Lets first determine the total number of orders

```
SELECT
   COUNT(*) as total_transactions,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin,
   ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
   Transactions
```

total_transactions	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
148395	2429282	984868963.0	960211894.59	24657068.41	0.025

- There are almost 150k transactions in the table.
- The company has a profit margin of 2.5% over 4 years.
- Notice that the total cost seems to be high compared to the total_sales

1. **Find the top 10 single orders with highest/lowest profit margin**

HIGHEST

```
SELECT *
FROM
   transactions
ORDER BY profit_margin DESC
LIMIT 10
```

product_code	customer_code	market_code	order_date	sales_qty	sales_amount	currency	profit_margin_percentage	profit_margin	cost_price
Prod318	Cus038	Mark013	2018-02-23 00:00:00	1798	1338264.0	INR	0.36	481775.04	856488.96
Prod329	Cus006	Mark004	2018-12-14 00:00:00	280	1160782.0	INR	0.38	441097.16	719684.84
Prod329	Cus006	Mark004	2019-01-18 00:00:00	360	1477458.0	INR	0.28	413688.24	1063769.76
Prod329	Cus006	Mark004	2018-11-23 00:00:00	240	994954.0	INR	0.4	397981.6	596972.4
Prod049	Cus022	Mark002	2018-03-07 00:00:00	747	996102.0	INR	0.32	318752.64	677349.36
Prod329	Cus006	Mark004	2019-01-08 00:00:00	240	984977.0	INR	0.31	305342.87	679634.13
Prod316	Cus020	Mark004	2018-02-28 00:00:00	480	878935.0	INR	0.34	298837.9	580097.1
Prod040	Cus020	Mark004	2018-03-09 00:00:00	400	807301.0	INR	0.37	298701.37	508599.63
Prod304	Cus006	Mark004	2018-08-03 00:00:00	600	809574.0	INR	0.36	291446.64	518127.36
Prod308	Cus006	Mark004	2018-07-05 00:00:00	560	762949.0	INR	0.35	267032.15	495916.85

- The transaction with the highest profit come from `Mark013` of customer `Cus038` purchased `Prod318`.

- 4/10 transactions are of `Prod329` bought of customer `Cus006`. This is a sign of a frequent customer, who purchased many times and helped generated high profit.

- Most of the transactions are from `Mark004`, which means that this market could be performing well.

- Most of the transactions have a profit margin percentage of around 30%.

- Note that with similar profit margin percentages, the data indicates that their is no product outperforms others (as high profit products have high cost and low profit products also have low cost).

LOWEST

```
SELECT *

FROM

   transactions

ORDER BY profit_margin

LIMIT 10
```

product_code	customer_code	market_code	order_date	sales_qty	sales_amount	currency	profit_margin_percentage	profit_margin	cost_price
Prod073	Cus006	Mark004	2020-04-16 00:00:00	947	1477394.0	INR	-0.25	-369348.5	1846742.5
Prod159	Cus006	Mark004	2018-01-30 00:00:00	1480	1228148.0	INR	-0.29	-356162.92	1584310.92
Prod329	Cus006	Mark004	2018-10-26 00:00:00	200	829130.0	INR	-0.35	-290195.5	1119325.5
Prod316	Cus006	Mark004	2018-08-07 00:00:00	640	1316921.0	INR	-0.21	-276553.41	1593474.41
Prod328	Cus006	Mark004	2018-07-18 00:00:00	303	850509.0	INR	-0.3	-255152.7	1105661.7
Prod332	Cus020	Mark004	2018-01-03 00:00:00	393	778588.0	INR	-0.26	-202432.88	981020.88
Prod084	Cus006	Mark004	2020-02-28 00:00:00	800	666111.0	INR	-0.3	-199833.3	865944.3
Prod329	Cus006	Mark004	2020-03-19 00:00:00	160	629750.0	INR	-0.31	-195222.5	824972.5
Prod320	Cus006	Mark004	2020-05-08 00:00:00	276	873528.0	INR	-0.22	-192176.16	1065704.16
Prod324	Cus006	Mark004	2018-04-13 00:00:00	333	589958.0	INR	-0.32	-188786.56	778744.56

-There is no specific product appear many times in this list.

- 9/10 orders are for customer `Cus006`. This customers both appeared frequently in the top 10 profit/loss list.

- All of these orders are from `Mark004`

- The losses are ranged from 20-30% for each transaction.

2. **Take a look at the summary of loss transactions (transactions that have negative profit margin**

```
SELECT
   COUNT(*) as total_transactions,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin
FROM
   transactions
WHERE
   profit_margin < 0
```

total_transactions	total_quantity	sales_amount	total_cost	profit_margin
68501	1130275	459414589.0	540746253.92	-81331664.92

- We have about 45% of the orders that have a negative profit margin. Which means the company loses money almost once every two orders. This is a huge number.

- As the total profit margin (determined in the first query) is positive (24,657,068.41), the company is actually able to cover this loss.

- If we do an addition of the total profit margin (24,657,068.41) with the total loss (81,331,664.92), we get the total profit margin (if there is no loss) of 105,988,733.33.

This means that over 4 years, the company has a total loss of 76.7%(81.3/105.9) of its profit.

- We can say that 45% of the orders that have negative profit margin has loss the company a HUGE amount of money (76.7% of the total sales profit).

3. **Determine 10 products that have the highest/lowest profit margin****

- By sum up sales and profit data and then group them by `product_code`

- Note that in order to determine the `profit margin percentage`, we will need to recalculate them by doing a division between the sum of `profit_margin` and the sum of `sales_amount`. This variable won't be correct if we just calculate it with `SUM` as other features.

```
SELECT
   product_code,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin,
   ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
   transactions
GROUP BY
   product_code
ORDER BY
   profit_margin DESC
LIMIT
   10
```

product_code	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Prod329	8485	34381481.0	32433893.95	1947587.05	0.057
Prod318	74195	68967202.0	67100858.63	1866343.37	0.027
Prod316	44477	60883452.0	59712074.21	1171377.79	0.019
Prod040	16116	23581969.0	22556232.29	1025736.71	0.043
Prod324	20878	41455364.0	40445417.9	1009946.1	0.024
Prod334	29221	31468996.0	30604021.73	864974.27	0.027
Prod304	21727	17873777.0	17086752.63	787024.37	0.044
Prod308	11269	8350170.0	7563974.93	786195.07	0.094
Prod090	277959	13418817.0	12714268.74	704548.26	0.053
Prod049	9661	11048968.0	10354255.74	694712.26	0.063

- `Prod329` has the highest profit margin of 1.95 millions rupee.

- Due to high cost, there is no product yields a high profit margin percentage.

- 2 products `Prod329` and `Prod318` seem to have a significantly higher profit margin compared to other products in the list.

- `Prod308` and `Prod049` have a high profit margin percentage of 6.3% and 9.4%, which means that they can make the most profit (in percentage) out of the cost compared to other products.

```
SELECT
   product_code,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin,
   ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
   transactions
GROUP BY
   product_code
ORDER BY
   profit_margin
LIMIT
```

product_code	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Prod073	947	1477394.0	1846742.5	-369348.5	-0.25
Prod336	1816	3400849.0	3732668.96	-331819.96	-0.098
Prod044	2879	5126501.0	5394350.49	-267849.49	-0.052
Prod084	1180	1029689.0	1219589.71	-189900.71	-0.184
Prod169	1055	1515289.0	1667575.66	-152286.66	-0.101
Prod319	18918	22188881.0	22335771.95	-146890.95	-0.007
Prod016	1931	1997834.0	2143052.99	-145218.99	-0.073
Prod024	4421	9337235.0	9445182.54	-107947.54	-0.012
Prod206	4691	5391375.0	5480118.0	-88743.0	-0.016
Prod030	1196	997609.0	1079390.64	-81781.64	-0.082

- `Prod073` has the highest loss of 369k rupee and its loss is also the highest in percentage (-25%). This is an exceptional loss compared to other products.

- Most of other products in list has a loss percentage ranged from 1% to 10%.

4. Determine the products that have the highest/lowest profit margin percentage

- We'll only take the more than products that have more than 20 units sold to make sure that we have enough data to prevent bias.

- In order to filter `total_quantity`, we use `HAVING` as this clause support aggregated data (we used `SUM`).

HIGHEST

```
SELECT
    product_code,
    SUM(sales_qty) as total_quantity,
    SUM(sales_amount) as sales_amount,
    ROUND(SUM(cost_price), 3) as total_cost,
    ROUND(SUM(profit_margin), 3) as profit_margin,
    ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
    transactions
GROUP BY
    product_code
HAVING
    total_quantity > 20
ORDER BY
    profit_margin_perc DESC
LIMIT
    10
```

product_code	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Prod001	100	41241.0	25157.01	16083.99	0.39
Prod153	247	75574.0	47611.62	27962.38	0.37
Prod155	126	38500.0	25410.0	13090.0	0.34
Prod201	387	106921.0	70685.97	36235.03	0.339
Prod035	124	47727.0	33246.26	14480.74	0.303
Prod112	51	8444.0	6079.68	2364.32	0.28
Prod192	63	16324.0	11763.8	4560.2	0.279
Prod219	396	127657.0	92925.8	34731.2	0.272
Prod083	1313	789444.0	586901.5	202542.5	0.257
Prod012	33	29648.0	22236.0	7412.0	0.25

- The rest of the list shows a good profit margin rate, ranged from 25%-34%.

- The profit margin percentages observed are high. However, compared to the products that have the highest profit margin, these products have a quite small quantity sold (most are at hundreds) and the sales amount are considerably smaller.

- However, this shows that these products have a good potential and it is worthy to take a deeper look at them to see if we can focus to gain more profit from.

- `Prod001` and `Prod153` have the highest profit margin percentage of 0.39 and 0.37, respectively.

LOWEST

```
SELECT
    product_code,
    SUM(sales_qty) as total_quantity,
    SUM(sales_amount) as sales_amount,
    ROUND(SUM(cost_price), 3) as total_cost,
    ROUND(SUM(profit_margin), 3) as profit_margin,
    ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
    transactions
GROUP BY
    product_code
HAVING
    total_quantity > 20
ORDER BY
    profit_margin_perc
LIMIT
    10
```

product_code	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Prod080	52	23681.0	31969.35	-8288.35	-0.35
Prod022	33	56166.0	73048.49	-16882.49	-0.301
Prod073	947	1477394.0	1846742.5	-369348.5	-0.25
Prod203	233	35648.0	44203.52	-8555.52	-0.24
Prod190	67	16625.0	20448.75	-3823.75	-0.23
Prod191	90	17663.0	21547.07	-3884.07	-0.22
Prod038	164	91520.0	111240.69	-19720.69	-0.215
Prod109	45	3046.0	3666.84	-620.84	-0.204
Prod107	400	316611.0	376767.09	-60156.09	-0.19
Prod084	1180	1029689.0	1219589.71	-189900.71	-0.184

- The list shows the loss mostly ranged from -20% to -30%.

- Some product (`Prod073` and `Prod084`) have a (extremely) high amount of loss (more than 1M rupees). Notice that these products also have quite a few amount of units sold. This means that the losses could be happened from a long time without being notice, therefore, the company keeped selling the products and generated further losses.

- `Prod080` and `Prod022` have the highest loss percentage of 0.35 and 0.30, respectively.

5. **Determine the performance of each market. Additionally, let's join the markets' zones in `markets` table with `transactions` to see which zone is performing well****

We need to know `zone`, which is from the `markets` table. Join two table `transactions ` and `markets` using `INNER JOIN`, which will join the records that match the value of `market_code` in each table.

```
SELECT
    ma.zone,
    tr.market_code,
    SUM(sales_qty) as total_quantity,
    SUM(sales_amount) as sales_amount,
    ROUND(SUM(cost_price), 3) as total_cost,
    ROUND(SUM(profit_margin), 3) as profit_margin,
    ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
    transactions tr
INNER JOIN
    markets ma ON tr.market_code = ma.markets_code
GROUP BY
    ma.zone, tr.market_code
ORDER BY
    profit_margin DESC
```

zone	market_code	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
North	Mark004	988294	519569771.0	507615972.48	11953798.52	0.023
Central	Mark002	383643	150084801.0	145212161.23	4872639.77	0.032
North	Mark003	206925	132307441.0	129459172.49	2848268.51	0.022
Central	Mark011	262094	55026321.0	53614211.28	1412109.72	0.026
Central	Mark013	25856	16525290.0	15278890.84	1246399.16	0.075
Central	Mark007	86884	42084571.0	41043820.47	1040750.53	0.025
South	Mark010	255482	18813466.0	18110176.01	703289.99	0.037
South	Mark001	50485	18042702.0	17742129.0	300573.0	0.017
North	Mark009	5505	4428393.0	4246132.22	182260.78	0.041
North	Mark012	17099	2605796.0	2479118.95	126677.05	0.049
South	Mark014	77889	7436823.0	7389865.78	46957.22	0.006
South	Mark015	14979	893857.0	858260.64	35596.36	0.04
North	Mark008	37092	3094007.0	3062845.79	31161.21	0.01
North	Mark005	16642	13582609.0	13648487.45	-65878.45	-0.005
South	Mark006	413	373115.0	450649.96	-77534.96	-0.208

- Notice that the top 5 performing markets are in North and Central zone.

- Most of the profit margin percentage of the markets ranged from 2-4%.

- `Mark013` has the biggest profit margin percentage of 7.5%.

- There are some markets that have a very small profit margin such as `Mark014` and `Mark008` with 0.6% and 1%. Note that these markets have small profit with just around 35-46 thousands rupee so these percentages are actually very small compared to other markets'.

- There are two markets `Mark005` and `Mark006` that have total loss. Note that `Mark006` has a 20% loss.

Let's take a look at the total sales of each zone

```
SELECT
    ma.zone,
    SUM(sales_qty) as total_quantity,
    SUM(sales_amount) as sales_amount,
    ROUND(SUM(cost_price), 3) as total_cost,
    ROUND(SUM(profit_margin), 3) as profit_margin,
    ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
    transactions tr
INNER JOIN
    markets ma ON tr.market_code = ma.markets_code
GROUP BY
    ma.zone
ORDER BY
    profit_margin DESC
```

zone	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
North	1271557	675588017.0	660511729.38	15076287.62	0.022
Central	758477	263720983.0	255149083.82	8571899.18	0.033
South	399248	45559963.0	44551081.39	1008881.61	0.022

- `South` zone, as observed from the previous query and this result, has the smallest profit margin.

- `North` zone has the highest profit margin of 15M rupee, almost doubled from the Central zone and 15x more than the South zone.

- We can observe that even though `North` and `Central` zones bring more profit, they did not outperform `South` zone as their profit margin percentage are similar. The upper two zones have high sales amount but also have high cost, which significantly reduce their performance.

Let's look at each zone's performance in each year

```
SELECT
    ma.zone,
    date.year,
    SUM(sales_qty) as total_quantity,
    SUM(sales_amount) as sales_amount,
    ROUND(SUM(cost_price), 3) as total_cost,
    ROUND(SUM(profit_margin), 3) as profit_margin,
    ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
    transactions tr
INNER JOIN
    markets ma ON tr.market_code = ma.markets_code
LEFT JOIN
    date ON order_date = date.date
GROUP BY
    ma.zone, date.year
ORDER BY
    ma.zone DESC
```

zone	year	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
South	2017	36821	4734621.0	4676791.97	57829.03	0.012
South	2018	151831	18810117.0	18596115.86	214001.14	0.011
South	2019	152388	15454705.0	15098973.66	355731.34	0.023
South	2020	58208	6560520.0	6179199.9	381320.1	0.058
North	2017	127822	63782899.0	62032205.53	1750693.47	0.027
North	2018	524305	287037445.0	281686400.29	5351044.71	0.019
North	2019	426678	225201876.0	218114632.48	7087243.52	0.031
North	2020	192752	99565797.0	98678491.08	887305.92	0.009
Central	2017	69819	24420633.0	23456087.47	964545.53	0.039
Central	2018	321361	107839601.0	104067350.7	3772250.3	0.035
Central	2019	268017	95362521.0	92318951.97	3043569.03	0.032
Central	2020	99280	36098228.0	35306693.68	791534.32	0.022

- It is visible that `Central` and `North` zones are contributing more to the total sales, with `North` is signficantly larger in each year.

- Both of these markets have a major drop in sales in 2020, with `North` went down by 87.5% and `Central` decreased by 73.9%.

- On the other hand, `South` market, eventhough have a smaller sales contribution, increased gradually and managed to have an increased sales of 30k in 2020.

- Moreover, in 2020, `South` market has a profit margin percentage of 5.8%, which is the best number observed in the list. This proves the efficiency of the markets in this zone even during a bad year.

6. Take a look at the sales by year

- Join the year from `date` table by using `date.date` and `transactions.date`

- Calculate sale performance with the data grouped by year

```
SELECT
   date.year,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin,
   ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
   transactions
INNER JOIN
   date ON order_date = date.date
GROUP BY
   date.year
ORDER BY
   year DESC
```

year	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
2020	350240	142224545.0	140164384.66	2060160.34	0.014
2019	847083	336019102.0	325532558.11	10486543.89	0.031
2018	997497	413687163.0	404349866.85	9337296.15	0.023
2017	234462	92938153.0	90165084.97	2773068.03	0.03

-We can see a good increase in profit margin from 2017 to 2019, with an exceptional performance in 2018 with the peak at 2019. However, the sales quantity and profit margin decreased drastically in 2020. This can be probably due to the outbreak of the Covid-19 epidemic.

7. **Take a look at the sales by each month of a year**

We will look at the average sales performance in each month in this case.

```
SELECT
   date.month_name,
   ROUND(AVG(sales_qty), 1) as avg_quantity,
   ROUND(AVG(sales_amount), 3) as avg_sales,
   ROUND(AVG(cost_price), 3) as avg_cost,
   ROUND(AVG(profit_margin), 3) as avg_profit_margin,
   ROUND(AVG(profit_margin) / AVG(sales_amount), 3) as avg_profit_margin_perc
FROM
   transactions
INNER JOIN
   date ON order_date = date.date
GROUP BY
   month_name
ORDER BY
   avg_profit_margin DESC
```

month_name	avg_quantity	avg_sales	avg_cost	avg_profit_margin	avg_profit_margin_perc
December	15.6	6773.156	6560.797	212.359	0.031
March	17.4	6967.44	6759.132	208.308	0.03
January	16.1	7209.517	7001.797	207.72	0.029
November	17.0	6567.139	6361.565	205.574	0.031
July	16.7	6933.292	6733.569	199.724	0.029
February	16.3	6630.794	6436.313	194.481	0.029
September	15.9	6201.304	6034.457	166.847	0.027
October	15.6	5924.45	5768.717	155.732	0.026
August	19.4	7648.362	7505.699	142.664	0.019
May	15.7	6205.995	6079.028	126.967	0.02
April	16.9	6793.994	6709.172	84.822	0.012
June	14.4	5981.513	5899.45	82.063	0.014

- In general, the company seems to have a better profit margin from the last quarter of the year to the first quarter of the next year (Q4 and Q1), while it has a slower sales performance in Q2 and Q3.

- In the better half of the year (Q4-Q1), the company can generate doubled the sales profit (compared to the other half).

8. **Find how each customer type performs**

```
SELECT
   customers.customer_type,
   COUNT(*) as total_transactions,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin,
   ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
   transactions tr
RIGHT JOIN
   customers ON customers.customer_code = tr.customer_code
GROUP BY
   customers.customer_type
ORDER BY
   profit_margin DESC
LIMIT
   5
```

customer_type	total_transactions	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Brick & Mortar	96190	1854201	744525338.0	728343186.57	16182151.43	0.022
E-Commerce	52205	575081	240343625.0	231868708.02	8474916.98	0.035

- There are only two types of customers: `Brick & Mortar` (Offline stores) and `E-Commerce` (Online).

- `Brick & Mortar` outperforms `E-commerce`, with almost doubled number of transactions and profit margin.

- However, `E-commerce` has a higher number of profit margin percentage by 60%. Means that this customer type generates a higher profit per cost compared to `Brick & Mortar`.

Let's see the sales trend of these two customer types in 4 years

```
SELECT
    customers.customer_type,
    date.year,
    COUNT(*) as total_transactions,
    SUM(sales_qty) as total_quantity,
    SUM(sales_amount) as sales_amount,
    ROUND(SUM(cost_price), 3) as total_cost,
    ROUND(SUM(profit_margin), 3) as profit_margin,
    ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
    transactions tr
RIGHT JOIN
    customers ON customers.customer_code = tr.customer_code
INNER JOIN
    date ON order_date = date.date
GROUP BY
    customers.customer_type, date.year
ORDER BY
    customer_type
```

customer_type	year	total_transactions	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Brick & Mortar	2017	10216	181689	66076415.0	64636017.46	1440397.54	0.022
Brick & Mortar	2018	40515	759078	307748862.0	301745914.93	6002947.07	0.02
Brick & Mortar	2019	32766	651750	257563281.0	250227721.54	7335559.46	0.028
Brick & Mortar	2020	12693	261684	113136780.0	111733532.64	1403247.36	0.012
E-Commerce	2017	4341	52773	26861738.0	25529067.51	1332670.49	0.05
E-Commerce	2018	20240	238419	105938301.0	102603951.92	3334349.08	0.031
E-Commerce	2019	18946	195333	78455821.0	75304836.57	3150984.43	0.04
E-Commerce	2020	8678	88556	29087765.0	28430852.02	656912.98	0.023

- `Brick & Mortar` generates a higher profit margin in general.

- However, `E-Commerce` has a better `profit_margin_perc` in 4 years, which means that it could make more profit out of the cost.

9A. Find top 5 customers that helped making the highest profit margin

```
SELECT
   tr.customer_code,
   cu.customer_type,
   COUNT(*) as total_transactions,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin,
   ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
   transactions tr
RIGHT JOIN
   customers cu ON cu.customer_code = tr.customer_code
GROUP BY
   cu.customer_type, tr.customer_code
ORDER BY
   profit_margin DESC
LIMIT
   5
```

customer_code	customer_type	total_transactions	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Cus006	Brick & Mortar	13819	653823	413333588.0	404025688.65	9307899.35	0.023
Cus020	E-Commerce	17327	123356	43893083.0	42107271.61	1785811.39	0.041
Cus022	E-Commerce	4686	79456	49644189.0	47955929.0	1688260.0	0.034
Cus038	E-Commerce	130	25891	16529970.0	15283326.74	1246643.26	0.075
Cus005	Brick & Mortar	19938	279093	44962166.0	43908381.91	1053784.09	0.023

- Customer `Cus006` generated the highest amount of profit margin.

- `Cus038` have the best profit margin percentage in the list of 7.5%. However, we still need more data for this customer as it has a significantly less number of transactions made compared to other customers in the list.

9B. Let's see which products that `Cus006` - with the highest profit margin, contributed the most to its profit margin

```
SELECT
   product_code,
   COUNT(*) as total_transactions,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin,
   ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
   transactions
WHERE
   customer_code = 'Cus006'
GROUP BY
   product_code
ORDER BY
    profit_margin DESC
LIMIT
   10
```

product_code	total_transactions	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Prod329	107	8262	33783964.0	31850923.51	1933040.49	0.057
Prod324	270	17182	34414139.0	33477610.99	936528.01	0.027
Prod304	298	17165	14601102.0	13690238.32	910863.68	0.062
Prod308	79	9295	7507749.0	6705782.35	801966.65	0.107
Prod040	180	7851	14365108.0	13646145.91	718962.09	0.05
Prod339	166	7404	13972858.0	13364340.01	608517.99	0.044
Prod102	438	7716	9022343.0	8542511.71	479831.29	0.053
Prod209	149	17627	7314775.0	6874051.0	440724.0	0.06
Prod322	21	938	1584289.0	1231658.3	352630.7	0.223
Prod313	56	5173	6182497.0	5854536.63	327960.37	0.053

- `Prod329` has a signficantly higher profit margin compared to other products (1.9M) and has a good profit margin percentage of 5.7%.

- `Prod322`, `Prod308` have a great profit margin percentage of 22.3% and 10.7%, respectively. These products managed to have better returns out of the cost compared to other products.

10A. Find top 5 customers that have the lowest profit margin

```
SELECT
   tr.customer_code,
   customers.customer_type,
   COUNT(*) as total_transactions,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin,
   ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
   transactions tr
RIGHT JOIN
   customers ON customers.customer_code = tr.customer_code
GROUP BY
   customers.customer_type, tr.customer_code
ORDER BY
   profit_margin
LIMIT
   5
```

customer_code	customer_type	total_transactions	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Cus018	Brick & Mortar	3104	10470	1868461.0	1905947.76	-37486.76	-0.02
Cus015	Brick & Mortar	164	500	336367.0	333619.31	2747.69	0.008
Cus034	E-Commerce	275	3244	430368.0	415281.72	15086.28	0.035
Cus028	E-Commerce	203	23433	2252506.0	2218026.24	34479.76	0.015
Cus026	E-Commerce	1223	38340	3342051.0	3307440.61	34610.39	0.01

- `Cus018` is the only customer that has a negative profit margin.

- We will take a deeper look at this customer to see if there is any purchase of them having problem.

10B. Let's see which products that `Cus018` - the only customer that has a negative profit margin, contributed the most the loss

```
SELECT
   product_code,
   COUNT(*) as total_transactions,
   SUM(sales_qty) as total_quantity,
   SUM(sales_amount) as sales_amount,
   ROUND(SUM(cost_price), 3) as total_cost,
   ROUND(SUM(profit_margin), 3) as profit_margin,
   ROUND(SUM(profit_margin) / SUM(sales_amount), 3) as profit_margin_perc
FROM
   transactions
WHERE
   customer_code = 'Cus018'
GROUP BY
   product_code
ORDER BY
   profit_margin
LIMIT
   10
```

product_code	total_transactions	total_quantity	sales_amount	total_cost	profit_margin	profit_margin_perc
Prod163	1	4000	644444.0	702443.96	-57999.96	-0.09
Prod255	254	1114	135116.0	137737.16	-2621.16	-0.019
Prod054	13	34	6439.0	7119.31	-680.31	-0.106
Prod058	3	3	2736.0	3182.88	-446.88	-0.163
Prod121	75	119	20211.0	20485.24	-274.24	-0.014
Prod286	32	32	3494.0	3679.11	-185.11	-0.053
Prod057	4	4	3462.0	3629.11	-167.11	-0.048
Prod065	12	22	6053.0	6181.23	-128.23	-0.021
Prod292	40	40	6534.0	6634.25	-100.25	-0.015
Prod260	40	56	4979.0	5076.35	-97.35	-0.02

- The one order with `Prod163` has a significantly larger loss compared to other products that have loss.

- This only transaction is the main reason for the whole lost calculated of the customer as it has a much greater loss compared to other products.

We may need to find more details about the order so we can track from the sales team to understand what happened (It's much easier as we only have a single transaction in this case).

```
SELECT
    cu.customer_name,
    pr.product_name
    *
FROM
    transactions
WHERE
    customer_code = 'Cus018' AND product_code = 'Prod163'
```

product_code	customer_code	market_code	order_date	sales_qty	sales_amount	currency	profit_margin_percentage	profit_margin	cost_price
Prod163	Cus018	Mark004	2019-08-16 00:00:00	4000	644444.0	INR	-0.09	-57999.96	702443.96

-With the full details of the order, we could now use the date to track back and make inquiries about this order. Additionally, we can look deeper at `Prod163` to see if similar losses happen with this product with other customers.

Conclusion

Answer the problem questions using the insights found*(Note that the numbers which are used to compare/considered as a good number are chosen based on the general observations from the analyses or compared to other objects in the same category)*:

- Which products have high/low performances (profit margin)?

- Top products: `Prod329`, `Prod308`, `Prod040`, `Prod049`: have high profit margin, and average profit margin percentage larger than 5%.

- Products with high potential: `Prod001`, `Prod153`, `Prod155`, `Prod201` (All have more than 100 units sold with a profit margin percentage >= 30%).

- Products that have a considerable amount of net loss: `Prod073`, `Prod084`, `Prod169`, `Prod336`, `Prod044`, `Prod016`, `Prod030` (Most have a total loss of more than 100k rupee and a loss percentage > 5%).

- Products that have a high loss percentage and can potentially create more loss: `Prod080`, `Prod022` (Both have a loss percentage >= 30%).

- As there are many products have a good profit margin and a good future potential, the company can focus on these units in future marketing, advertisement to boost up their sales. AtliQ can also focus their R&D to further develop these products and support their customers during their usage.

- For loss products, it is suggested to take a look on what is increasing the products' costs (could be operation coss, accidents, logistic costs, ...). If problems could not be found, the company can remove their production lines and focus on better products.

- Who are the best customers? (bring the most profit)

- `Cus006` generated a significant larger amount of profit margin compared to other customers (about 9.3M rupees).

- On the other hand, `Cus018` is the only customer that have a net loss (-37k rupees).

- In general, there are many customer re-purchased many times and it is suggested that the company can open a rewards/referral/frequent customers program.

- Even though there is only one customer that has a net loss, it is worth to communicate more with them in order to determine bottlenecks/logistic issues as our costs are extremely high.

- `Brick & Mortar` customers is a reliable and efficient source to generate profits. However, `E-commerce` customers have a great potential as they helped generated more profit per cost.

- What is the sales performance between months/years?

- The company had a good development in sales from 2017 to 2019, at the peak in 2019, it had increased by 12.9% from the previous year 2018.

- However, the sales decreased drastically in 2020, from 10.5M in 2019 to 2.1M rupees (80%). The profit margin percentage was also reduced by half, from 3.1% to 1.4%.

- Annually, the company seems to have a better sales from Q4 to Q1 compared to Q2 and Q3. During the peak months, the sales profit could be double off-peak months.

- How do different markets perform?

- By zone:

- `North` and `Central` zones have bigger markets and generated the most profit in the 3 zones. In 4 years, these two zones always contribute a major portion to the profit margin.

- However in 2020, the year that we observed a decline in general, `South` market did the best. This market:

- Generated profit, which the other 02 markets could not.

- Have the highest profit margin - made the most out of the cost.

- By markets:

- There are 6 markets generate a net profit more than 1M rupees: `Mark007`, `Mark013`, `Mark011`, `Mark003`, `Mark002`, `Mark004`. The last two market generates 4.87M and 11.95M rupees, respectively.

- There are 4 markets require detailed observations:

- `Mark014` and `Mark008` have an extremely small profit margin (~35-46k rupees).

- `Mark005` and `Mark006` have a net loss with `Mark006` has a 20% loss.

PROBLEMS:

1. High loss:

- The profits are generated well (up to 20-30% in a single order) but the losses are also as high as the profits. This explains why the net profit margin percentage are considerably smaller(less than 10%, mostly observed at around 2-5%) when we consider the transactions as groups (based on customers/products/markets/years).

- Note that the frequency of loss orders are high (45% - almost once every two orders). The company needs to find a problem related to this issue

2. An issue in 2020 (is likely to be the Covid-19) had a signficant impact on the sales performance, with the total revenue decreased by 57.8% and profit margin reduced by 80.8% (compared between year 2020 and 2019).

We'll need to observe the BI dashboard in order to fully understand the data and determine other issues. Suggestion and implemetation will be added in the final report presentation.