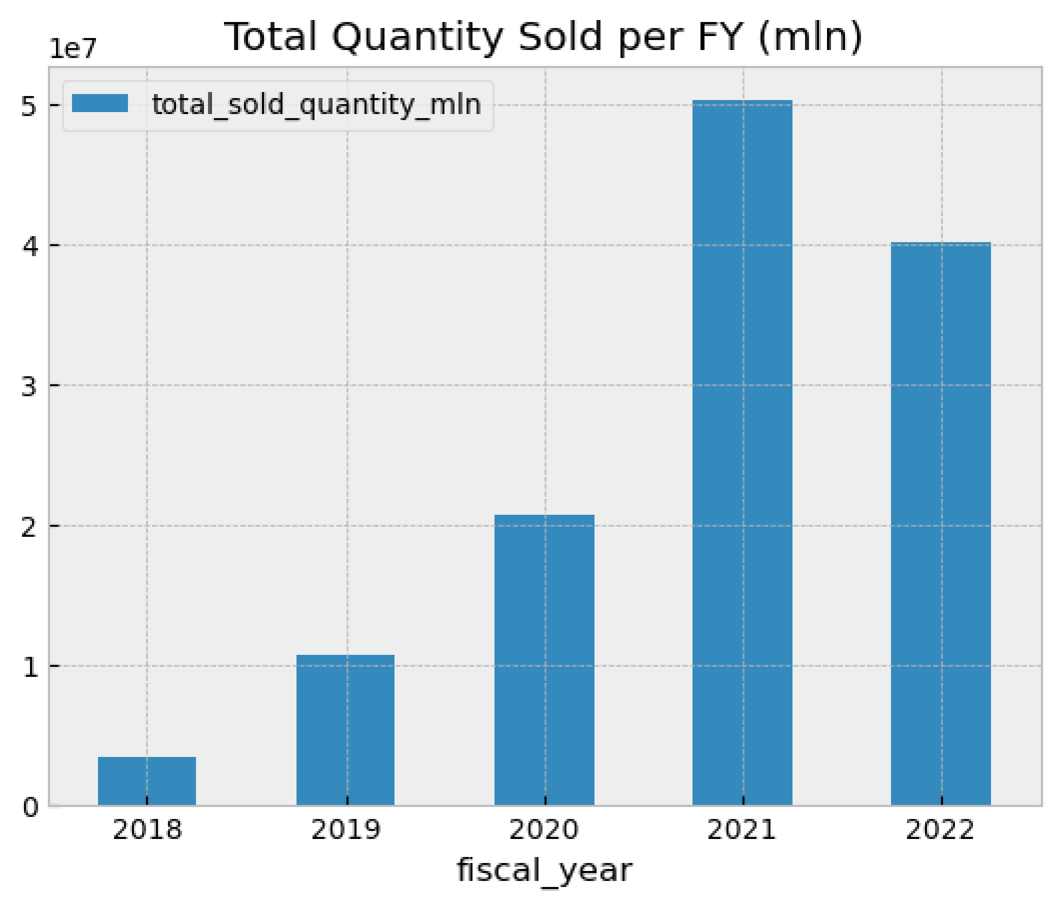
Task 1: Get the total sold quantity for each fiscal year & Show it through visualisation

```
# import necessary libraries
import pandas as pd
from sqlalchemy import create_engine

# connect with database engine
engine = create_engine("mysql+pymysql://root:root@localhost:3306/gdb0041")
conn = engine.connect()

# query total sold quantity per fiscal year
query = """
    SELECT
        fiscal_year,
        ROUND(SUM(sold_quantity) / 1000000, 2)  as total_qty_sold_mln
    FROM fact_sales_monthly
    GROUP BY fiscal_year;
"""

df_sold_qty = pd.read_sql_query(text(query), conn)
df_sold_qty
```

-	fiscal_year	total_qty_sold_mln
0	2018	3.45
1	2019	10.78
2	2020	20.77
3	2021	50.16
4	2022	40.11

```
# bar plot for total quantity sold
plt.style.use('bmh')
```

```
df_sold_qty.plot(kind="bar", x="fiscal_year", y="total_qty_sold_mln", rot=0,
title="Total Quantity Sold per FY (mln)");
```



🔎 **Bussiness Insights:**

1. For every fiscal year, the total sold quantity is growing more than double of its previous year which is very good sign and depicts the business expansion.
2. In 2022, we observe decline in sold qty but, we have data upto december only which is 4th month of 2022 fiscal year and still 8 more months to go and we can expect very high total sales.

Task 2: Query the quarters of 2021 by sold quantity and plot line graph

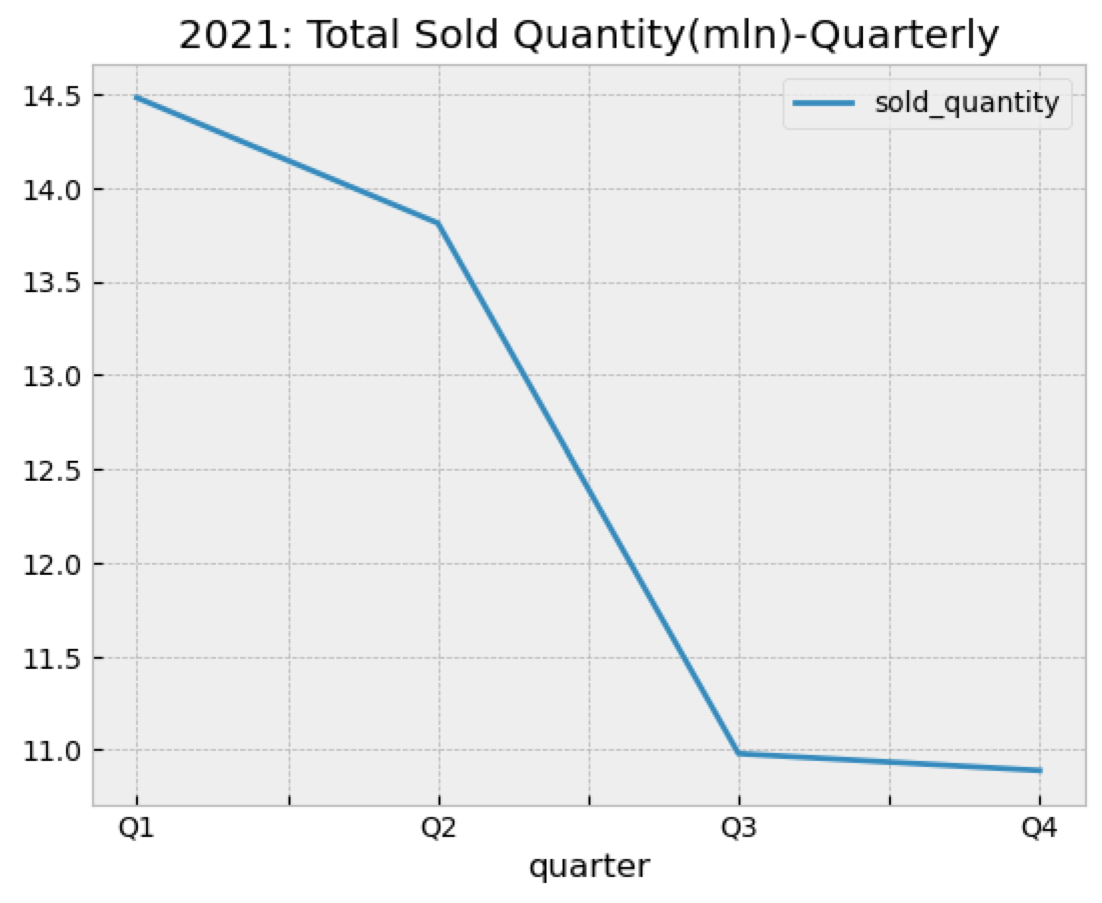
```
# querying the quarters by sold quantity
query = """
    SELECT
       *,
       get_fiscal_quarter(s.date) as quarter
    FROM fact_sales_monthly s
    WHERE fiscal_year = 2021
"""

df_quaterly_sales = pd.read_sql_query(text(query), conn)
df_quaterly_sales.head(2)
```

-	date	fiscal_year	product_code	customer_code	sold_quantity	quarter
0	2020-09-01	2021	A0118150101	70002017	248	Q1
1	2020-09-01	2021	A0118150101	70002018	240	Q1

```
# Now let's groupby by quarter and convert to million
q = pd.DataFrame(round(df_quaterly_sales.groupby("quarter")
["sold_quantity"].sum()/1000000, 2))
q
```

quarter	sold_quantity
Q1	14.48
Q2	13.81
Q3	10.98
Q4	10.89

```
# Plot sold_quantity on line graph
q.plot(kind="line", y="sold_quantity", title="2021: Total Sold Quantity(mln)-
Quarterly");
```



🔎 Bussiness Insights:

- From the above, we can see that **Q1** has the highest total sales followed by Q2.
- Through investigation, it is found that Quarter1 and Quarter2 has major events across the world like Christmas, Dhussera, Diwali etc which are helping to generate more sales and revenue to Atliq company.
- So, like every fiscal year, need to be more attention in these Quarters and have very good back-up of the products in Warehouses.

Task 3: Generate a report with Top 5 products in each division by sold quantity

```
# call a stored procedure
df_top_products = pd.read_sql_query(
    text("call gdb0041.get_top_n_products_per_division_by_qty_sold(2021, 5);"),
conn
)

df_top_products
```

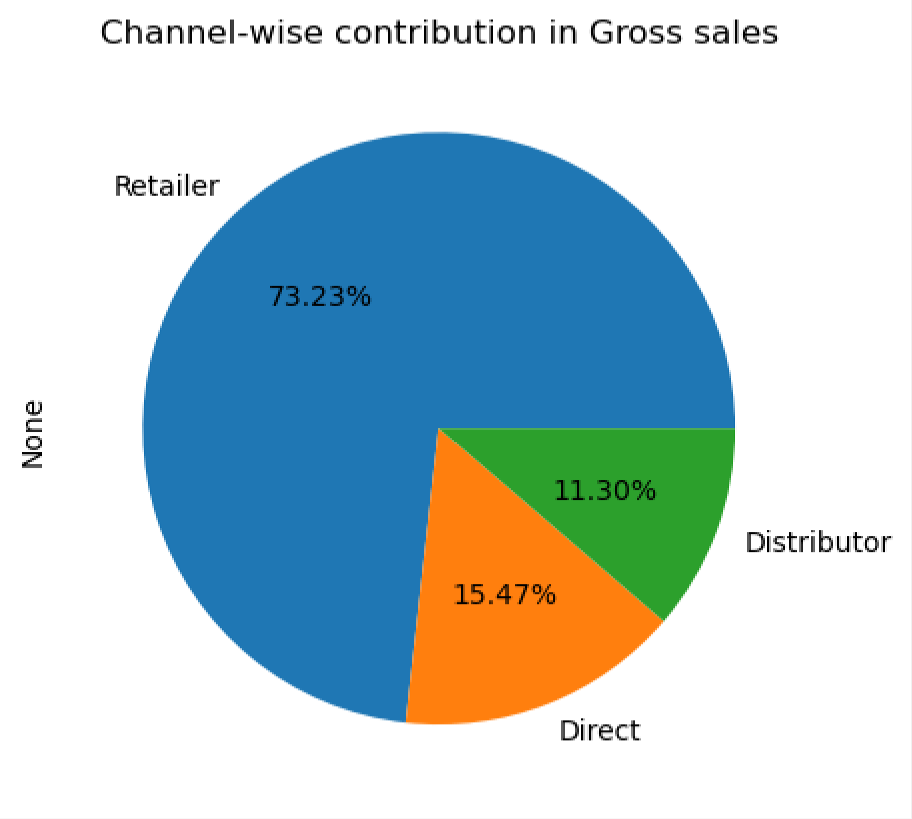
-	division	product	sold_quantity_mln	rnk
0	N & S	AQ Pen Drive DRC	2.0346	1
1	N & S	AQ Digit SSD	1.2401	2
2	N & S	AQ Clx1	1.2387	3
3	N & S	AQ Neuer SSD	1.2260	4
4	N & S	AQ Clx2	1.2010	5
5	P & A	AQ Gamers Ms	2.4771	1
6	P & A	AQ Maxima Ms	2.4620	2
7	P & A	AQ Master wireless x1 Ms	2.4488	3
8	P & A	AQ Master wired x1 Ms	2.4475	4
9	P & A	AQ Lite Ms	2.4434	5
10	PC	AQ Digit	0.1351	1
11	PC	AQ Gen Y	0.1350	2
12	PC	AQ Elite	0.1344	3
13	PC	AQ Gen X	0.1343	4
14	PC	AQ Velocity	0.1018	5

Task 4: Which channel brings more gross sales in the year 2021 and plot the pie chart

```
# query channelwise gross sales
query = """
    WITH channel_gross_sales AS
    (
        SELECT
            c.channel AS channel,
            ROUND(SUM(s.gross_price_total)/1000000,2) AS gross_sales_mln
        FROM
                gdb0041.net_sales s
        JOIN
                gdb0041.dim_customer c USING (customer_code)
        WHERE
                s.fiscal_year = 2021
        GROUP BY channel
    )

    SELECT
        channel,
        gross_sales_mln,
        ROUND(100 * gross_sales_mln / SUM(gross_sales_mln) OVER (),
                2
              ) AS percentage
        FROM channel_gross_sales
        ORDER BY percentage DESC;
"""

df_channel_gross = pd.read_sql_query(text(query), conn)
df_channel_gross
```

-	channel	gross_sales_mln	percentage
0	Retailer	1219.08	73.23
1	Direct	257.53	15.47
2	Distributor	188.03	11.30

```
# Create a Pie chart for channel-wise gross sales
plt.style.use("default")
x = pd.Series(list(df_channel_gross.gross_sales_mln),
index=df_channel_gross.channel)
x.plot(kind="pie", autopct="%.2f%%", title="Channel-wise contribution in Gross
sales");
```



🔎 **Bussiness Insights:**

- In 2021, Retailers contribute nearly 73% of total gross_sales amount.
- We can give good pre-invoice deductions(discounts) on products for top performing retailers and that have a scope to maintain good relationships with them and thus have a scope to increase more gross sales.
- We need to think why **Direct(Atliq Stores)** are failing to perform same as retailers and do through study of sucess measures of retailers and try to implement for our stores

Task 5: Provide the list of markets in which customer "Atliq Exclusive" operates its business in the APAC region.

```
query="""
         SELECT DISTINCT market
         FROM dim_customer
         WHERE customer='Atliq Exclusive' AND region='APAC';
"""
distinct_market=pd.read_sql_query(text(query),conn)
distinct_market
```

	market
0	India
1	Indonesia
2	Japan

	market
3	Philiphines
4	South Korea
5	Australia
6	Newzealand
7	Bangladesh

Task 6: Percentage of unique product increase in 2021 vs. 2020.

```
query="""
       SELECT
unique_products_2020,unique_products_2021,round((unique_products_2021-
unique_products_2020)*100/(unique_products_2020),2) AS chng_pct
       FROM (
       (SELECT COUNT(DISTINCT product_code) AS unique_products_2020
       FROM fact_sales_monthly
       WHERE fiscal_year=2020)x,
       (SELECT COUNT(DISTINCT product_code) AS unique_products_2021
       FROM fact_sales_monthly
       WHERE fiscal_year=2021)y
       );
"""
product_ch_pct=pd.read_sql_query(text(query),conn)
product_ch_pct
```

unique_products_2020	unique_products_2021	chng_pct
0	245	334

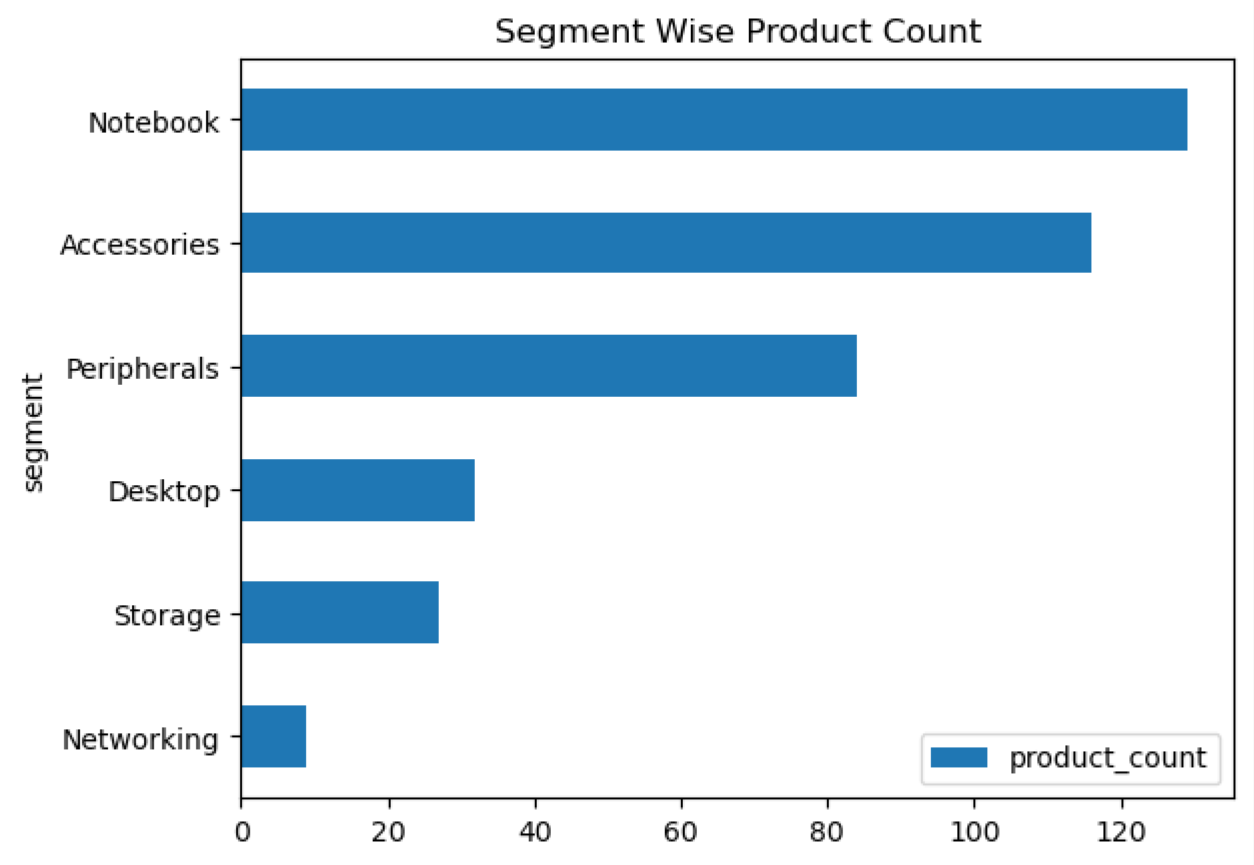
Task 7: Provide a report with all the unique product counts for each segment and sort them in descending order of product counts.

```
query="""
      SELECT segment, COUNT(product_code) AS product_count
      FROM dim_product
      GROUP BY segment
      ORDER BY product_count DESC;
"""
seg_wise_product_count=pd.read_sql_query(text(query),conn)
seg_wise_product_count
```

	segment	product_count
0	Notebook	129

	segment	product_count
1	Accessories	116
2	Peripherals	84
3	Desktop	32
4	Storage	27
5	Networking	9

```
seg_wise_product_count.sort_values(by='product_count',ascending=True).plot(kind='b
arh',x='segment',y='product_count',title='Segment Wise Product Count')
```



🔎 **Business Insights:**

- segment Notebooks is doing extremely well for Atliq Hardware with a maximum of (32.5%) share.
- This says that introducing new notebooks will definitely do well.
- Networking and Storage segment needs some attention to increase its share of business.

Task 8: Segment had the most increase in unique products in 2021 vs 2020

```
query="""
       WITH x AS(SELECT segment, COUNT(DISTINCT product_code) AS
product_count_2020
```

```
                  FROM dim_product p
                  JOIN fact_sales_monthly s
                  USING (product_code)
                  WHERE fiscal_year=2020
                  GROUP BY segment
                  ORDER BY product_count_2020 DESC),
            y AS(SELECT segment, COUNT(DISTINCT product_code) AS
product_count_2021
                  FROM dim_product p
                  JOIN fact_sales_monthly s
                  USING (product_code)
                  WHERE fiscal_year=2021
                  GROUP BY segment
                  ORDER BY product_count_2021 DESC)
            SELECT x.segment,x.product_count_2020,y.product_count_2021,
(y.product_count_2021-x.product_count_2020) AS difference
            FROM x
            JOIN y
            USING(segment)
            ORDER BY difference DESC;
"""
differnce_count=pd.read_sql_query(text(query),conn)
differnce_count
```

	segment	product_count_2020	product_count_2021	difference
0	Accessories	69	103	34
1	Notebook	92	108	16
2	Peripherals	59	75	16
3	Desktop	7	22	15
4	Storage	12	17	5
5	Networking	6	9	3

🔎 **Business Insights:**

- Accessories has been 34 new products in 2021 which is a high compared to any other segments.
- Accessories has surpassed Notebooks in 2021 in terms of unique product count.
- In 2021, Desktop witnessed 142% y-o-y increase in product count compared to 2020.
- Increasing the Desktop segment inventory will be helpful for upcoming demand.

Task 9: Get the products that have the highest and lowest manufacturing costs

```
query ="""
      WITH x as(SELECT * FROM dim_product),
     y AS (SELECT * FROM fact_manufacturing_cost
   WHERE manufacturing_cost IN (
   (SELECT MAX(manufacturing_cost) FROM fact_manufacturing_cost),
   (SELECT MIN(manufacturing_cost) FROM fact_manufacturing_cost)))
   SELECT x.product_code,x.product,ROUND(y.manufacturing_cost,2) AS
manufacturing_cost
   FROM x
   JOIN y
   ON x.product_code=y.product_code
   ORDER BY manufacturing_cost DESC;
"""

m_cost=pd.read_sql_query(text(query),conn)
m_cost
```

	product_code	product	manufacturing_cost
0	A6121110208	AQ HOME Allin1 Gen 2	263.42
1	A2118150101	AQ Master wired x1 Ms	0.87

Task 10: Generate a report which contains the top 5 customers who received an average high pre_invoice_discount_pct for the fiscal year 2021 and in the Indian market.

```
query="""
     SELECT customer_code, customer, AVG(pre_invoice_discount_pct)*100 AS
average_discount_percentage
     FROM dim_customer c
     JOIN fact_pre_invoice_deductions pre
     USING (customer_code)
     WHERE fiscal_year=2021 AND market='India'
     GROUP BY customer_code,customer
     ORDER BY average_discount_percentage DESC
     LIMIT 5;
"""
average_discount_pct=pd.read_sql_query(text(query),conn)
average_discount_pct
```

	customer_code	customer	average_discount_percentage
0	90002009	Flipkart	30.83
1	90002006	Viveks	30.38
2	90002003	Ezone	30.28
3	90002002	Croma	30.25
4	90002016	Amazon	29.33

🔑 **Business Insights:**

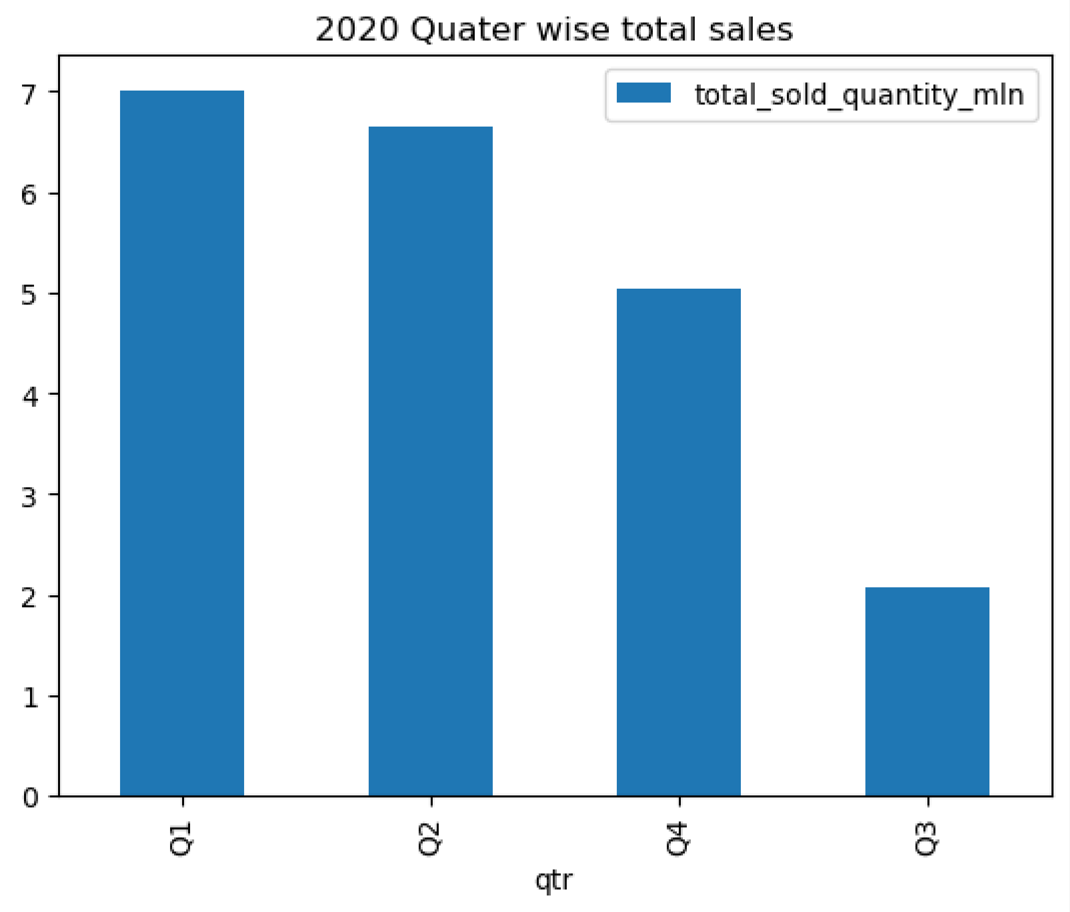
- Total Gross Sales by Flipkart in 2020 was Rs.13M, so it tops the list by recieving highest average discount percentage of 30.83.
- In India, Amazon made the most sales in 2020 for Rs.16M, but has only recieved the 29% average discount.

Task 11: In which quarter of 2020 got the maximum total_sold_quantity?

```
query="""
      SELECT
CASE
   WHEN MONTH(date) IN (9,10,11) THEN 'Q1'
   WHEN MONTH(date) IN (12,1,2) THEN 'Q2'
   WHEN MONTH(date) IN (3,4,5) THEN 'Q3'
   ELSE 'Q4'
   END AS qtr,
   ROUND(SUM(sold_quantity)/1000000,2) AS total_sold_quantity_mln
   FROM fact_sales_monthly
   WHERE fiscal_year=2020
   GROUP BY qtr
   ORDER BY total_sold_quantity_mln DESC;
"""

quarters_2020=pd.read_sql_query(text(query),conn)
quarters_2020
```

	qtr	total_sold_quantity_mln
0	Q1	7.01
1	Q2	6.65
2	Q4	5.04
3	Q3	2.08

```
quarters_2020.plot(kind='bar',x='qtr',y='total_sold_quantity_mln',title='2020
Quater wise total sales')
```



🔎 **Business Insights:**

- InsightsIn first quarter of FY2020, AltiQHardwares recorded the highest saleof Rs.7.01M in FY2020In first quarter of FY2020, AltiQ Hardwares recorded the highest sale Rs.7.01M in FY2020In first quarter of FY2020, AltiQ Hardwares recorded the highest sale Rs.7.01M in FY2020
- It has been seen 21.9% decline insales from Q2 to Q3.