```python
import pandas as pd
import matplotlib.pyplot as plt

file_path = r"C:\Users\72526\SuperStore_Orders.csv"

df = pd.read_csv(file_path, encoding="latin1")

shape = df.shape
head = df.head()
info = df.dtypes

shape, head, info
```

```
((51290, 21),
          order_id  order_date   ship_date       ship_mode
customer_name  \
 0     AG-2011-2040  01-01-2011  06-01-2011  Standard Class  Toby
Braunhardt
 1    IN-2011-47883  01-01-2011  08-01-2011  Standard Class
Joseph Holt
 2     HU-2011-1220  01-01-2011  05-01-2011    Second Class    Annie
Thurman
 3  IT-2011-3647632  01-01-2011  05-01-2011    Second Class     Eugene
Moren
 4    IN-2011-47883  01-01-2011  08-01-2011  Standard Class
Joseph Holt

        segment            state    country  market   region  ...  \
 0     Consumer      Constantine    Algeria  Africa   Africa  ...
 1     Consumer  New South Wales  Australia    APAC  Oceania  ...
 2     Consumer         Budapest    Hungary    EMEA     EMEA  ...
 3  Home Office        Stockholm     Sweden      EU    North  ...
 4     Consumer  New South Wales  Australia    APAC  Oceania  ...

           category sub_category                 product_name sales
quantity  \
 0  Office Supplies      Storage          Tenex Lockers, Blue   408
2
 1  Office Supplies     Supplies     Acme Trimmer, High Speed   120
3
 2  Office Supplies      Storage      Tenex Box, Single Width    66
4
 3  Office Supplies        Paper  Enermax Note Cards, Premium    45
3
 4        Furniture  Furnishings   Eldon Light Bulb, Duo Pack   114
5

    discount   profit  shipping_cost  order_priority  year
 0       0.0  106.140          35.46          Medium  2011
 1       0.1   36.036           9.72          Medium  2011
```

```
2       0.0   29.640           8.17           High  2011
3       0.5  -26.055           4.82           High  2011
4       0.1   37.770           4.70         Medium  2011

[5 rows x 21 columns],
order_id           object
order_date         object
ship_date          object
ship_mode          object
customer_name      object
segment            object
state              object
country            object
market             object
region             object
product_id         object
category           object
sub_category       object
product_name       object
sales              object
quantity            int64
discount          float64
profit            float64
shipping_cost     float64
order_priority     object
year                int64
dtype: object)
```

```python
import pandas as pd
import numpy as np

df_new = pd.read_csv(file_path, encoding="latin1")

df_new['sales'] = df_new['sales'].replace(r'[^0-9.\-]', '',
regex=True)
df_new['sales'] = pd.to_numeric(df_new['sales'], errors='coerce')

df_new['order_date'] = pd.to_datetime(df_new['order_date'],
errors='coerce', dayfirst=True)
df_new['ship_date'] = pd.to_datetime(df_new['ship_date'],
errors='coerce', dayfirst=True)

desc_stats =
df_new[['sales','quantity','discount','profit','shipping_cost']].descr
ibe()

category_stats = df_new.groupby("category")
[['sales','profit']].describe()
segment_stats = df_new.groupby("segment")
[['sales','profit']].describe()
```

```
region_stats = df_new.groupby("region")[['sales','profit']].describe()

print("Descriptive Statistics (Overall)", desc_stats)

Descriptive Statistics (Overall)               sales      quantity
discount        profit  shipping_cost
count  51290.000000  51290.000000  51290.000000  51290.000000
51290.000000
mean     246.498440      3.476545      0.142908     28.641740
26.375915
std      487.567175      2.278766      0.212280    174.424113
57.296804
min        0.000000      1.000000      0.000000  -6599.978000
0.000000
25%       31.000000      2.000000      0.000000      0.000000
2.610000
50%       85.000000      3.000000      0.000000      9.240000
7.790000
75%      251.000000      5.000000      0.200000     36.810000
24.450000
max    22638.000000     14.000000      0.850000   8399.976000
933.570000

import numpy as np
import pandas as pd


PATH = "/mnt/data/SuperStore_Orders.csv"
df = pd.read_csv(file_path, encoding="latin1")

df["sales"] = pd.to_numeric(df["sales"].astype(str).str.replace(r"[^0-
9.\-]", "", regex=True), errors="coerce")
for col in ["quantity", "discount", "profit", "shipping_cost"]:
    df[col] = pd.to_numeric(df[col], errors="coerce")

df["order_date"] = pd.to_datetime(df["order_date"], errors="coerce",
dayfirst=True)
df["ship_date"]  = pd.to_datetime(df["ship_date"],  errors="coerce",
dayfirst=True)

numeric_cols = ["sales", "quantity", "discount", "profit",
"shipping_cost"]

def manual_stats(series: pd.Series) -> pd.Series:
    s = series.dropna().astype(float)
    return pd.Series({
        "count":   int(s.shape[0]),
        "missing": int(series.isna().sum()),
        "mean":    float(s.mean()) if len(s) else np.nan,
        "std":     float(s.std(ddof=1)) if len(s) > 1 else np.nan,
```

```
        "min":     float(s.min()) if len(s) else np.nan,
        "q25":     float(s.quantile(0.25)) if len(s) else np.nan,
        "median":  float(s.quantile(0.50)) if len(s) else np.nan,
        "q75":     float(s.quantile(0.75)) if len(s) else np.nan,
        "max":     float(s.max()) if len(s) else np.nan,
    })

overall_stats = pd.concat({col: manual_stats(df[col]) for col in
numeric_cols}, axis=1)
print("\n=== Overall numeric stats (manual) ===")
print(overall_stats)

def group_summary(df: pd.DataFrame, by: str) -> pd.DataFrame:
    out = (
        df.groupby(by)
          .agg(
              orders=("order_id", "count"),
              sales_total=("sales", "sum"),
              sales_mean=("sales", "mean"),
              profit_total=("profit", "sum"),
              profit_mean=("profit", "mean"),
          )
          .sort_values("sales_total", ascending=False)
    )
    out["margin_pct"] = (out["profit_total"] / out["sales_total"]) *
100
    return out

category_summary = group_summary(df, "category")
segment_summary  = group_summary(df, "segment")
region_summary   = group_summary(df, "region")

print("\n=== By Category (orders, totals, means, margin %) ===")
print(category_summary)

print("\n=== By Segment (orders, totals, means, margin %) ===")
print(segment_summary)

print("\n=== By Region (orders, totals, means, margin %) ===")
print(region_summary)


=== Overall numeric stats (manual) ===
                sales      quantity      discount        profit
shipping_cost
count    51290.000000  51290.000000  51290.000000  51290.000000
51290.000000
missing      0.000000      0.000000      0.000000      0.000000
0.000000
mean       246.498440      3.476545      0.142908     28.641740
```

```
26.375915
std        487.567175      2.278766      0.212280    174.424113
57.296804
min          0.000000      1.000000      0.000000  -6599.978000
0.000000
q25         31.000000      2.000000      0.000000      0.000000
2.610000
median      85.000000      3.000000      0.000000      9.240000
7.790000
q75        251.000000      5.000000      0.200000     36.810000
24.450000
max      22638.000000     14.000000      0.850000   8399.976000
933.570000

=== By Category (orders, totals, means, margin %) ===
                orders  sales_total  sales_mean  profit_total
profit_mean  \
category

Technology        10141      4744691  467.872103  663778.73318
65.454958
Furniture          9876      4110884  416.249899  286782.25380
29.038300
Office Supplies   31273      3787330  121.105426  518473.83430
16.578961

                margin_pct
category
Technology        13.989925
Furniture          6.976170
Office Supplies   13.689693

=== By Segment (orders, totals, means, margin %) ===
             orders  sales_total  sales_mean  profit_total
profit_mean  \
segment

Consumer      26518      6508141  245.423524  749239.78206
28.254008
Corporate     15429      3824808  247.897336  442785.85866
28.698286
Home Office    9343      2309956  247.239217  277009.18056
29.648847

             margin_pct
segment
Consumer      11.512347
Corporate     11.576682
Home Office   11.991968
```

```
=== By Region (orders, totals, means, margin %) ===
                orders  sales_total  sales_mean  profit_total
profit_mean  \
region

Central           11117      2822399  253.881353  311403.98164
28.011512
South              6645      1600960  240.927013  140355.76618
21.122011
North              4785      1248192  260.855172  194597.95252
40.668329
Oceania            3487      1100207  315.516777  121666.64200
34.891495
Southeast Asia     3129       884438  282.658357   17852.32900
5.705442
North Asia         2338       848349  362.852438  165578.42100
70.820539
EMEA               5029       806184  160.307019   43897.97100
8.728966
Africa             4587       783776  170.868978   88871.63100
19.374674
Central Asia       2048       752839  367.597168  132480.18700
64.687591
West               3203       725514  226.510771  108418.44890
33.849032
East               2848       678834  238.354635   91522.78000
32.135808
Caribbean          1690       324281  191.882249   34571.32104
20.456403
Canada              384        66932  174.302083   17817.39000
46.399453

                margin_pct
region
Central          11.033308
South             8.766975
North            15.590386
Oceania          11.058523
Southeast Asia    2.018494
North Asia       19.517725
EMEA              5.445155
Africa           11.338907
Central Asia     17.597413
West             14.943674
East             13.482351
Caribbean        10.660915
Canada           26.620137
```

```
# --- Quantile item finder & binner (no seaborn) ---
import numpy as np
```

```
import pandas as pd
import matplotlib.pyplot as plt
from pathlib import Path

# 0) Load & basic cleaning
CANDIDATES = [
    r"C:\path\to\SuperStore_Orders.csv",          # <- put your local
path here
    r"C:\Users\72526\SuperStore_Orders.csv",      # <- example
    "/mnt/data/SuperStore_Orders.csv",            # <- fallback
(uploaded file in this chat)
]
for p in CANDIDATES:
    if Path(p).exists():
        PATH = p
        break
else:
    raise FileNotFoundError("Update CANDIDATES to point at your
SuperStore_Orders.csv")

df = pd.read_csv(PATH, encoding="latin1")

# Clean 'sales' to numeric
df["sales"] = pd.to_numeric(df["sales"].astype(str).str.replace(r"[^0-
9.\-]", "", regex=True),
                            errors="coerce")

# 1) Helper: slice rows around a target value
def slice_sales_at_value(data: pd.DataFrame, value: float, *, tol:
float=None, window: float=None) -> pd.DataFrame:
    s = data["sales"]
    if window is not None:
        mask = s.between(value - window, value + window,
inclusive="both")
    elif tol is not None:
        mask = np.isclose(s, value, atol=tol)
    else:
        mask = (s == value)
    return data.loc[mask].copy()

# 2) Helper: aggregate counts (bin) by category / sub_category /
product_name
def build_bins(df_slice: pd.DataFrame) -> dict:
    out = {}
    out["by_category"] = (
        df_slice.groupby("category", dropna=False)
                .size().sort_values(ascending=False)
                .rename("count").reset_index()
    )
    out["by_subcategory"] = (
```

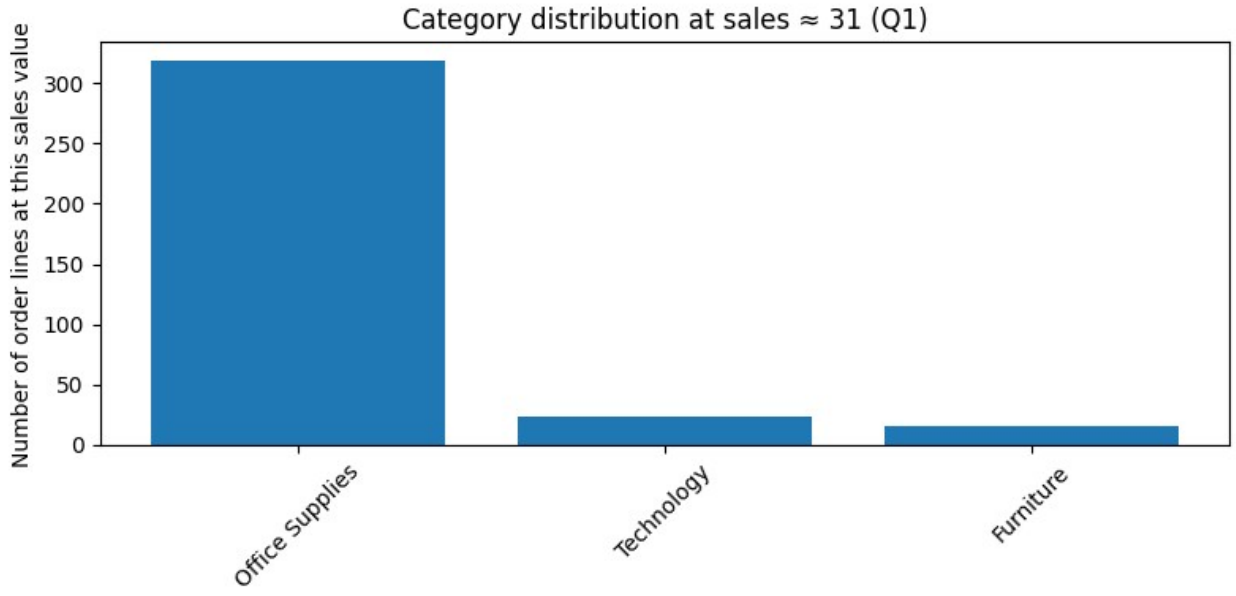
```
        df_slice.groupby(["category", "sub_category"], dropna=False)
                .size().sort_values(ascending=False)
                .rename("count").reset_index()
    )
    out["by_product"] = (
        df_slice.groupby("product_name", dropna=False)
                .size().sort_values(ascending=False)
                .rename("count").reset_index()
    )
    return out

# 3) Quantiles
q25 = float(df["sales"].quantile(0.25))  # ~ 31
q75 = float(df["sales"].quantile(0.75))  # ~ 251

print(f"Q1 (25th pct) sales ≈ {q25:.0f}")
print(f"Q3 (75th pct) sales ≈ {q75:.0f}")

# Choose ONE of the modes below:
MODE = "tolerance"   # options: "exact", "tolerance", "window"
TOL = 0.5            # used if MODE == "tolerance"
WIN = None           # e.g., 5.0 for ±5 range if MODE == "window"

# 4) Get slices at Q1 and Q3
if MODE == "exact":
    eq25 = slice_sales_at_value(df, q25, tol=None, window=None)
    eq75 = slice_sales_at_value(df, q75, tol=None, window=None)
elif MODE == "tolerance":
    eq25 = slice_sales_at_value(df, q25, tol=TOL)
    eq75 = slice_sales_at_value(df, q75, tol=TOL)
elif MODE == "window":
    eq25 = slice_sales_at_value(df, q25, window=WIN)
    eq75 = slice_sales_at_value(df, q75, window=WIN)
else:
    raise ValueError("MODE must be 'exact', 'tolerance', or
'window'.")

print(f"Rows at/near Q1: {len(eq25)}   | Rows at/near Q3:
{len(eq75)}")

# 5) Build binned summaries
bins25 = build_bins(eq25)
bins75 = build_bins(eq75)

# Show top products (binned by same name)
print("\nTop products at/near Q1:")
print(bins25["by_product"].head(20))

print("\nTop products at/near Q3:")
print(bins75["by_product"].head(20))
```

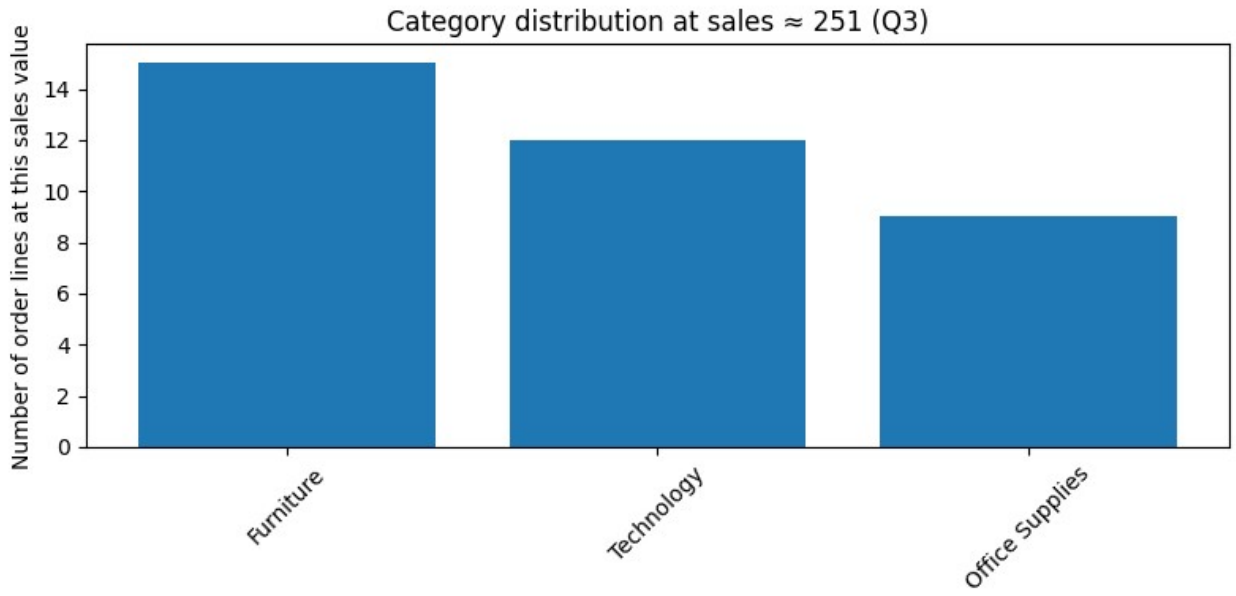
```python
print("\nCategory counts at/near Q1:")
print(bins25["by_category"])

print("\nCategory counts at/near Q3:")
print(bins75["by_category"])

print("\nTop (category, sub_category) at/near Q1:")
print(bins25["by_subcategory"].head(20))

print("\nTop (category, sub_category) at/near Q3:")
print(bins75["by_subcategory"].head(20))

# 6) Plot category distributions at Q1 and Q3
def plot_category_counts(cat_df: pd.DataFrame, title: str):
    if cat_df.empty:
        print(f"[WARN] No rows to plot for: {title}")
        return
    x = cat_df["category"].astype(str)
    y = cat_df["count"].values

    plt.figure(figsize=(8, 4))
    plt.bar(x, y)
    plt.title(title)
    plt.ylabel("Number of order lines at this sales value")
    plt.xticks(rotation=45)
    plt.tight_layout()
    plt.show()

plot_category_counts(bins25["by_category"], f"Category distribution at
sales ≈ {q25:.0f} (Q1)")
plot_category_counts(bins75["by_category"], f"Category distribution at
sales ≈ {q75:.0f} (Q3)")
```

```
Q1 (25th pct) sales ≈ 31
Q3 (75th pct) sales ≈ 251
Rows at/near Q1: 358   | Rows at/near Q3: 36

Top products at/near Q1:
                                        product_name  count
0                          Boston Pens, Fluorescent     10
1                             BIC Pens, Fluorescent      9
2                             Ibico Binder, Economy      9
3                             Tenex Box, Wire Frame      8
4                          Cardinal Binder, Durable      7
5                              Rogers Folders, Blue      7
6       Green Bar Computer Printout Paper, Multicolor      6
7                         Rogers Folders, Industrial      6
8                                            Staples      5
```

```
9                                    Smead Folders, Blue      5
10                    Logitech Flash Drive, Bluetooth      4
11                              Accos Staples, 12 Pack      4
12        SanDisk Computer Printout Paper, Multicolor      4
13                     Stockwell Rubber Bands, 12 Pack      4
14  GlobeWeis Manila Envelope, with clear poly window      4
15                        Stockwell Staples, Bulk Pack      4
16               Sterilite Officeware Hinged File Box      4
17                    Acco Hole Reinforcements, Clear      3
18                      Green Bar Note Cards, Premium      3
19                           Stiletto Scissors, Steel      3

Top products at/near Q3:
                                          product_name  count
0                        Ikea Corner Shelving, Mobile      3
1                  Cardinal Binding Machine, Recycled      2
2                           Bush Corner Shelving, Pine      2
3                                Enermax Keyboard, USB      2
4                    Samsung Signal Booster, Cordless      2
5                       Kleencut Box Cutter, Serrated      2
6                           HP Personal Copier, Color      2
7                         Canon Fax and Copier, Color      1
8                    Brother Wireless Fax, High-Speed      1
9            Bevis Round Conference Table Top, X-Base      1
10                         Avery 3-Hole Punch, Economy      1
11                      Apple Signal Booster, Cordless      1
12                  Green Bar Message Books, 8.5 x 11      1
13                         Enermax Mouse, Programmable      1
14                            Elite Shears, High Speed      1
15                           Eldon Door Stop, Duo Pack      1
16                Hon Steel Folding Chair, Set of Two      1
17                         Logitech Numeric Keypad, USB      1
18                         Novimex Chairmat, Adjustable      1
19  Harbour Creations Executive Leather Armchair, ...      1

Category counts at/near Q1:
          category  count
0  Office Supplies    318
1       Technology     24
2        Furniture     16

Category counts at/near Q3:
          category  count
0        Furniture     15
1       Technology     12
2  Office Supplies      9

Top (category, sub_category) at/near Q1:
           category sub_category  count
0   Office Supplies      Binders     64
```

```
1   Office Supplies        Paper     60
2   Office Supplies      Storage     53
3   Office Supplies          Art     35
4   Office Supplies    Envelopes     33
5   Office Supplies       Labels     28
6   Office Supplies    Fasteners     24
7        Technology  Accessories     23
8   Office Supplies     Supplies     15
9         Furniture  Furnishings     14
10  Office Supplies   Appliances      6
11        Furniture       Chairs      2
12       Technology       Phones      1

Top (category, sub_category) at/near Q3:
           category sub_category  count
0         Furniture    Bookcases      6
1        Technology      Copiers      5
2         Furniture  Furnishings      4
3         Furniture       Chairs      4
4        Technology  Accessories      4
5        Technology       Phones      3
6   Office Supplies      Binders      3
7   Office Supplies     Supplies      3
8         Furniture       Tables      1
9   Office Supplies      Storage      1
10  Office Supplies          Art      1
11  Office Supplies        Paper      1
```






Berdasarkan data diatas ditemukan bahwa dalam persenan kuantil Q1 dalam "sales" ditemukan dominasi oleh office supplies. dan kuantil Q3 terbagi rata. Hal ini menunjukkan bahwa penjualan sales di dominasi oleh office supplies seperti

1. Boston Pens, Fluorescent — 10 lines
2. BIC Pens, Fluorescent — 9 lines
3. Ibico Binder, Economy — 9 lines
4. Tenex Box, Wire Frame — 8 lines
5. Rogers Folders, Blue — 7 lines

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

# 0) Load data (change PATH if needed)
PATH = "/mnt/data/SuperStore_Orders.csv"  # or your local CSV path
df = pd.read_csv(file_path, encoding="latin1")

# Ensure numeric shipping_cost
df["shipping_cost"] = pd.to_numeric(df["shipping_cost"],
errors="coerce")

# 1) Country-level shipping cost summary
country_ship = (
    df.groupby("country", dropna=False)
      .agg(
          orders=("order_id", "count"),
          avg_shipping=("shipping_cost", "mean"),
          median_shipping=("shipping_cost", "median"),
          p75_shipping=("shipping_cost", lambda s: s.quantile(0.75)),
```

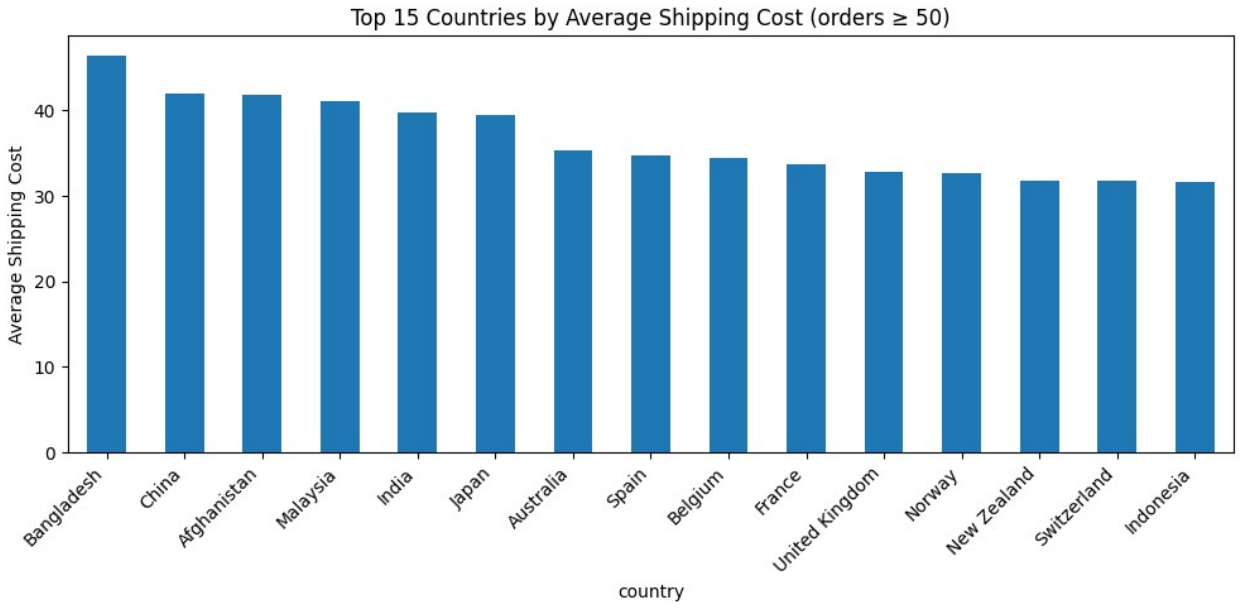
```
            total_shipping=("shipping_cost", "sum"),
        )
        .sort_values("avg_shipping", ascending=False)
)

# Optional: filter to avoid small-sample outliers
MIN_ORDERS = 50
country_ship_filtered = country_ship.query("orders >=
@MIN_ORDERS").copy()

print("\n== Country shipping cost summary (ALL) ==")
print(country_ship.round(3).head(20))
print(f"\n== Country shipping cost summary (orders >= {MIN_ORDERS})
==")
print(country_ship_filtered.round(3).head(20))

# 2) Region-level shipping cost summary + compare to overall average
overall_avg = df["shipping_cost"].mean()

region_ship = (
    df.groupby("region", dropna=False)
      .agg(
          orders=("order_id", "count"),
          avg_shipping=("shipping_cost", "mean"),
          median_shipping=("shipping_cost", "median"),
          p75_shipping=("shipping_cost", lambda s: s.quantile(0.75)),
          total_shipping=("shipping_cost", "sum"),
      )
      .sort_values("avg_shipping", ascending=False)
)

region_ship["delta_from_overall"] = region_ship["avg_shipping"] -
overall_avg
region_ship["abs_delta"] = region_ship["delta_from_overall"].abs()
region_closest_to_overall = region_ship["abs_delta"].idxmin()

print("\n== Region shipping cost summary (with distance to overall
avg) ==")
print(region_ship.round(3))
print(f"\nOverall average shipping cost: {overall_avg:.3f}")
print(f"Region closest to overall average: {region_closest_to_overall}
"
      f"({region_ship.loc[region_closest_to_overall,
'avg_shipping']:.3f})")

# 3) Plots
# Top-N countries by average shipping cost (filtered for min orders)
TOP_N = 15
plt.figure(figsize=(10, 5))
country_ship_filtered.head(TOP_N)["avg_shipping"].plot(kind="bar")
```

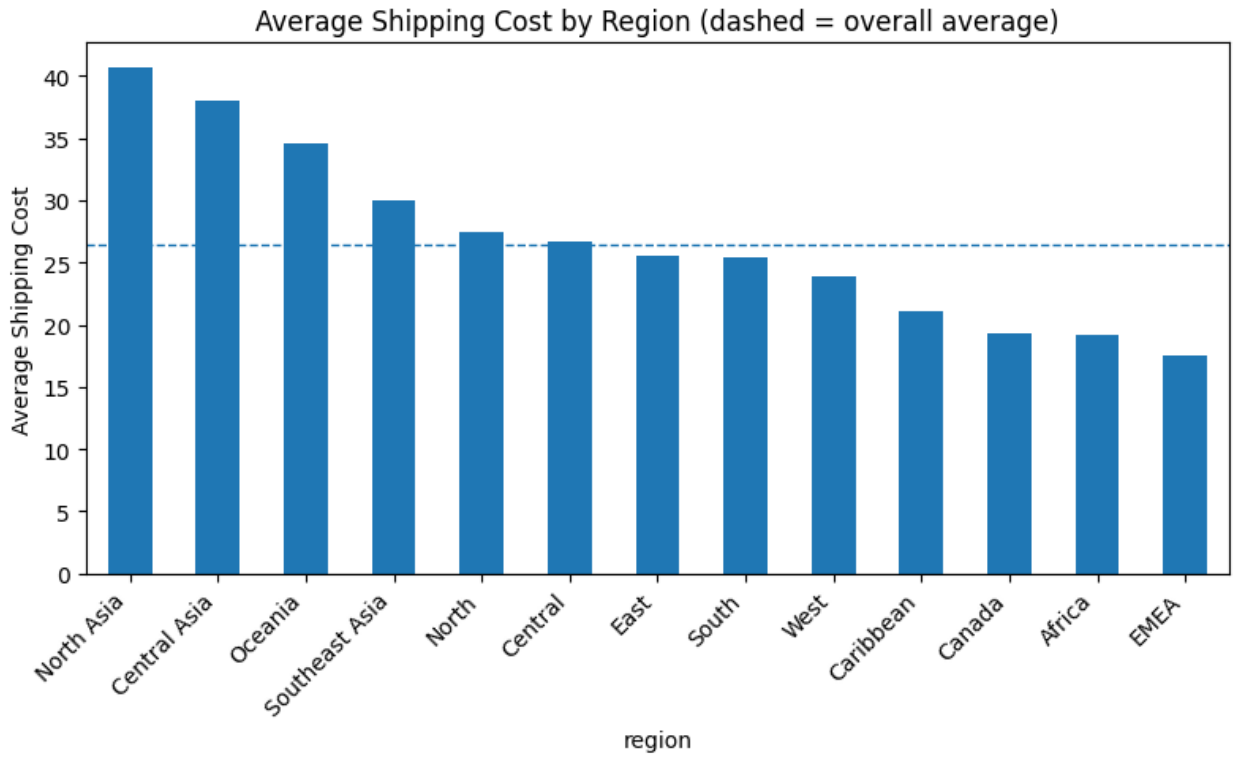
```
plt.title(f"Top {TOP_N} Countries by Average Shipping Cost (orders ≥
{MIN_ORDERS})")
plt.ylabel("Average Shipping Cost")
plt.xlabel("country")
plt.xticks(rotation=45, ha="right")
plt.tight_layout()
plt.show()

# Region average with overall average line
plt.figure(figsize=(8, 5))
region_ship["avg_shipping"].plot(kind="bar")
plt.axhline(overall_avg, linestyle="--", linewidth=1)
plt.title("Average Shipping Cost by Region (dashed = overall
average)")
plt.ylabel("Average Shipping Cost")
plt.xlabel("region")
plt.xticks(rotation=45, ha="right")
plt.tight_layout()
plt.show()


== Country shipping cost summary (ALL) ==
                          orders  avg_shipping  median_shipping
p75_shipping  \
country

Taiwan                        14       155.661           21.605
163.295
Chad                           2       148.970          148.970
222.525
Lesotho                        6       135.650           21.310
284.628
Montenegro                     4        93.938           39.840
120.083
Slovenia                       3        61.220           28.160
89.095
Republic of the Congo          6        59.303           29.515
39.645
Central African Republic       7        57.626           16.590
71.310
Namibia                        9        50.370           12.810
22.110
Bangladesh                   163        46.403           16.710
50.020
Estonia                       13        46.070            7.180
25.820
Uruguay                       24        45.230            3.965
23.118
Mauritania                    10        44.115            3.885
97.325
```

```
Albania                          16        43.661             6.040
29.765
Qatar                            16        43.078            15.005
32.050
China                          1880        41.998            13.755
43.152
Afghanistan                      55        41.822            11.010
40.970
Malaysia                        176        41.111            15.260
44.675
South Sudan                       2        40.855            40.855
55.428
Cambodia                         45        40.483            14.030
59.780
India                          1555        39.730            12.370
38.515

                           total_shipping
country
Taiwan                            2179.25
Chad                               297.94
Lesotho                            813.90
Montenegro                         375.75
Slovenia                           183.66
Republic of the Congo              355.82
Central African Republic           403.38
Namibia                            453.33
Bangladesh                        7563.67
Estonia                            598.91
Uruguay                           1085.51
Mauritania                         441.15
Albania                            698.57
Qatar                              689.25
China                            78957.02
Afghanistan                       2300.23
Malaysia                          7235.57
South Sudan                         81.71
Cambodia                          1821.74
India                            61780.72

== Country shipping cost summary (orders >= 50) ==
                orders  avg_shipping  median_shipping  p75_shipping  \
country
Bangladesh         163        46.403           16.710        50.020
China             1880        41.998           13.755        43.152
Afghanistan         55        41.822           11.010        40.970
Malaysia           176        41.111           15.260        44.675
India             1555        39.730           12.370        38.515
Japan              250        39.459           13.745        40.662
```

```
Australia          2837        35.375            11.590        32.660
Spain               859        34.747            12.920        35.130
Belgium             147        34.506            14.270        37.890
France             2827        33.742            12.580        32.480
United Kingdom     1633        32.811            11.340        33.670
Norway               70        32.638            10.880        37.420
New Zealand         628        31.803            10.065        28.448
Switzerland          78        31.741            12.455        37.490
Indonesia          1390        31.618             8.390        29.212
Germany            2065        30.976            11.850        32.400
Singapore           141        30.872            12.580        29.760
Senegal             112        30.816            11.750        22.980
Zambia              102        30.071            14.170        28.998
Ecuador              56        29.534             8.500        23.098

                total_shipping
country
Bangladesh             7563.67
China                 78957.02
Afghanistan            2300.23
Malaysia               7235.57
India                 61780.72
Japan                  9864.65
Australia            100359.02
Spain                 29848.09
Belgium                5072.37
France                95387.81
United Kingdom        53580.27
Norway                 2284.68
New Zealand           19972.34
Switzerland            2475.81
Indonesia             43948.62
Germany               63965.18
Singapore              4352.89
Senegal                3451.37
Zambia                 3067.20
Ecuador                1653.88

== Region shipping cost summary (with distance to overall avg) ==
               orders  avg_shipping  median_shipping  p75_shipping  \
region
North Asia       2338        40.646           13.315        41.392
Central Asia     2048        38.003           11.955        36.062
Oceania          3487        34.594           11.160        31.860
Southeast Asia   3129        29.938            9.280        28.790
North            4785        27.476            8.930        26.790
Central         11117        26.710            8.560        26.110
East             2848        25.542            5.260        20.242
South            6645        25.354            7.890        24.470
```

```
West              3203        23.888             5.650        21.535
Caribbean         1690        21.059             7.440        22.405
Canada             384        19.285             6.270        15.897
Africa            4587        19.215             5.150        16.085
EMEA              5029        17.573             5.070        15.350

                total_shipping  delta_from_overall  abs_delta
region
North Asia           95030.61              14.270     14.270
Central Asia         77830.15              11.627     11.627
Oceania             120628.51               8.218      8.218
Southeast Asia       93675.84               3.562      3.562
North               131474.09               1.100      1.100
Central             296940.56               0.335      0.335
East                 72743.62              -0.834      0.834
South               168474.07              -1.022      1.022
West                 76512.26              -2.488      2.488
Caribbean            35590.15              -5.317      5.317
Canada                7405.63              -7.090      7.090
Africa               88139.47              -7.161      7.161
EMEA                 88375.73              -8.803      8.803

Overall average shipping cost: 26.376
Region closest to overall average: Central (26.710)
```





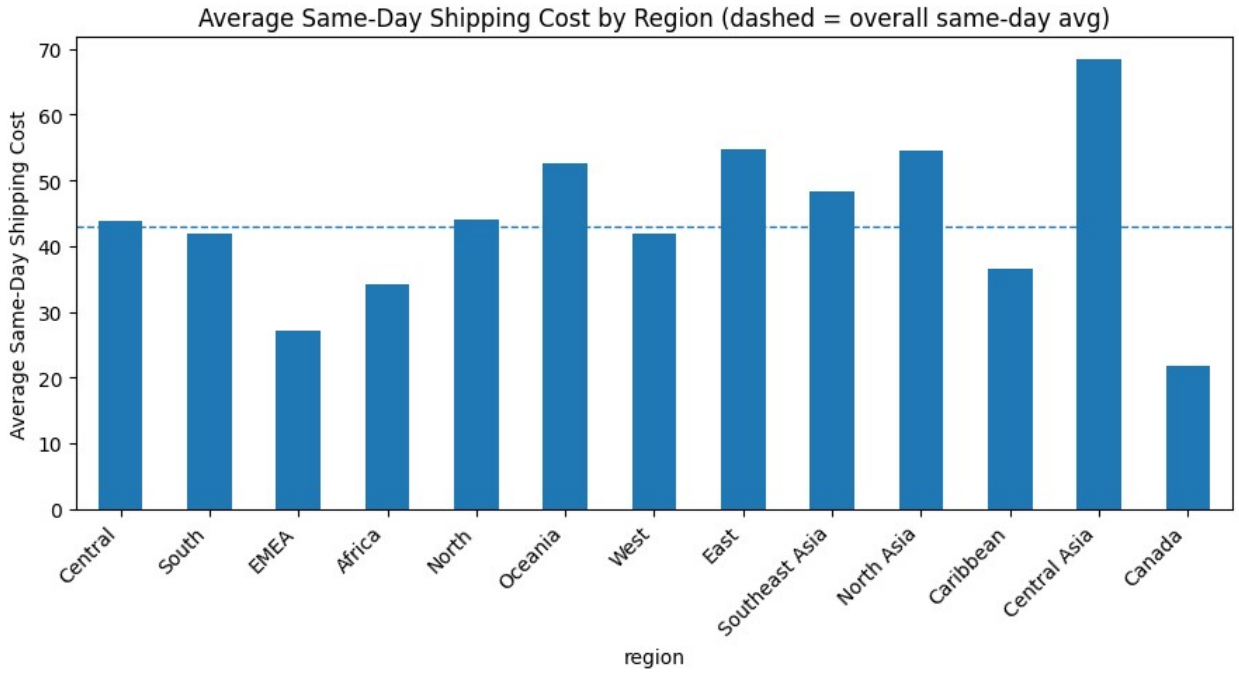

Data dalam shipping cost menunjukkan bahwa median memiliki nilai rentang 7-8 USD. dan average memiliki nilai 26.375915. Hal ini menujukkan bahwa 50% data memiliki shipping cost dibawah 7. Setelah di cek negara tujuan yang mendekati average adalah negara negara dari EMEA atau ASIA, yang menunjukkan bahwa shipping cost tinggi berpengaruh dengan nilai profit dari region yang dituju, berdasarkan region profit South east asia dna EMEA adalah yang terendah

```
# Normalize ship_mode and filter Same Day
ship = df["ship_mode"].astype(str).str.strip().str.lower()
same_day_df = df[ship.eq("same day")].copy()

# Ensure numeric shipping_cost
same_day_df["shipping_cost"] =
pd.to_numeric(same_day_df["shipping_cost"], errors="coerce")

# Counts and averages per region for Same Day
same_day_region = (
    same_day_df.groupby("region")
               .agg(
                   same_day_orders=("order_id", "count"),
                   same_day_avg_shipping=("shipping_cost", "mean"),
                   same_day_median_shipping=("shipping_cost",
"median"),
                   same_day_p75_shipping=("shipping_cost", lambda s:
s.quantile(0.75)),
                   same_day_total_shipping=("shipping_cost", "sum")
```

```
                )
                .sort_values("same_day_orders", ascending=False)
)

# Add share of orders within each region
region_totals = df.groupby("region").agg(total_orders=("order_id",
"count"))
same_day_region = same_day_region.join(region_totals, how="left")
same_day_region["same_day_share_%"] =
(same_day_region["same_day_orders"] / same_day_region["total_orders"]
* 100)

# Show interactive table
print(
    "Same-Day shipping by region: count, share, and average costs",
    same_day_region.reset_index().round(3)
)

# Plot average Same-Day shipping cost by region
overall_same_day_avg = same_day_df["shipping_cost"].mean()

plt.figure(figsize=(9,5))
same_day_region["same_day_avg_shipping"].plot(kind="bar")
plt.axhline(overall_same_day_avg, linestyle="--", linewidth=1)  #
overall same-day avg
plt.title("Average Same-Day Shipping Cost by Region (dashed = overall
same-day avg)")
plt.ylabel("Average Same-Day Shipping Cost")
plt.xlabel("region")
plt.xticks(rotation=45, ha="right")
plt.tight_layout()
plt.show()

overall_same_day_avg
```

```
Same-Day shipping by region: count, share, and average costs
region  same_day_orders  same_day_avg_shipping  \
0          Central              568                 43.882
1            South              341                 41.976
2             EMEA              300                 27.114
3           Africa              257                 34.235
4            North              246                 44.126
5          Oceania              205                 52.630
6             West              185                 41.880
7             East              155                 54.804
8   Southeast Asia              145                 48.328
9       North Asia              106                 54.513
10       Caribbean               85                 36.442
11    Central Asia               79                 68.367
12          Canada               29                 21.777
```

```
    same_day_median_shipping  same_day_p75_shipping
same_day_total_shipping  \
0                     13.745                  42.862
24925.07
1                     14.860                  41.890
14313.70
2                      9.275                  25.832
8134.33
3                      7.940                  26.250
8798.43
4                     16.805                  51.425
10854.95
5                     17.900                  49.200
10789.21
6                      8.230                  36.430
7747.71
7                     10.040                  40.285
8494.63
8                     16.460                  45.170
7007.52
9                     16.225                  63.777
5778.43
10                    11.310                  28.820
3097.57
11                    16.640                  64.580
5400.98
12                     7.780                  18.700
631.53

    total_orders  same_day_share_%
0          11117             5.109
1           6645             5.132
2           5029             5.965
3           4587             5.603
4           4785             5.141
5           3487             5.879
6           3203             5.776
7           2848             5.442
8           3129             4.634
9           2338             4.534
10          1690             5.030
11          2048             3.857
12           384             7.552
```




```
np.float64(42.93745279526102)
```

Alasan mengapa nilai average shipping cost north, central, wesst, east, dan south tinggi adalah banyaknya pengguna same day dengan price average 40. Berdasarkan data count negara yang menggunakan same day region central, west, east, north, dan south adalah yang tertinggi dan menyebabkan average shipping day region mereka tinggi.

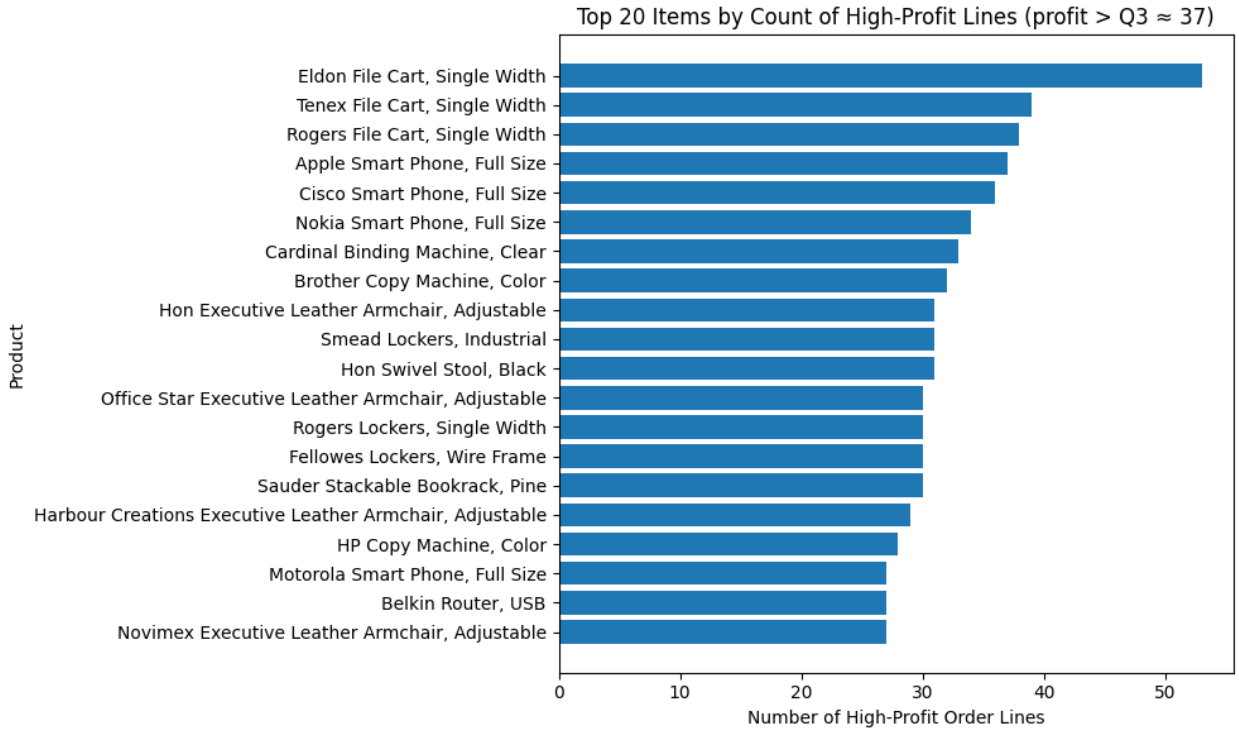
```
df["sales"] = pd.to_numeric(df["sales"].astype(str).str.replace(r"[^0-
9.\-]", "", regex=True), errors="coerce")
for col in ["quantity", "discount", "profit", "shipping_cost"]:
    df[col] = pd.to_numeric(df[col], errors="coerce")

q75_profit = float(df["profit"].quantile(0.75))
high = df[df["profit"] > q75_profit].copy()

print(f"Q3(profit) threshold ≈ {q75_profit:.2f}")
print(f"High-profit rows: {len(high)} / {len(df)}")

item_high = (
    high.groupby(["product_name", "category", "sub_category"],
as_index=False)
        .agg(
            high_profit_orders=("order_id", "count"),
            high_profit_total=("profit", "sum"),
            high_profit_median=("profit", "median"),
            sales_total=("sales", "sum"),
        )
```

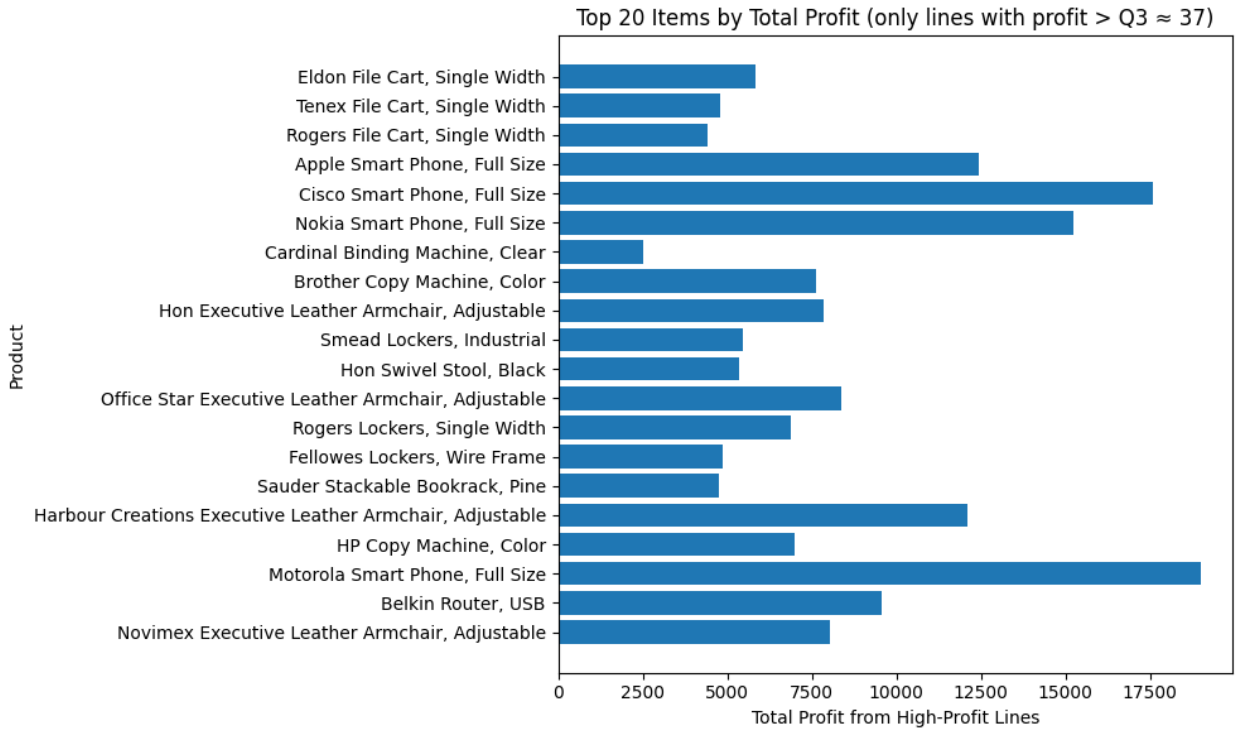
```
        .sort_values(["high_profit_orders", "high_profit_total"],
ascending=False)
)

TOP_N = 20
top_items = item_high.head(TOP_N)

print("\nTop items by count of high-profit order lines:")
print(top_items[["product_name", "category", "sub_category",
                 "high_profit_orders", "high_profit_total",
"high_profit_median", "sales_total"]])

plt.figure(figsize=(10, 6))
plt.barh(top_items["product_name"], top_items["high_profit_orders"])
plt.title(f"Top {TOP_N} Items by Count of High-Profit Lines (profit >
Q3 ≈ {q75_profit:.0f})")
plt.xlabel("Number of High-Profit Order Lines")
plt.ylabel("Product")
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()

plt.figure(figsize=(10, 6))
plt.barh(top_items["product_name"], top_items["high_profit_total"])
plt.title(f"Top {TOP_N} Items by Total Profit (only lines with profit
> Q3 ≈ {q75_profit:.0f})")
plt.xlabel("Total Profit from High-Profit Lines")
plt.ylabel("Product")
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()

cat_high = (
    high.groupby("category")
        .agg(high_profit_orders=("order_id", "count"),
             high_profit_total=("profit", "sum"))
        .sort_values("high_profit_orders", ascending=False)
)
subcat_high = (
    high.groupby(["category", "sub_category"])
        .agg(high_profit_orders=("order_id", "count"),
             high_profit_total=("profit", "sum"))
        .sort_values("high_profit_orders", ascending=False)
)

print("\nHigh-profit summary by Category:")
print(cat_high)

print("\nHigh-profit summary by (Category, Sub-category):")
print(subcat_high.head(20))
```

```
Q3(profit) threshold ≈ 36.81
High-profit rows: 12819 / 51290

Top items by count of high-profit order lines:
                                          product_name
category  \
678                        Eldon File Cart, Single Width  Office
Supplies
2127                       Tenex File Cart, Single Width  Office
Supplies
1749                      Rogers File Cart, Single Width  Office
Supplies
140                         Apple Smart Phone, Full Size
Technology
542                         Cisco Smart Phone, Full Size
Technology
1560                        Nokia Smart Phone, Full Size
Technology
482                      Cardinal Binding Machine, Clear  Office
Supplies
366                          Brother Copy Machine, Color
Technology
1120         Hon Executive Leather Armchair, Adjustable
Furniture
2005                           Smead Lockers, Industrial  Office
Supplies
1151                             Hon Swivel Stool, Black
Furniture
1626  Office Star Executive Leather Armchair, Adjust...
Furniture
1753                        Rogers Lockers, Single Width  Office
Supplies
829                         Fellowes Lockers, Wire Frame  Office
Supplies
1963                     Sauder Stackable Bookrack, Pine
Furniture
1034  Harbour Creations Executive Leather Armchair, ...
Furniture
976                                HP Copy Machine, Color
Technology
1528                     Motorola Smart Phone, Full Size
Technology
262                                   Belkin Router, USB
Technology
1577     Novimex Executive Leather Armchair, Adjustable
Furniture

     sub_category  high_profit_orders  high_profit_total
high_profit_median  \
678       Storage                  53         5820.64700
```

```
76.70000
2127      Storage                 39          4786.07790
99.55800
1749      Storage                 38          4436.43800
100.63500
140        Phones                 37         12425.45050
210.33000
542        Phones                 36         17603.42960
390.80000
1560       Phones                 34         15224.69000
299.22000
482       Binders                 33          2534.17590
64.26000
366       Copiers                 32          7631.52220
188.78508
1120       Chairs                 31          7842.34560
165.34800
2005      Storage                 31          5472.61000
167.04000
1151       Chairs                 31          5338.05560
135.36240
1626       Chairs                 30          8385.94200
253.42500
1753      Storage                 30          6886.47900
178.82925
829       Storage                 30          4849.30200
132.06000
1963    Bookcases                 30          4765.46930
113.46000
1034       Chairs                 29         12108.40900
314.19000
976       Copiers                 28          6986.00992
193.44000
1528       Phones                 27         18989.15380
674.73000
262   Accessories                 27          9576.62200
243.42000
1577       Chairs                 27          8053.72400
282.42000

      sales_total
678         23254
2127        14849
1749        21265
140         72314
542         75724
1560        60520
482          6397
366         23118
1120        45200
```

```
2005        23600
1151        18238
1626        36146
1753        19162
829         13250
1963        13370
1034        43491
976         19643
1528        64234
262         22151
1577        33366
```





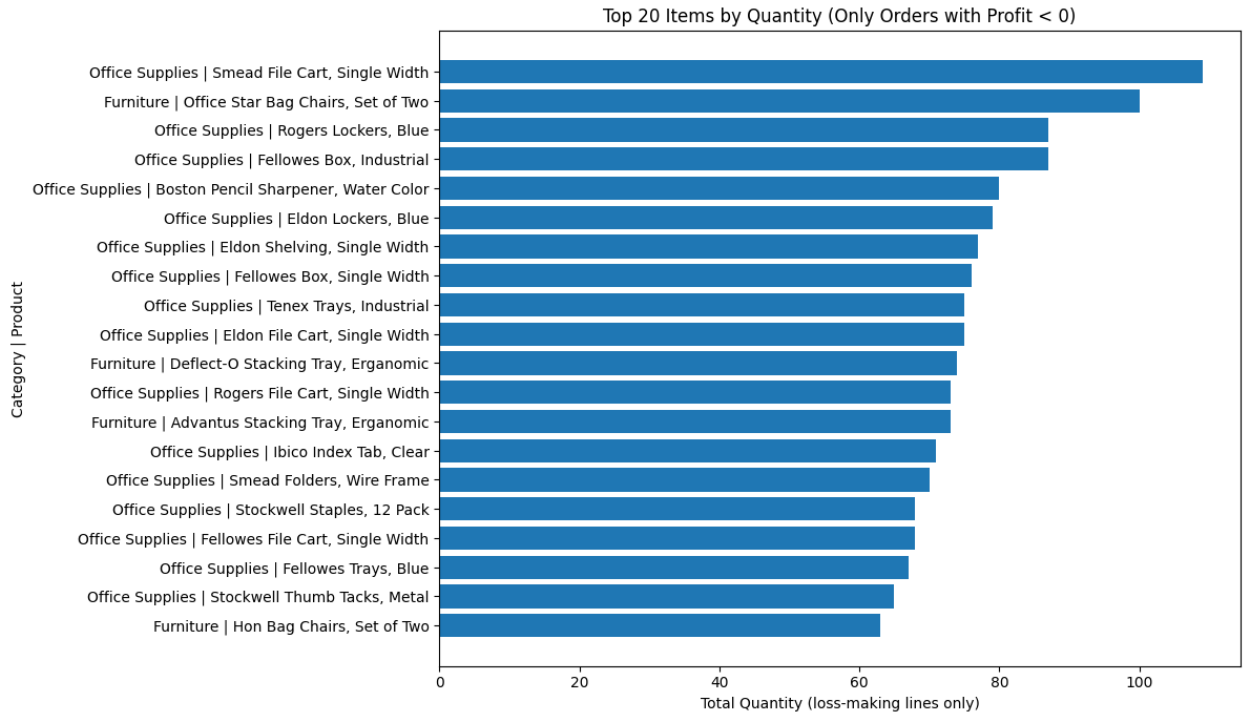

```
High-profit summary by Category:
                 high_profit_orders  high_profit_total
category
Technology                     4638       900587.77102
Office Supplies                4588       570769.95870
Furniture                      3593       610181.40910

High-profit summary by (Category, Sub-category):
                              high_profit_orders  high_profit_total
category        sub_category
Technology      Phones                      1555       295772.94560
Furniture       Chairs                      1378       222431.57410
Technology      Copiers                     1337       323747.93342
Furniture       Bookcases                   1303       256453.91240
Office Supplies Storage                     1258       155097.38850
Technology      Accessories                 1087       150064.76820
Office Supplies Appliances                   837       197366.49020
Technology      Machines                     659       131002.12380
Office Supplies Art                          639        43469.60760
Furniture       Furnishings                  620        52529.93320
Office Supplies Binders                      592        86555.12650
                Paper                        546        39193.77740
                Supplies                     313        21058.06160
                Envelopes                    302        21654.07860
Furniture       Tables                       292        78765.98940
```

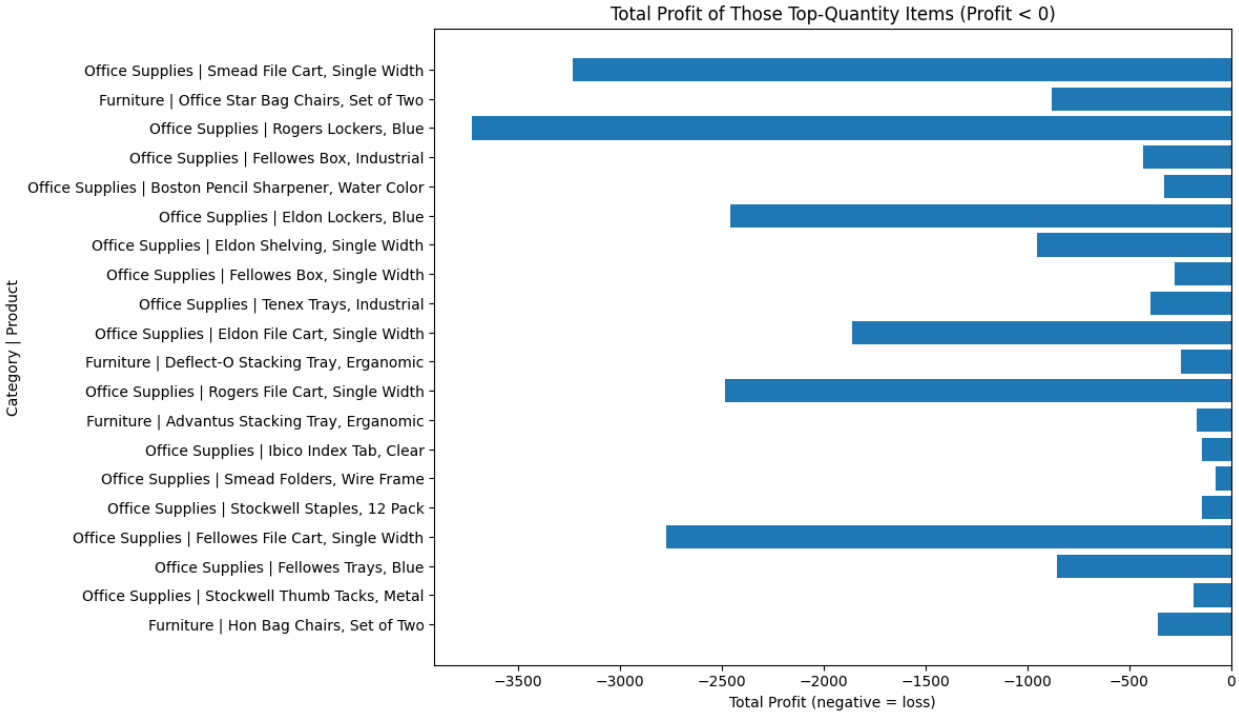
```
Office Supplies Fasteners                    56         2875.54980
                Labels                       45         3499.87850
```

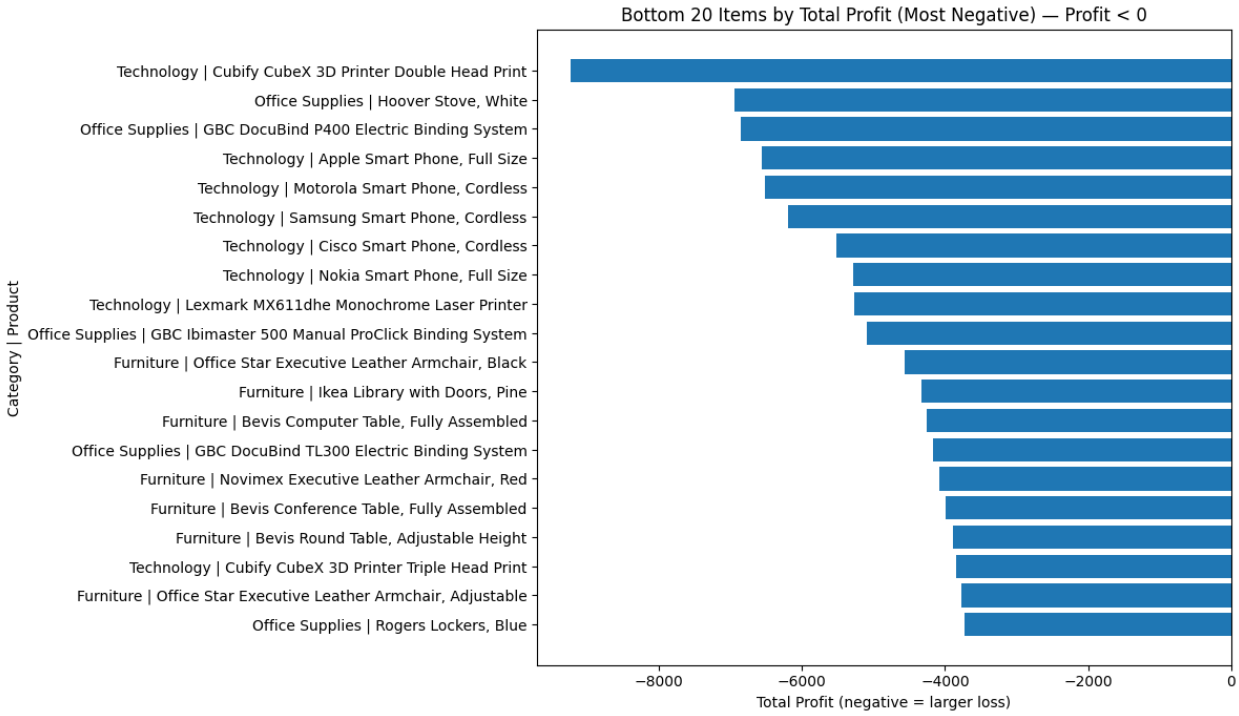
berdasarkan data barang top 3 "file cart (elden, tenex, roger)" adalah barang barang dengan kuantitas tinggi yang memiliki profit diatas 25% (profit 37). Akan tetapi barang seperti "smart phone (motorola, apple, cisco, nokia)" memiliki jumlah profit yang lebih tinggi dengan kuantitas yang setara

```
df["sales"] = pd.to_numeric(df["sales"].astype(str).str.replace(r"[^0-
9.\-]", "", regex=True), errors="coerce")
for col in ["quantity", "discount", "profit", "shipping_cost"]:
    df[col] = pd.to_numeric(df[col], errors="coerce")

# --- Filter to loss-making lines (profit < 0) ---
loss_only = df[df["profit"] < 0].copy()

# --- Aggregate by Category + Item ---
agg = (
    loss_only.groupby(["category", "product_name", "sub_category"],
as_index=False)
             .agg(
                 orders=("order_id", "count"),
                 total_quantity=("quantity", "sum"),
                 total_profit=("profit", "sum"),
                 avg_profit=("profit", "mean"),
             )
)

# A helper to create readable labels that include the category
def item_label(row):
    return f"{row['category']} | {row['product_name']}"

# 1) Top 20 (by quantity) among items with profit < 0
top_qty = agg.sort_values("total_quantity",
ascending=False).head(20).copy()
top_qty["label"] = top_qty.apply(item_label, axis=1)

plt.figure(figsize=(12, 7))
plt.barh(top_qty["label"], top_qty["total_quantity"])
plt.title("Top 20 Items by Quantity (Only Orders with Profit < 0)")
plt.xlabel("Total Quantity (loss-making lines only)")
plt.ylabel("Category | Product")
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()

# 2) For those same 20 items: show their total profit (still < 0, so
more negative = worse)
plt.figure(figsize=(12, 7))
```

```
plt.barh(top_qty["label"], top_qty["total_profit"])
plt.title("Total Profit of Those Top-Quantity Items (Profit < 0)")
plt.xlabel("Total Profit (negative = loss)")
plt.ylabel("Category | Product")
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()

# 3) Items with the lowest total profit (most negative) among profit < 0
worst_loss = agg.sort_values("total_profit", ascending=True).head(20).copy()
worst_loss["label"] = worst_loss.apply(item_label, axis=1)

plt.figure(figsize=(12, 7))
plt.barh(worst_loss["label"], worst_loss["total_profit"])
plt.title("Bottom 20 Items by Total Profit (Most Negative) — Profit < 0")
plt.xlabel("Total Profit (negative = larger loss)")
plt.ylabel("Category | Product")
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()
```






Dapat dilihat bahwa barang barang yang memiliki profit bawah Q1 bernilai 0 dalam profit atau (75% barang yang memiliki profit dibawah 0) terlihat bahwa banyak barang office supplies yang memiliki kuantitas tinggi tapi merugikan. tapi dalam total loss 'technology' memiliki nilai tertinggi untuk total loss. jadi dalam kuantitas besar 'office supplies' memiliki banyak barang yang bikin rugi

1) Office Supplies (kuantitas tinggi tapi sering rugi)

Opsi uji 2–4 minggu (pilih sebagian SKU dulu):

- Batasi diskon untuk SKU yang paling sering muncul di transaksi rugi (top loss-by-quantity).
    - Bundling margin: padukan item “Q1/low-ticket” dengan produk komplementer yang marginnya lebih baik (mis. paper/label/organizer) agar basket margin naik.
    - Atur metode kirim: default ke Standard untuk keranjang kecil; Same Day hanya jika nilai keranjang melewati ambang tertentu.
- Yang dipantau: jumlah order rugi per SKU, perubahan conversion, dan margin per order.

2) Kategori ber-ticket besar (contoh: Technology) — loss per-SKU besar

- Penyesuaian ringan pada harga & cap diskon untuk SKU yang masuk daftar “bottom total loss”.
- Negosiasi vendor/rebate pada SKU yang kerugiannya paling besar.
- Arahkan promosi ke segmen yang lebih “willing-to-pay” (mis. Corporate/Home Office) agar diskon tidak terlalu agresif.
- Yang dipantau: total loss per-SKU, dampak ke volume, dan margin kategori.

3) Menurunkan porsi order non-profit (umum, lintas kategori)

- Flag ringan di proses order: jika estimasi profit_line ≤ 0, tampilkan peringatan/konfirmasi internal sebelum checkout final.
- Cap diskon default (mis. ≤ ~20%) untuk transaksi reguler; diskon lebih tinggi butuh persetujuan singkat (hanya untuk clearance).
- Simulasi ongkir sebelum konfirmasi: pastikan ongkir + diskon tidak membuat profit_line negatif.
- Yang dipantau: proporsi profit ≤ 0 dari seluruh order, rata-rata diskon, dan rerata shipping per order.

4) Monitoring ringan langsung dari notebook

- Tiga daftar mingguan :
    - Top-Qty loss items (SKU volume tinggi namun sering rugi).
    - Bottom total loss items (SKU dengan kerugian kumulatif terbesar).
    - Ringkasan per kategori/region (untuk melihat konsentrasi loss).

- KPI sederhana :
  - Penurunan proporsi order profit ≤ 0 (target penurunan bertahap).
  - Penurunan total loss pada 10 SKU terburuk.
  - Stabil/naiknya margin kategori prioritas.