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SC2207: INTRODUCTION TO DATABASES
Lab 5 Report

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Overall Insights and Reflections

Our project was carried out in four distinct stages: **Relationships Exploration**, **Data Population**, **Query Solution**, and **Report Writing**.

The **Relationships Exploration** stage was the most uncertain and debated phase. We spent significant time trying to understand and define the relationships between entities and attributes, often revisiting or adjusting our initial assumptions. Interestingly, this phase also helped us uncover inconsistencies and design issues in the schema provided in Lab 3. For example, it is improper to separate the **MarketValue** attribute from the **PORTFOLIO** entity, as it cannot inherently serve as a key on its own.

The **Data Population** stage was both the most time-consuming and engaging part of the project. Initially, we assumed we could simply generate random sample data. However, we quickly realized that many attributes are interdependent, and that the logic behind the data needed to reflect real-world constraints and relationships. These underlying relationships had not been realized or explored during the initial design phase—they only became apparent during the implementation of the data population, as we worked through attribute dependencies and entity logic.

For instance, in the **PORTFOLIO** table, the **MarketValue** is calculated based on **INVESTED_VALUE** and **UNREALIZED_GAIN_LOSS**. But both **INVESTED_VALUE** and **UNREALIZED_GAIN_LOSS** are weak entities dependent on **PORTFOLIO**, meaning we had to generate the portfolio data first, then populate the weak entities, and finally update the original portfolio records based on those values. A similar dependency exists between **INVESTED_VALUE** and **TRANSACTIONS**. Details are revealed below.

The **Query Solution** stage was relatively smooth once the data was well structured. It was satisfying to see how our well-organized schema and consistent data made complex queries easier to implement and validate.

Finally, the **Report Writing** stage required the most manual effort, since we needed to include all the code and result tables in the report, along with the necessary textual explanations. In addition, we also needed to include and format all result tables, ensuring they were well-designed and visually organized for clarity and effective presentation. This stage gives us the opportunity to reflect on the project as a whole and appreciate the progress made through each stage.

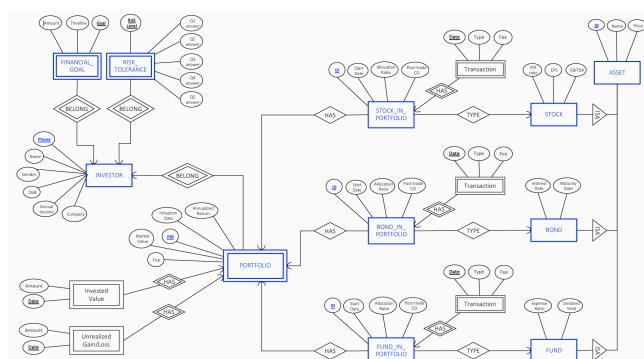


Table Creation

USER_SURVEY_RESPONSES (Phone, Q1Answer, Q2Answer, Q3Answer, Q4Answer, Q5Answer)

- Captures the raw responses of each investor (by Phone) to five survey questions — used to evaluate their risk profile.

```
CREATE TABLE USER_SURVEY_RESPONSES (
    Phone VARCHAR(20) NOT NULL,
    Q1Answer VARCHAR(255) NOT NULL,
    Q2Answer VARCHAR(255) NOT NULL,
    Q3Answer VARCHAR(255) NOT NULL,
    Q4Answer VARCHAR(255) NOT NULL,
    Q5Answer VARCHAR(255) NOT NULL,
    PRIMARY KEY (Phone),
    FOREIGN KEY (Phone) REFERENCES INVESTOR (Phone)
);
```

RISK_LEVEL_DETERMINATION (Q1Answer, Q2Answer, Q3Answer, Q4Answer, Q5Answer, RiskLevel)

- Maps a specific combination of survey responses to a calculated RiskLevel — acts as a reference table or logic engine.

```
CREATE TABLE RISK_LEVEL_DETERMINATION (
    Q1Answer VARCHAR(255) NOT NULL,
    Q2Answer VARCHAR(255) NOT NULL,
    Q3Answer VARCHAR(255) NOT NULL,
    Q4Answer VARCHAR(255) NOT NULL,
    Q5Answer VARCHAR(255) NOT NULL,
    RiskLevel VARCHAR(20) NOT NULL
    CHECK (RiskLevel IN ('Conservative', 'Moderate', 'Aggressive')),
    PRIMARY KEY (Q1Answer, Q2Answer, Q3Answer, Q4Answer, Q5Answer)
);
```

FINANCIAL_GOAL (Phone, Goal, Timeline, Amount)

- Records each investor's financial goal (e.g., retirement), the target timeline, and the goal amount.

```
CREATE TABLE FINANCIAL_GOAL (
    Phone VARCHAR(20) NOT NULL,
    Goal VARCHAR(255) NOT NULL,
    Timeline TEXT NOT NULL,
    Amount DECIMAL(15, 2) NOT NULL CHECK (Amount > 0),
    PRIMARY KEY (Phone, Goal),
    FOREIGN KEY (Phone) REFERENCES INVESTOR(Phone)
);
```

INVESTOR (Phone, Name, Gender, DoB, AnnualIncome, Company)

- Core table for investor demographics — includes identity, gender, date of birth, income, and associated company.

```
CREATE TABLE INVESTOR (
    Phone VARCHAR(20) NOT NULL,
    Name VARCHAR(100) NOT NULL,
    Gender VARCHAR(10) NOT NULL,
    DoB DATE NOT NULL,
    AnnualIncome DECIMAL(12, 2),
    Company VARCHAR(100) NOT NULL,
    PRIMARY KEY (Phone)
);
```

PORTFOLIO (Phone, PID, InceptionDate, AnnualizedReturn, MarketValue, Fee)

- Main portfolio entity linked to an investor. This includes a unique ID (Phone, PID), inception date, calculated annual return, current market value, and fee.
- In Lab 3 we spilt PORTFOLIO into two sub-relations:
 - **PORTFOLIO_DETAILS** (Phone, PID, InceptionDate, AnnualizedReturn, MarketValue)
 - **MARKET_VALUE_FEES** (MarketValue, Fee)but during the implementation, we find it improper to do so because MarketValue is not unique (many portfolios can have the same market value), and it's a computed value, not an inherent identifier. Therefore, we merged the tables back into a single **PORTFOLIO** table.
- We initially set the attributes AnnualizedReturn, MarketValue, and Fee to 0 instead of NOT NULL because they depend on **INVESTED_VALUE** and **UNREALIZED_LOSS_GAIN**, which are populated later. These three attributes will be updated afterward. Details are revealed in the Data Population section.

```
CREATE TABLE PORTFOLIO (
    Phone VARCHAR(20) NOT NULL,
    PID INT NOT NULL,
    InceptionDate DATE NOT NULL,
    AnnualizedReturn DECIMAL(5,2) DEFAULT 0,
    MarketValue DECIMAL(15,2) DEFAULT 0,
    Fee DECIMAL(15,2) DEFAULT 0,
    PRIMARY KEY (Phone, PID),
    FOREIGN KEY (Phone) REFERENCES INVESTOR(Phone)
);
```

INVESTED_VALUE (Phone, PID, Date, Amount)

- Tracks capital inflows or outflows by date — shows how much was added or withdrawn for a specific portfolio.
- Amount represents the cumulative invested value up to the specified date.

```
CREATE TABLE INVESTED_VALUE (
    Phone VARCHAR(20) NOT NULL,
    PID INT NOT NULL,
    Date DATE NOT NULL,
    Amount DECIMAL(15,2),
    PRIMARY KEY (Phone, PID, Date),
    FOREIGN KEY (Phone, PID) REFERENCES PORTFOLIO (Phone, PID)
);
```

UNREALIZED_GAIN/LOSS (Phone, PID, Date, Amount)

- Captures temporary profit or loss (not yet sold) for each portfolio on specific dates — useful for performance monitoring.
- In this context, Amount represents the unrealized gain or loss for the current month, recorded on a monthly basis. The specific date is mentioned in the next section.

```
CREATE TABLE UNREALIZED_GAIN_LOSS (
    Phone VARCHAR(20) NOT NULL,
    PID INT NOT NULL,
    Date DATE NOT NULL,
    Amount DECIMAL(15,2),
    PRIMARY KEY (Phone, PID, Date),
    FOREIGN KEY (Phone, PID) REFERENCES PORTFOLIO (Phone, PID)
);
```

ASSET (ID, Name, Price)

- Base table for all asset types (STOCK, BOND, FOND) — each asset has a unique ID, name, and current price.

```
CREATE TABLE ASSET (
    ID INT NOT NULL,
    Name VARCHAR(100) NOT NULL,
    Price DECIMAL(15,2) NOT NULL,
    PRIMARY KEY (ID)
);
```

STOCK (ID, P/E, EPS, EBITDA)

- Stock-specific metrics like Price-to-Earnings (P/E), Earnings Per Share (EPS), and Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA).

```
CREATE TABLE STOCK (
    ID INT NOT NULL,
    P_E DECIMAL(10,2),
    EPS DECIMAL(10,2),
    EBITDA DECIMAL(15,2),
    PRIMARY KEY (ID),
    FOREIGN KEY (ID) REFERENCES ASSET (ID)
);
```

BOND (ID, InterestRate, MaturityDate)

- Bond-specific metrics such as interest rate and maturity date.

```
CREATE TABLE BOND (
    ID INT NOT NULL,
    InterestRate DECIMAL(5,2),
    MaturityDate DATE NOT NULL,
    PRIMARY KEY (ID),
    FOREIGN KEY (ID) REFERENCES ASSET (ID)
);
```

FUND (ID, ExpenseRatio, DividendYield)

- Fund-specific metrics such as expense ratio and dividend yield.

```
CREATE TABLE FUND (
    ID INT NOT NULL,
    ExpenseRatio DECIMAL(5,2),
    DividendYield DECIMAL(5,2),
    PRIMARY KEY (ID),
    FOREIGN KEY (ID) REFERENCES ASSET (ID)
);
```

PORTFOLIO_STOCK_DETAILS (ID, StockID, PID, StartDate, AllocationRatio)

- Tracks which stocks are in which portfolio (Phone, PID), when they were added, and their allocation ratio.

```
CREATE TABLE PORTFOLIO_STOCK_DETAILS (
    Phone VARCHAR(20) NOT NULL,
    ID INT NOT NULL,
    StockID INT NOT NULL,
    PID INT NOT NULL,
    StartDate DATE NOT NULL,
    AllocationRatio DECIMAL(5,2),
    PRIMARY KEY (ID),
    FOREIGN KEY (StockID) REFERENCES STOCK (ID),
    FOREIGN KEY (Phone, PID) REFERENCES PORTFOLIO
);
```

STOCK_POST_TRADE_COMPANY (StockID, Post-trade CO)

- Maps each stock to the company that executed the purchase (e.g., Saxo, Clearstream).

```
CREATE TABLE STOCK_POST_TRADE_COMPANY (
    StockID INT NOT NULL,
    PostTradeCO VARCHAR(255),
    PRIMARY KEY (StockID),
    FOREIGN KEY (StockID) REFERENCES STOCK (ID)
);
```

PORTFOLIO_BOND_DETAILS (ID, BondID, PID, StartDate, AllocationRatio)

- Tracks bonds in portfolios, along with their allocation and entry date.

```
CREATE TABLE PORTFOLIO_BOND_DETAILS (
    Phone VARCHAR(20) NOT NULL,
    ID INT NOT NULL,
    BondID INT NOT NULL,
    PID INT NOT NULL,
    StartDate DATE NOT NULL,
    AllocationRatio DECIMAL(5,2),
    PRIMARY KEY (ID),
    FOREIGN KEY (BondID) REFERENCES BOND (ID),
    FOREIGN KEY (Phone, PID) REFERENCES PORTFOLIO
);
```

BOND_POST_TRADE_COMPANY (BondID, Post-trade CO)

- Links bonds to post-trade companies responsible for buying/selling them.

```
CREATE TABLE BOND_POST_TRADE_COMPANY (
    BondID INT NOT NULL,
    PostTradeCO VARCHAR(255),
    PRIMARY KEY (BondID),
    FOREIGN KEY (BondID) REFERENCES BOND (ID)
);
```

PORTFOLIO_FUND_DETAILS (ID, BondID, PID, StartDate, AllocationRatio)

- Manages funds in portfolios and their respective allocation ratio.

```
CREATE TABLE PORTFOLIO_FUND_DETAILS (
    Phone VARCHAR(20) NOT NULL,
    ID INT NOT NULL,
    FundID INT NOT NULL,
    PID INT NOT NULL,
    StartDate DATE NOT NULL,
    AllocationRatio DECIMAL(5,2),
    PRIMARY KEY (ID),
    FOREIGN KEY (FundID) REFERENCES FUND (ID),
    FOREIGN KEY (Phone, PID) REFERENCES PORTFOLIO
);
```

FUND_POST_TRADE_COMPANY (BondID, Post-trade CO)

- Connects funds to the post-trade company handling the transactions.

```
CREATE TABLE FUND_POST_TRADE_COMPANY (
    FundID INT NOT NULL,
    PostTradeCO VARCHAR(255),
    PRIMARY KEY (FundID),
    FOREIGN KEY (FundID) REFERENCES FUND (ID)
);
```

TRANSACTION_STOCK (Date, ID, Type, Fee)

- Records buy/sell/rebalance operations for stocks with associated fees.
- It is linked to INVESTED_VALUE, as any change in this value corresponds to a transaction in the related stock. An increase indicates a 'buy', while a decrease indicates a 'sell'."

```
CREATE TABLE TRANSACTION_STOCK (
    Date DATE NOT NULL,
    ID INT NOT NULL,
    Type VARCHAR(20),
    Fee DECIMAL(10,2),
    PRIMARY KEY (Date, ID),
    FOREIGN KEY (ID) REFERENCES PORTFOLIO_STOCK_DETAILS (ID)
);
```

TRANSACTION_BOND (Date, ID, Type, Fee)

- Same as above, but for bonds.

```
CREATE TABLE TRANSACTION_BOND (
    Date DATE NOT NULL,
    ID INT NOT NULL,
    Type VARCHAR(20),
    Fee DECIMAL(10,2),
    PRIMARY KEY (Date, ID),
    FOREIGN KEY (ID) REFERENCES PORTFOLIO_BOND_DETAILS (ID)
);
```

TRANSACTION_FUND (Date, ID, Type, Fee)

- Same as above, but for funds.

```
CREATE TABLE TRANSACTION_FUND (
    Date DATE NOT NULL,
    ID INT NOT NULL,
    Type VARCHAR(20),
    Fee DECIMAL(10,2),
    PRIMARY KEY (Date, ID),
    FOREIGN KEY (ID) REFERENCES PORTFOLIO_FUND_DETAILS (ID)
);
```

Data Population & Display

1. INVESTOR

```
INSERT INTO INVESTOR (Phone, Name, Gender, DoB, AnnualIncome, Company) VALUES
-- TechCorp group
('81234567', 'Aaron Tan', 'Male', '1990-05-10', 85000.00, 'TechCorp'),
('84567890', 'David Ong', 'Male', '1995-08-22', 65000.00, 'TechCorp'),
('85678901', 'Evelyn Goh', 'Male', '1987-11-03', 78000.00, 'TechCorp'),
('88901234', 'Harrison Lee', 'Male', '1999-02-14', 110000.00, 'TechCorp'),
('90123456', 'James Foo', 'Male', '1986-04-18', 89000.00, 'TechCorp'),
('84565432', 'Nathan Ho', 'Male', '2001-06-30', 67000.00, 'TechCorp'),
('90111876', 'Timothy Chan', 'Male', '1993-09-05', 94000.00, 'TechCorp'),
-- FinanceCo group
('82345678', 'Brandon Lim', 'Male', '1994-03-25', 72000.00, 'FinanceCo'),
('82347654', 'Lucas Wong', 'Male', '1990-12-12', 81000.00, 'FinanceCo'),
('89912345', 'Irene Tan', 'Female', '2000-07-26', 72000.00, 'FinanceCo'),
('85654321', 'Olivia Sim', 'Female', '1992-11-01', 60000.00, 'FinanceCo'),
('86743210', 'Patrick Lim', 'Male', '1985-06-15', 115000.00, 'FinanceCo'),
('86743210', 'Patrick Lim', 'Male', '1985-06-15', 115000.00, 'FinanceCo'),
('89921987', 'Samantha Lau', 'Female', '1998-05-20', 72000.00, 'FinanceCo'),
-- HealthTech group
('83456789', 'Cheryl Ng', 'Female', '1989-10-25', 95000.00, 'HealthTech'),
('86789012', 'Francis Teo', 'Male', '1991-02-28', 102000.00, 'HealthTech'),
('87890123', 'Gina Chia', 'Female', '1997-01-17', 56000.00, 'HealthTech'),
('81239876', 'Katherine Choo', 'Female', '1990-09-03', 93000.00, 'HealthTech'),
('83456543', 'Megan Soh', 'Female', '1986-08-08', 107000.00, 'HealthTech'),
('87842109', 'Queenie Yeo', 'Female', '2003-12-17', 58000.00, 'HealthTech'),
('88932098', 'Ryan Tan', 'Male', '1996-05-29', 50000.00, 'HealthTech');
```

	Phone	Name	Gender	DoB	AnnualIncome	Company
1	81234567	Aaron Tan	Male	1990-05-10	85000.00	TechCorp
2	81239876	Katherine Choo	Female	1990-09-03	93000.00	HealthTech
3	82345678	Brandon Lim	Male	1994-03-25	72000.00	FinanceCo
4	82347654	Lucas Wong	Male	1990-12-12	81000.00	FinanceCo
5	83456543	Megan Soh	Female	1986-08-08	107000.00	HealthTech
6	83456789	Cheryl Ng	Female	1989-10-25	95000.00	HealthTech
7	84565432	Nathan Ho	Male	2001-06-30	67000.00	TechCorp
8	84567890	David Ong	Male	1995-08-22	65000.00	TechCorp
9	85654321	Olivia Sim	Female	1992-11-01	60000.00	FinanceCo
10	85678901	Evelyn Goh	Female	1987-11-03	78000.00	TechCorp
11	86743210	Patrick Lim	Male	1985-06-15	115000.00	FinanceCo
12	86789012	Francis Teo	Male	1991-02-28	102000.00	HealthTech
13	87842109	Queenie Yeo	Female	2003-12-17	58000.00	HealthTech
14	87890123	Gina Chia	Female	1997-01-17	56000.00	HealthTech
15	88901234	Harrison Lee	Male	1999-02-14	110000.00	TechCorp
16	88932098	Ryan Tan	Male	1996-05-29	50000.00	HealthTech
17	89912345	Irene Tan	Female	2000-07-26	72000.00	FinanceCo
18	89921987	Samantha Lau	Female	1998-05-20	72000.00	FinanceCo
19	90111876	Timothy Chan	Male	1993-09-05	94000.00	TechCorp
20	90123456	James Foo	Male	1986-04-18	89000.00	TechCorp

Given the scale of the data and the dependency of other entities on the INVESTOR entity, we decided to generate 20 sample users.

A smaller sample size would make it difficult to address the queries outlined in Appendix B, while a larger sample would significantly increase the time required to generate related data—such as **UNREALIZED_GAIN_LOSS**, which tracks monthly gains or losses for each user's portfolio.

Therefore, a sample size of 20 strikes a balance between data complexity and manageability, allowing for both meaningful query results and efficient data generation.

Besides, we took several other factors into account when designing the sample data. For example, in **Query 6**, we need to find *the most popular financial goals for investors working in the same company and whose age is between 30 to 40 years old*, and in **Query 7**, *Are male investors in their 20s making more money from their investments than their female counterparts in 2024?* These queries highlight the importance of thoughtful age and company distribution, rather than relying solely on random data generation.

Therefore, the details of these users are as follows:

- **Phone Numbers:** Start with 8 or 9 (following Singaporean format) and have 8 digits.
- **Companies:** Evenly distributed — TechCorp (7), FinanceCo (6), HealthTech (7)
- **Gender:** Evenly balanced — 10 Male, 10 Female
- **Age** (as of 2025): Primarily between 20 and 40, with a well-distributed range
- **Income:** The majority earn over \$80K, reflecting strong investment potential

2. USER SURVEY RESPONSES & RISK LEVEL DETERMINATION

```

INSERT INTO USER_SURVEY_RESPONSES (Phone, Q1Answer, Q2Answer, Q3Answer, Q4Answer, Q5Answer) VALUES
('81234567', 'I prefer low risk.', 'I want stable returns.', 'I invest mostly in bonds.', 'I hold for 5 years.', 'I worry during downturns.'),
('82345678', 'I take moderate risks.', 'I like a balanced approach.', 'I invest in stocks and bonds.', 'I hold for 10 years.', 'I stay calm in downturns.'),
('83456789', 'I take high risks.', 'I want maximum returns.', 'I invest in stocks.', 'I hold for 15 years.', 'I buy more in downturns.'),
('84567890', 'I take moderate risks.', 'I prefer stability.', 'I hold 60% stocks, 40% bonds.', 'I hold for 8 years.', 'I adjust my portfolio during downturns.'),
('85678901', 'I take very low risks.', 'I avoid volatility.', 'I invest in government bonds.', 'I hold for 3 years.', 'I sell off in downturns.'),

('86789012', 'I take high risks.', 'I invest for maximum returns.', 'I focus on growth stocks.', 'I hold for 20 years.', 'I invest more during downturns.'),
('87890123', 'I take moderate risks.', 'I prefer a balanced approach.', 'I diversify my portfolio.', 'I hold for 7 years.', 'I rebalance my portfolio when needed.'),
('88901234', 'I take very low risks.', 'I seek guaranteed returns.', 'I invest mostly in fixed deposits.', 'I hold for 4 years.', 'I reduce investments in downturns.'),
('89912345', 'I take high risks.', 'I trade frequently.', 'I hold a majority of tech stocks.', 'I hold for 12 years.', 'I see downturns as buying opportunities.'),
('90123456', 'I take moderate risks.', 'I like steady growth.', 'I mix stocks and ETFs.', 'I hold for 6 years.', 'I review my portfolio semi-annually.'),

('81239876', 'I prefer low risk.', 'I want predictable income.', 'I invest in blue-chip stocks.', 'I hold for 10 years.', 'I rebalance yearly.'),
('82347654', 'I take high risks.', 'I invest in startups and crypto.', 'I hold long-term for high growth.', 'I hold for 15 years.', 'I invest more in downturns.'),
('83456543', 'I take moderate risks.', 'I like a diversified portfolio.', 'I mix stocks and real estate.', 'I hold for 8 years.', 'I take small profits in downturns.'),
('84565432', 'I take very low risks.', 'I avoid market volatility.', 'I focus on dividend-paying stocks.', 'I hold for 5 years.', 'I hold cash in downturns.'),
('85654321', 'I take moderate risks.', 'I balance risk and reward.', 'I hold 50% stocks, 50% bonds.', 'I hold for 9 years.', 'I adjust my strategy in downturns.'),

('86742109', 'I take high risks.', 'I look for high returns.', 'I invest in emerging markets.', 'I hold for 18 years.', 'I take aggressive positions in downturns.'),
('87842109', 'I prefer low risk.', 'I want stability.', 'I avoid speculative assets.', 'I hold for 6 years.', 'I sell during downturns.'),
('88932098', 'I take moderate risks.', 'I have a long-term plan.', 'I hold diversified assets.', 'I hold for 12 years.', 'I add to my positions gradually.'),
('89921987', 'I take high risks.', 'I seek maximum short-term gains.', 'I hold mainly growth stocks.', 'I hold for 10 years.', 'I buy more when stocks dip.'),
('90111876', 'I take very low risks.', 'I need steady income.', 'I hold mostly bonds and cash.', 'I hold for 5 years.', 'I reduce exposure in downturns.'');

```

	Phone	Q1Answer	Q2Answer	Q3Answer	Q4Answer	Q5Answer
1	81234567	I prefer low risk.	I want stable returns.	I invest mostly in bonds.	I hold for 5 years.	I worry during downturns.
2	81239876	I prefer low risk.	I want predictable income.	I invest in blue-chip stocks.	I hold for 10 years.	I rebalance yearly.
3	82345678	I take moderate risks.	I like a balanced approach.	I invest in stocks and bonds.	I hold for 10 years.	I stay calm in downturns.
4	82347654	I take high risks.	I invest in startups and crypto.	I hold long-term for high growth.	I hold for 15 years.	I invest more in downturns.
5	83456543	I take moderate risks.	I like a diversified portfolio.	I mix stocks and real estate.	I hold for 8 years.	I take small profits in downturns.
6	83456789	I take high risks.	I want maximum returns.	I invest in stocks.	I hold for 15 years.	I buy more in downturns.
7	84565432	I take very low risks.	I avoid market volatility.	I focus on dividend-paying stocks.	I hold for 5 years.	I hold cash in downturns.
8	84567890	I take moderate risks.	I prefer stability.	I hold 60% stocks, 40% bonds.	I hold for 8 years.	I adjust my portfolio during downturns.
9	85654321	I take moderate risks.	I balance risk and reward.	I hold 50% stocks, 50% bonds.	I hold for 9 years.	I adjust my strategy in downturns.
10	85678901	I take very low risks.	I avoid volatility.	I invest in government bonds.	I hold for 3 years.	I sell off in downturns.
11	86743210	I take high risks.	I look for high returns.	I invest in emerging markets.	I hold for 18 years.	I take aggressive positions in downturns.
12	86789012	I take high risks.	I invest for maximum returns.	I focus on growth stocks.	I hold for 20 years.	I invest more during downturns.
13	87842109	I prefer low risk.	I want stability.	I avoid speculative assets.	I hold for 6 years.	I sell during downturns.
14	87890123	I take moderate risks.	I prefer a balanced approach.	I diversify my portfolio.	I hold for 7 years.	I rebalance my portfolio when needed.
15	88901234	I take very low risks.	I seek guaranteed returns.	I invest mostly in fixed deposits.	I hold for 4 years.	I reduce investments in downturns.
16	88932098	I take moderate risks.	I have a long-term plan.	I hold diversified assets.	I hold for 12 years.	I add to my positions gradually.
17	89912345	I take high risks.	I trade frequently.	I hold a majority of tech stocks.	I hold for 12 years.	I see downturns as buying opportunities.
18	89921987	I take high risks.	I seek maximum short-term gains.	I hold mainly growth stocks.	I hold for 10 years.	I buy more when stocks dip.
19	90111876	I take very low risks.	I need steady income.	I hold mostly bonds and cash.	I hold for 5 years.	I reduce exposure in downturns.
20	90123456	I take moderate risks.	I like steady growth.	I mix stocks and ETFs.	I hold for 6 years.	I review my portfolio semi-annually.

```

INSERT INTO RISK_LEVEL_DETERMINATION (Q1Answer, Q2Answer, Q3Answer, Q4Answer, Q5Answer, RiskLevel) VALUES
('I prefer low risk.', 'I want stable returns.', 'I invest mostly in bonds.', 'I hold for 5 years.', 'I worry during downturns.', 'Conservative'),
('I take moderate risks.', 'I like a balanced approach.', 'I invest in stocks and bonds.', 'I hold for 10 years.', 'I stay calm in downturns.', 'Moderate'),
('I take high risks.', 'I want maximum returns.', 'I invest in stocks.', 'I hold for 15 years.', 'I buy more in downturns.', 'Aggressive'),
('I take moderate risks.', 'I prefer stability.', 'I hold 60% stocks, 40% bonds.', 'I hold for 8 years.', 'I adjust my portfolio during downturns.', 'Moderate'),
('I take very low risks.', 'I avoid volatility.', 'I invest in government bonds.', 'I hold for 3 years.', 'I sell off in downturns.', 'Conservative'),

('I take high risks.', 'I invest for maximum returns.', 'I focus on growth stocks.', 'I hold for 20 years.', 'I invest more during downturns.', 'Aggressive'),
('I take moderate risks.', 'I prefer a balanced approach.', 'I diversify my portfolio.', 'I hold for 7 years.', 'I rebalance my portfolio when needed.', 'Moderate'),
('I take very low risks.', 'I seek guaranteed returns.', 'I invest mostly in fixed deposits.', 'I hold for 4 years.', 'I reduce investments in downturns.', 'Conservative'),
('I take high risks.', 'I trade frequently.', 'I hold a majority of tech stocks.', 'I hold for 12 years.', 'I see downturns as buying opportunities.', 'Aggressive'),
('I take moderate risks.', 'I like steady growth.', 'I mix stocks and ETFs.', 'I hold for 6 years.', 'I review my portfolio semi-annually.', 'Moderate'),

('I prefer low risk.', 'I want predictable income.', 'I invest in blue-chip stocks.', 'I hold for 10 years.', 'I rebalance yearly.', 'Conservative'),
('I take high risks.', 'I invest in startups and crypto.', 'I hold long-term for high growth.', 'I hold for 15 years.', 'I invest more in downturns.', 'Aggressive'),
('I take moderate risks.', 'I like a diversified portfolio.', 'I mix stocks and real estate.', 'I hold for 8 years.', 'I take small profits in downturns.', 'Moderate'),
('I take very low risks.', 'I avoid market volatility.', 'I focus on dividend-paying stocks.', 'I hold for 5 years.', 'I hold cash in downturns.', 'Conservative'),
('I take moderate risks.', 'I balance risk and reward.', 'I hold 50% stocks, 50% bonds.', 'I hold for 9 years.', 'I adjust my strategy in downturns.', 'Moderate'),

('I take high risks.', 'I look for high returns.', 'I invest in emerging markets.', 'I hold for 18 years.', 'I take aggressive positions in downturns.', 'Aggressive'),
('I prefer low risk.', 'I want stability.', 'I avoid speculative assets.', 'I hold for 6 years.', 'I sell during downturns.', 'Conservative'),
('I take moderate risks.', 'I have a long-term plan.', 'I hold diversified assets.', 'I hold for 12 years.', 'I add to my positions gradually.', 'Moderate'),
('I take high risks.', 'I seek maximum short-term gains.', 'I hold mainly growth stocks.', 'I hold for 10 years.', 'I buy more when stocks dip.', 'Aggressive'),
('I take very low risks.', 'I need steady income.', 'I hold mostly bonds and cash.', 'I hold for 5 years.', 'I reduce exposure in downturns.', 'Conservative');

```

	Q1Answer	Q2Answer	Q3Answer	Q4Answer	Q5Answer	RiskLevel
1	I prefer low risk.	I want predictable income.	I invest in blue-chip stocks.	I hold for 10 years.	I rebalance yearly.	Conservative
2	I prefer low risk.	I want stability.	I avoid speculative assets.	I hold for 6 years.	I sell during downturns.	Conservative
3	I prefer low risk.	I want stable returns.	I invest mostly in bonds.	I hold for 5 years.	I worry during downturns.	Conservative
4	I take high risks.	I invest for maximum returns.	I focus on growth stocks.	I hold for 20 years.	I invest more during downturns.	Aggressive
5	I take high risks.	I invest in startups and crypto.	I hold long-term for high growth.	I hold for 15 years.	I invest more in downturns.	Aggressive
6	I take high risks.	I look for high returns.	I invest in emerging markets.	I hold for 18 years.	I take aggressive positions in downturns.	Aggressive
7	I take high risks.	I seek maximum short-term gains.	I hold mainly growth stocks.	I hold for 10 years.	I buy more when stocks dip.	Aggressive
8	I take high risks.	I trade frequently.	I hold a majority of tech stocks.	I hold for 12 years.	I see downturns as buying opportunities.	Aggressive
9	I take high risks.	I want maximum returns.	I invest in stocks.	I hold for 15 years.	I buy more in downturns.	Aggressive
10	I take moderate risks.	I balance risk and reward.	I hold 50% stocks, 50% bonds.	I hold for 9 years.	I adjust my strategy in downturns.	Moderate
11	I take moderate risks.	I have a long-term plan.	I hold diversified assets.	I hold for 12 years.	I add to my positions gradually.	Moderate
12	I take moderate risks.	I like a balanced approach.	I invest in stocks and bonds.	I hold for 10 years.	I stay calm in downturns.	Moderate
13	I take moderate risks.	I like a diversified portfolio.	I mix stocks and real estate.	I hold for 8 years.	I take small profits in downturns.	Moderate
14	I take moderate risks.	I like steady growth.	I mix stocks and ETFs.	I hold for 6 years.	I review my portfolio semi-annually.	Moderate
15	I take moderate risks.	I prefer a balanced approach.	I diversify my portfolio.	I hold for 7 years.	I rebalance my portfolio when needed.	Moderate
16	I take moderate risks.	I prefer stability.	I hold 60% stocks, 40% bonds.	I hold for 8 years.	I adjust my portfolio during downturns.	Moderate
17	I take very low risks.	I avoid market volatility.	I focus on dividend-paying stocks.	I hold for 5 years.	I hold cash in downturns.	Conservative
18	I take very low risks.	I avoid volatility.	I invest in government bonds.	I hold for 3 years.	I sell off in downturns.	Conservative
19	I take very low risks.	I need steady income.	I hold mostly bonds and cash.	I hold for 5 years.	I reduce exposure in downturns.	Conservative
20	I take very low risks.	I seek guaranteed returns.	I invest mostly in fixed deposits.	I hold for 4 years.	I reduce investments in downturns.	Conservative

3. FINANCIAL GOAL

Each user is assigned 1 to 2 financial goals, randomly selected from the following options:

- (1) funding children's education
- (2) holiday vacations
- (3) purchasing a car
- (4) buying a house
- (5) generating sufficient monthly income after retirement
- (6) other goals. (anything but not belong to the given options)

```
INSERT INTO FINANCIAL_GOAL (Phone, Goal, Timeline, Amount) VALUES
-- User 1: Children's education (long-term) + House purchase
('81234567', 'To fund children\'s education', 'By the time my child starts university in 2040', 120000.00),
('81234567', 'To buy a house', 'Purchase within the next 10 years before 2034', 500000.00),
-- User 2: Retirement planning
('82345678', 'To generate sufficient monthly cash after retirement', 'Targeting financial independence by 2050', 300000.00),
-- User 3: Buying a car + Holiday vacations
('83456789', 'To buy a car', 'Looking to purchase a new vehicle by 2028', 80000.00),
('83456789', 'To fund holiday vacations', 'Plan to travel every 2 years starting from 2025', 20000.00),
-- User 4: House purchase goal
('84567890', 'To buy a house', 'Intend to buy property before starting a family in 2032', 450000.00),
-- User 5: Children's education & Retirement
('85678901', 'To fund children\'s education', 'Saving to support tuition fees by 2045', 150000.00),
('85678901', 'To generate sufficient monthly cash after retirement', 'Aiming for passive income by 2048', 250000.00),
-- User 6: Buying a car & Holiday vacations
('86789012', 'To buy a car', 'Upgrade to an electric vehicle by 2027', 60000.00),
('86789012', 'To fund holiday vacations', 'Annual international trips from 2026 onward', 15000.00),
-- User 7: Starting a business
('87890123', 'To start a business', 'Launching a tech startup by 2030', 200000.00),
-- User 8: Children's education & House purchase
('88901234', 'To fund children\'s education', 'Saving to pay tuition from 2038 to 2042', 180000.00),
('88901234', 'To buy a house', 'Intend to purchase a condo before 2035', 550000.00),
-- User 9: Sole retirement goal
('89912345', 'To generate sufficient monthly cash after retirement', 'Building a stable income source by 2045', 280000.00),
-- User 10: House + Vacations
('90123456', 'To buy a house', 'Planning to buy a landed property before 2033', 480000.00),
('90123456', 'To fund holiday vacations', 'Will take a luxury vacation every December', 18000.00),
-- User 11: Luxury watch purchase
('81239876', 'To buy a luxury watch', 'Planning to purchase a Rolex in 2026', 50000.00),
-- User 12: Children's education
('82347654', 'To fund children\'s education', 'Setting aside funds for school fees starting in 2035', 130000.00),
-- User 13: House & Retirement planning
('83456543', 'To buy a house', 'Aim to purchase a home within the next 9 years', 400000.00),
('83456543', 'To generate sufficient monthly cash after retirement', 'Retirement goal by 2047', 200000.00),
-- User 14: Buying a car
('84565432', 'To buy a car', 'Looking to replace my current vehicle by 2029', 75000.00),
-- User 15: Children's education + Vacations
('85654321', 'To fund children\'s education', 'Saving to support school expenses starting 2036', 160000.00),
('85654321', 'To fund holiday vacations', 'Plan to travel every 3 years starting in 2027', 25000.00),
-- User 16: Business startup goal
('86743210', 'To launch a startup company', 'Targeting launch by 2030', 500000.00),
-- User 17: Sole retirement goal
('87842109', 'To generate sufficient monthly cash after retirement', 'Retirement income goal set for 2043', 350000.00),
-- User 18: House purchase
('88921098', 'To buy a house', 'Goal to buy a resale flat in 2031', 470000.00),
-- User 19: Children's education & Buying a car
('89921987', 'To fund children\'s education', 'University tuition funding from 2037 onward', 140000.00),
('89921987', 'To buy a car', 'Purchasing a new SUV by 2026', 70000.00),
-- User 20: Health-related expenses
('90111876', 'To afford high-quality medical care', 'Ensure medical funds are available by 2030', 200000.00);
```

	Phone	Goal	Timeline	Amount
1	81234567	To buy a house	Purchase within the next 10 years before 2034	500000.00
2	81234567	To fund children's education	By the time my child starts university in 2040	120000.00
3	81239876	To buy a luxury watch	Planning to purchase a Rolex in 2026	50000.00
4	82345678	To generate sufficient monthly cash after retirement	Targeting financial independence by 2050	300000.00
5	82347654	To fund children's education	Setting aside funds for school fees starting in 2035	130000.00
6	83456543	To buy a house	Aim to purchase a home within the next 9 years	400000.00
7	83456543	To generate sufficient monthly cash after retirement	Retirement goal by 2047	200000.00
8	83456789	To buy a car	Looking to purchase a new vehicle by 2028	80000.00
9	83456789	To fund holiday vacations	Plan to travel every 2 years starting from 2025	20000.00
10	84565432	To buy a car	Looking to replace my current vehicle by 2029	75000.00
11	84567890	To buy a house	Intend to buy property before starting a family in 2032	450000.00
12	85654321	To fund children's education	Saving to support school expenses starting 2036	160000.00
13	85654321	To fund holiday vacations	Plan to travel every 3 years starting in 2027	25000.00
14	85678901	To fund children's education	Saving to support tuition fees by 2045	150000.00
15	85678901	To generate sufficient monthly cash after retirement	Aiming for passive income by 2048	250000.00
16	86743210	To launch a startup company	Targeting launch by 2030	500000.00
17	86789012	To buy a car	Upgrade to an electric vehicle by 2027	60000.00
18	86789012	To fund holiday vacations	Annual international trips from 2026 onward	15000.00
19	87842109	To generate sufficient monthly cash after retirement	Retirement income goal set for 2043	350000.00
20	87890123	To start a business	Launching a tech startup by 2030	200000.00
21	88901234	To buy a house	Intend to purchase a condo before 2035	550000.00
22	88901234	To fund children's education	Saving to pay tuition from 2038 to 2042	180000.00
23	88932098	To buy a house	Goal to buy a resale flat in 2031	470000.00
24	89912345	To generate sufficient monthly cash after retirement	Building a stable income source by 2045	280000.00
25	89921987	To buy a car	Purchasing a new SUV by 2026	70000.00
26	89921987	To fund children's education	University tuition funding from 2037 onward	140000.00
27	90111876	To afford high-quality medical care	Ensure medical funds are available by 2030	200000.00
28	90123456	To buy a house	Planning to buy a landed property before 2033	480000.00
29	90123456	To fund holiday vacations	Will take a luxury vacation every December	18000.00

4. PORTFOLIO_DETAILS

```


INSERT INTO PORTFOLIO (Phone, PID, InceptionDate) VALUES
    -- Investor 1: Two portfolios (Education, House)
    ('81234567', 1, '2023-01-01'),
    ('81234567', 2, '2023-02-10'),

    -- Investor 2: One portfolio (Retirement)
    ('82345678', 1, '2023-02-15'),

    -- Investor 3: Two portfolios (Car, Vacation)
    ('83456789', 1, '2023-03-10'),
    ('83456789', 2, '2023-04-01'),

    -- Investor 4: One portfolio (House)
    ('84567890', 1, '2023-02-20'),

    -- Investor 5: Two portfolios (Education, Retirement)
    ('85678901', 1, '2023-01-25'),
    ('85678901', 2, '2023-02-15'),

    -- Investor 6: Two portfolios (Car, Vacation)
    ('86789012', 1, '2023-03-05'),
    ('86789012', 2, '2023-04-10'),

    -- Investor 7: One portfolio (Startup)
    ('87890123', 1, '2023-04-15'),

    -- Investor 8: Two portfolios (Education, House)
    ('88901234', 1, '2023-02-10'),
    ('88901234', 2, '2023-03-01'),

    -- Investor 9: One portfolio (Retirement)
    ('89912345', 1, '2023-03-30'),

    -- Investor 10: Two portfolios (House, Vacation)
    ('90123456', 1, '2023-01-15'),
    ('90123456', 2, '2023-02-25'),

```

-- Investor 11: One portfolio (Luxury Watch)
('81239876', 1, '2023-02-25'),

-- Investor 12: One portfolio (Education)
('82347654', 1, '2023-01-10'),

-- Investor 13: Two portfolios (House, Retirement)
('83456543', 1, '2023-03-25'),
('83456543', 2, '2023-04-05'),

-- Investor 14: One portfolio (Car)
('84565432', 1, '2023-04-05'),

-- Investor 15: Two portfolios (Education, Vacation)
('85654321', 1, '2023-02-15'),
('85654321', 2, '2023-03-20'),

-- Investor 16: One portfolio (Startup)
('86743210', 1, '2023-03-10'),

-- Investor 17: One portfolio (Retirement)
('87842109', 1, '2023-01-20'),

-- Investor 18: One portfolio (House)
('88932098', 1, '2023-02-05'),

-- Investor 19: Two portfolios (Education, Car)
('89921987', 1, '2023-03-01'),
('89921987', 2, '2023-03-25'),

-- Investor 20: One portfolio (Medical Care)
('90111876', 1, '2023-04-01');

Each user has one or two portfolios. While a user could have more, we limit it to a maximum of two for simplicity and better management.

Note that **PORTFOLIO** is a weak entity dependent on the **INVESTOR**, and each portfolio is identified using the **PID** (Portfolio ID) associated with the user.

All portfolio inception dates are set in 2023 (i.e., prior to 2024), since transactions in all queries occur in 2024 and thus require the portfolios to be initialized beforehand.

	Phone	PID	InceptionDate	AnnualizedReturn	MarketValue	Fee
1	81234567	1	2023-01-01	0.00	0.00	0.00
2	81234567	2	2023-02-10	0.00	0.00	0.00
3	81239876	1	2023-02-25	0.00	0.00	0.00
4	82345678	1	2023-02-15	0.00	0.00	0.00
5	82347654	1	2023-01-10	0.00	0.00	0.00
6	83456543	1	2023-03-25	0.00	0.00	0.00
7	83456543	2	2023-04-05	0.00	0.00	0.00
8	83456789	1	2023-03-10	0.00	0.00	0.00
9	83456789	2	2023-04-01	0.00	0.00	0.00
10	84565432	1	2023-04-05	0.00	0.00	0.00
11	84567890	1	2023-02-20	0.00	0.00	0.00
12	85654321	1	2023-03-15	0.00	0.00	0.00
13	85654321	2	2023-03-20	0.00	0.00	0.00
14	8678901	1	2023-01-25	0.00	0.00	0.00
15	8678901	2	2023-02-15	0.00	0.00	0.00
16	86743210	1	2023-03-10	0.00	0.00	0.00
17	86789012	1	2023-03-05	0.00	0.00	0.00
18	86789012	2	2023-04-10	0.00	0.00	0.00
19	87842109	1	2023-01-20	0.00	0.00	0.00
20	87890123	1	2023-04-15	0.00	0.00	0.00
21	88901234	1	2023-02-10	0.00	0.00	0.00
22	88901234	2	2023-03-01	0.00	0.00	0.00
23	88932098	1	2023-02-05	0.00	0.00	0.00
24	89912345	1	2023-03-30	0.00	0.00	0.00
25	89921987	1	2023-03-01	0.00	0.00	0.00
26	89921987	2	2023-03-25	0.00	0.00	0.00
27	90111876	1	2023-04-01	0.00	0.00	0.00
28	90123456	1	2023-01-15	0.00	0.00	0.00
29	90123456	2	2023-02-25	0.00	0.00	0.00

Currently, only **Phone**, **PID**, and **InceptionDate** are set. The remaining attributes — **AnnualizedReturn**, **MarketValue**, and **Fee** — will be determined after inserting data into **INVESTED_VALUE** and **ANNUALIZED_GAIN_LOSS**

5. INVESTED_VALUE

INVESTED_VALUE records the total amount invested as of a specific date, updated whenever a user tops up or withdraws money in one portfolio.

- For example, if USER 1 adds \$5,000 to their first portfolio (originally \$55,000), the system records: ('81234567', 1, '2024-03-04', 60000)

It's important to note that INVESTED_VALUE reflects only the amount contributed by the user—it does not account for any gains or losses. Additionally, the first record for each portfolio must be a top-up (i.e., a 'buy' operation).

We select USER 1, USER 2 and USER 5 as our designed answer for Query 5

- Find investors who consistently top up their investment at the beginning of every month (dollar-cost averaging) in 2024 for at least one of their portfolios.*

```


-- INSERT INTO INVESTED_VALUE (Phone, PID, Date, Amount) VALUES
-- USER 1 (DCA - Monthly Investment)
('81234567', 1, '2024-01-03', 55000.00),
('81234567', 2, '2024-02-02', 100000.00),
('81234567', 1, '2024-03-04', 60000.00),
('81234567', 2, '2024-04-02', 110000.00),
('81234567', 1, '2024-05-01', 65000.00),
('81234567', 2, '2024-06-03', 120000.00),
('81234567', 1, '2024-07-02', 70000.00),
('81234567', 2, '2024-08-01', 130000.00),
('81234567', 1, '2024-09-03', 75000.00),
('81234567', 2, '2024-10-02', 140000.00),
('81234567', 1, '2024-11-01', 80000.00),
('81234567', 2, '2024-12-03', 150000.00),

-- USER 2 (DCA - Monthly Investment)
('82345678', 1, '2024-01-02', 40000.00),
('82345678', 1, '2024-02-03', 45000.00),
('82345678', 1, '2024-03-02', 50000.00),
('82345678', 1, '2024-04-01', 55000.00),
('82345678', 1, '2024-05-02', 60000.00),
('82345678', 1, '2024-06-04', 65000.00),
('82345678', 1, '2024-07-01', 70000.00),
('82345678', 1, '2024-08-03', 75000.00),
('82345678', 1, '2024-09-02', 80000.00),
('82345678', 1, '2024-10-03', 85000.00),
('82345678', 1, '2024-11-04', 90000.00),
('82345678', 1, '2024-12-02', 95000.00),

-- USER 3 (No DCA, but frequent deposits & withdrawals)
('83456789', 1, '2024-01-12', 55000.00),
('83456789', 1, '2024-02-15', 50000.00), -- Withdrawal
('83456789', 1, '2024-03-18', 60000.00),
('83456789', 2, '2024-04-10', 70000.00),
('83456789', 1, '2024-05-08', 75000.00),
('83456789', 2, '2024-06-12', 68000.00),
('83456789', 1, '2024-07-17', 72000.00),
('83456789', 2, '2024-08-21', 77000.00),
('83456789', 1, '2024-09-12', 73000.00),
('83456789', 2, '2024-10-14', 80000.00),
('83456789', 1, '2024-11-16', 85000.00),
('83456789', 2, '2024-12-18', 90000.00),

-- USER 4 (Frequent top-ups & withdrawals)
('84567890', 1, '2024-01-10', 120000.00),
('84567890', 1, '2024-02-14', 115000.00), -- Withdrawal
('84567890', 1, '2024-03-20', 125000.00),
('84567890', 1, '2024-04-22', 135000.00),
('84567890', 1, '2024-05-25', 140000.00),
('84567890', 1, '2024-06-10', 138000.00), -- Small withdrawal
('84567890', 1, '2024-07-14', 145000.00),
('84567890', 1, '2024-08-17', 150000.00),
('84567890', 1, '2024-09-20', 155000.00),
('84567890', 1, '2024-10-24', 160000.00),
('84567890', 1, '2024-11-28', 170000.00),
('84567890', 1, '2024-12-15', 180000.00),

-- USER 5 (DCA - Monthly Investment)
('85678901', 1, '2024-01-02', 68000.00),
('85678901', 1, '2024-02-04', 74000.00),
('85678901', 1, '2024-03-01', 80000.00),
('85678901', 2, '2024-04-03', 86000.00),
('85678901', 1, '2024-05-02', 92000.00),
('85678901', 2, '2024-06-04', 98000.00),
('85678901', 1, '2024-07-01', 104000.00),
('85678901', 2, '2024-08-03', 110000.00),
('85678901', 1, '2024-09-02', 116000.00),
('85678901', 2, '2024-10-01', 122000.00),
('85678901', 1, '2024-11-05', 128000.00),
('85678901', 2, '2024-12-02', 134000.00),

-- USER 6 (Deposits & Withdrawals)
('86789012', 1, '2024-01-08', 75000.00),
('86789012', 1, '2024-02-12', 80000.00),
('86789012', 2, '2024-03-15', 85000.00),
('86789012', 1, '2024-04-18', 78000.00), -- Withdrawal
('86789012', 2, '2024-05-20', 90000.00),
('86789012', 1, '2024-06-25', 85000.00),
('86789012', 2, '2024-07-11', 95000.00),
('86789012', 1, '2024-08-17', 89000.00),
('86789012', 2, '2024-09-22', 98000.00),
('86789012', 1, '2024-10-24', 91000.00),
('86789012', 2, '2024-11-29', 100000.00),
('86789012', 1, '2024-12-13', 94000.00),

-- USER 7 (Less frequent, mostly deposits)
('87890123', 1, '2024-01-14', 130000.00),
('87890123', 1, '2024-03-12', 140000.00),
('87890123', 1, '2024-05-17', 150000.00),
('87890123', 1, '2024-07-20', 160000.00),
('87890123', 1, '2024-09-14', 170000.00),
('87890123', 1, '2024-11-10', 180000.00),


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```

-- USER 8 (Higher withdrawals, some deposits)
('88901234', 1, '2024-01-09', 180000.00),
('88901234', 2, '2024-02-15', 190000.00),
('88901234', 1, '2024-03-10', 175000.00), -- Withdrawal
('88901234', 1, '2024-04-18', 185000.00),
('88901234', 1, '2024-05-22', 170000.00), -- Another withdrawal
('88901234', 2, '2024-06-25', 195000.00),
('88901234', 1, '2024-07-13', 165000.00), -- Another withdrawal
('88901234', 2, '2024-08-14', 200000.00),
('88901234', 1, '2024-09-23', 180000.00),
('88901234', 2, '2024-10-20', 210000.00),
('88901234', 1, '2024-11-25', 190000.00),
('88901234', 2, '2024-12-18', 220000.00),

-- USER 9 (Occasional deposits, steady growth)
('89912345', 1, '2024-01-16', 250000.00),
('89912345', 1, '2024-04-12', 260000.00),
('89912345', 1, '2024-07-10', 270000.00),
('89912345', 1, '2024-10-05', 280000.00),

-- USER 10 (Frequent deposits, some withdrawals)
('90123456', 1, '2024-01-18', 300000.00),
('90123456', 1, '2024-02-20', 310000.00),
('90123456', 1, '2024-03-15', 305000.00), -- Small withdrawal
('90123456', 2, '2024-04-12', 320000.00),
('90123456', 1, '2024-05-22', 330000.00),
('90123456', 2, '2024-06-25', 340000.00),
('90123456', 1, '2024-07-12', 335000.00), -- Small withdrawal
('90123456', 2, '2024-08-15', 350000.00),
('90123456', 1, '2024-09-22', 360000.00),
('90123456', 2, '2024-10-20', 370000.00),
('90123456', 1, '2024-11-25', 380000.00),
('90123456', 2, '2024-12-18', 390000.00),

-- USER 11 (Invests once per quarter)
('81239876', 1, '2024-01-14', 70000.00),
('81239876', 1, '2024-04-10', 75000.00),
('81239876', 1, '2024-07-15', 80000.00),
('81239876', 1, '2024-10-20', 85000.00),

-- USER 12 (One deposit, one withdrawal)
('82347654', 1, '2024-02-22', 90000.00),
('82347654', 1, '2024-08-14', 85000.00), -- Withdrawal

-- USER 13 (Invests a few times per year)
('83456543', 1, '2024-03-10', 125000.00),
('83456543', 2, '2024-06-25', 130000.00),
('83456543', 1, '2024-09-18', 135000.00),
('83456543', 2, '2024-12-05', 140000.00),

```

Users 11 to 20 demonstrate lower investment activity and engage in buying or selling less frequently.

```

-- USER 14 (Invests once at the start and once near the end)
('84565432', 1, '2024-01-17', 60000.00),
('84565432', 1, '2024-11-29', 65000.00),

-- USER 15 (Invests only twice a year)
('85654321', 1, '2024-04-02', 40000.00),
('85654321', 2, '2024-10-15', 45000.00),

-- USER 16 (Invests only once)
('86743210', 1, '2024-05-07', 500000.00),

-- USER 17 (Invests once, withdraws once)
('87842109', 1, '2024-02-14', 150000.00),
('87842109', 1, '2024-09-20', 140000.00), -- Withdrawal

-- USER 18 (Occasionally invests)
('88932098', 1, '2024-03-10', 220000.00),
('88932098', 1, '2024-07-15', 225000.00),

-- USER 19 (Invests once, withdraws once)
('89921987', 1, '2024-04-22', 175000.00),
('89921987', 2, '2024-11-18', 165000.00), -- Withdrawal

-- USER 20 (Invests twice, large amounts)
('90111876', 1, '2024-06-12', 200000.00),
('90111876', 1, '2024-12-05', 220000.00);

```

Displaying all table records (129 entries in total):

	Phone	PID	Date	Amount		Phone	PID	Date	Amount		Phone	PID	Date	Amount		Phone	PID	Date	Amount			
1	81234567	1	2024-01-03	55000.00		33	83456543	2	2024-06-25	130000.00		64	85678901	1	2024-02-04	74000.00		96	88901234	1	2024-01-09	180000.00
2	81234567	1	2024-03-04	60000.00		34	83456543	2	2024-12-05	140000.00		65	85678901	1	2024-03-01	80000.00		97	88901234	1	2024-03-10	175000.00
3	81234567	1	2024-05-01	65000.00		35	83456789	1	2024-01-12	55000.00		66	85678901	1	2024-05-02	92000.00		98	88901234	1	2024-05-22	170000.00
4	81234567	1	2024-07-02	70000.00		36	83456789	1	2024-02-15	50000.00		67	85678901	1	2024-07-01	104000.00		99	88901234	1	2024-07-13	165000.00
5	81234567	1	2024-09-03	75000.00		37	83456789	1	2024-03-18	60000.00		68	85678901	1	2024-09-02	116000.00		100	88901234	1	2024-09-23	180000.00
6	81234567	1	2024-11-01	80000.00		38	83456789	1	2024-05-08	75000.00		69	85678901	1	2024-11-05	128000.00		101	88901234	1	2024-11-25	190000.00
7	81234567	2	2024-02-02	100000.00		39	83456789	1	2024-07-17	72000.00		70	85678901	2	2024-04-03	86000.00		102	88901234	2	2024-02-15	190000.00
8	81234567	2	2024-04-02	110000.00		40	83456789	1	2024-09-12	73000.00		71	85678901	2	2024-06-04	98000.00		103	88901234	2	2024-04-18	185000.00
9	81234567	2	2024-06-03	120000.00		41	83456789	1	2024-11-16	85000.00		72	85678901	2	2024-08-03	110000.00		104	88901234	2	2024-06-25	195000.00
10	81234567	2	2024-08-01	130000.00		42	83456789	2	2024-04-10	70000.00		73	85678901	2	2024-10-01	122000.00		105	88901234	2	2024-08-14	200000.00
11	81234567	2	2024-10-02	140000.00		43	83456789	2	2024-06-12	68000.00		74	85678901	2	2024-12-02	134000.00		106	88901234	2	2024-10-20	210000.00
12	81234567	2	2024-12-03	150000.00		44	83456789	2	2024-08-21	77000.00		75	86743210	1	2024-05-07	500000.00		107	88901234	2	2024-12-18	220000.00
13	81239876	1	2024-01-14	70000.00		45	83456789	2	2024-10-14	80000.00		76	86789012	1	2024-01-08	75000.00		108	88932098	1	2024-03-10	220000.00
14	81239876	1	2024-04-10	75000.00		46	83456789	2	2024-12-18	90000.00		77	86789012	1	2024-02-12	80000.00		109	88932098	1	2024-07-15	225000.00
15	81239876	1	2024-07-15	80000.00		47	84565432	1	2024-01-17	60000.00		78	86789012	1	2024-04-18	78000.00		110	89912345	1	2024-01-16	250000.00
16	81239876	1	2024-10-20	85000.00		48	84565432	1	2024-11-29	65000.00		79	86789012	1	2024-06-25	85000.00		111	89912345	1	2024-04-12	260000.00
17	82345678	1	2024-01-02	40000.00		49	84567890	1	2024-01-10	120000.00		80	86789012	1	2024-08-17	89000.00		112	89912345	1	2024-07-10	270000.00
18	82345678	1	2024-02-03	45000.00		50	84567890	1	2024-02-14	115000.00		81	86789012	1	2024-10-24	91000.00		113	89912345	1	2024-10-05	280000.00
19	82345678	1	2024-03-02	50000.00		51	84567890	1	2024-03-20	125000.00		82	86789012	1	2024-12-13	94000.00		114	89921987	1	2024-04-22	175000.00
20	82345678	1	2024-04-01	55000.00		52	84567890	1	2024-04-22	135000.00		83	86789012	2	2024-03-15	85000.00		115	89921987	2	2024-11-18	165000.00
21	82345678	1	2024-05-02	60000.00		53	84567890	1	2024-05-25	140000.00		84	86789012	2	2024-05-20	90000.00		116	90111876	1	2024-06-12	200000.00
22	82345678	1	2024-06-04	65000.00		54	84567890	1	2024-06-10	138000.00		85	86789012	2	2024-07-11	95000.00		117	90111876	1	2024-12-05	220000.00
23	82345678	1	2024-07-01	70000.00		55	84567890	1	2024-07-14	145000.00		86	86789012	2	2024-09-22	98000.00		118	90123456	1	2024-01-18	300000.00
24	82345678	1	2024-08-03	75000.00		56	84567890	1	2024-08-17	150000.00		87	86789012	2	2024-11-29	100000.00		119	90123456	1	2024-02-20	310000.00
25	82345678	1	2024-09-02	80000.00		57	84567890	1	2024-09-20	155000.00		88	87842109	1	2024-02-14	150000.00		120	90123456	1	2024-03-15	305000.00
26	82345678	1	2024-10-03	85000.00		58	84567890	1	2024-10-24	160000.00		89	87842109	1	2024-09-20	140000.00		121	90123456	1	2024-05-22	330000.00
27	82345678	1	2024-11-04	90000.00		59	84567890	1	2024-11-28	170000.00		90	87890123	1	2024-01-14	130000.00		122	90123456	1	2024-07-12	335000.00
28	82345678	1	2024-12-02	95000.00		60	84567890	1	2024-12-15	180000.00		91	87890123	1	2024-03-12	140000.00		123	90123456	1	2024-09-22	360000.00
29	82347654	1	2024-02-22	90000.00		61	85654321	1	2024-04-02	40000.00		92	87890123	1	2024-05-17	150000.00		124	90123456	1	2024-11-25	380000.00
30	82347654	1	2024-08-14	85000.00		62	85654321	2	2024-10-15	45000.00		93	87890123	1	2024-07-20	160000.00		125	90123456	2	2024-04-12	320000.00
31	83456543	1	2024-03-10	125000.00		63	85678901	1	2024-01-02	68000.00		94	87890123	1	2024-09-14	170000.00		126	90123456	2	2024-06-25	340000.00
32	83456543	1	2024-09-18	135000.00							95	87890123	1	2024-11-10	180000.00		127	90123456	2	2024-08-15	350000.00	

6. UNREALIZED_GAIN_LOSS

Unrealized gains or losses are recorded monthly for each portfolio. Since all queries are based on the year 2024, sample data is generated only for each month within that year.

$$12 \text{ (no. of months)} \times 29 \text{ (no. of portfolios)} = 348 \text{ entries in total}$$

However, this differs from the invested value—it represents only the gain or loss between two consecutive recording dates, not the total accumulated gain or loss.

For example, in USER 1's first portfolio, there was a gain of **\$1,500** on January 15th and a loss of **\$600** on February 15th. Therefore, the net unrealized gain/loss over the period is **\$1,500 - \$600 = \$900**. It differs from **INVESTED_VALUE** since it records the total amount of invested amount.

```
-- January
 $\square$  INSERT INTO UNREALIZED_GAINLOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-01-15', 1500.00),
('81234567', 2, '2024-01-15', -2000.00),
('82345678', 1, '2024-01-15', 1200.00),
('83456789', 1, '2024-01-15', -750.00),
('83456789', 2, '2024-01-15', 500.00),
('84567890', 1, '2024-01-15', 1800.00),
('85678901', 1, '2024-01-15', -500.00),
('85678901', 2, '2024-01-15', 2100.00),
('86789012', 1, '2024-01-15', 900.00),
('86789012', 2, '2024-01-15', -300.00),
('87890123', 1, '2024-01-15', 1100.00),
('88901234', 1, '2024-01-15', 2500.00),
('88901234', 2, '2024-01-15', -1200.00),
('89912345', 1, '2024-01-15', 1300.00),
('90123456', 1, '2024-01-15', 800.00),
('90123456', 2, '2024-01-15', -950.00),
('81239876', 1, '2024-01-15', 600.00),
('82347654', 1, '2024-01-15', -400.00),
('83456543', 1, '2024-01-15', 2200.00),
('83456543', 2, '2024-01-15', -700.00),
('84565432', 1, '2024-01-15', 1400.00),
('85654321', 1, '2024-01-15', 300.00),
('85654321', 2, '2024-01-15', -200.00),
('86743210', 1, '2024-01-15', 3200.00),
('87842109', 1, '2024-01-15', 1700.00),
('88932098', 1, '2024-01-15', -500.00),
('89921987', 1, '2024-01-15', 1100.00),
('89921987', 2, '2024-01-15', 900.00),
('90111876', 1, '2024-01-15', -650.00);

-- February
 $\square$  INSERT INTO UNREALIZED_GAINLOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-02-15', -600.00),
('81234567', 2, '2024-02-15', 2100.00),
('82345678', 1, '2024-02-15', -750.00),
('83456789', 1, '2024-02-15', 1700.00),
('83456789', 2, '2024-02-15', -500.00),
('84567890', 1, '2024-02-15', 1300.00),
('85678901', 1, '2024-02-15', -400.00),
('85678901', 2, '2024-02-15', 2500.00),
('86789012', 1, '2024-02-15', 800.00),
('86789012', 2, '2024-02-15', -300.00),
('87890123', 1, '2024-02-15', 1900.00),
('88901234', 1, '2024-02-15', -1000.00),
('88901234', 2, '2024-02-15', 2600.00),
('89912345', 1, '2024-02-15', -950.00),
('90123456', 1, '2024-02-15', 1800.00),
('90123456', 2, '2024-02-15', -700.00),
('81239876', 1, '2024-02-15', 900.00),
('82347654', 1, '2024-02-15', -550.00),
('83456543', 1, '2024-02-15', 2300.00),
('83456543', 2, '2024-02-15', -800.00),
('84565432', 1, '2024-02-15', 1200.00),
('85654321', 1, '2024-02-15', 400.00),
('85654321', 2, '2024-02-15', -250.00),
('86743210', 1, '2024-02-15', 3100.00),
('87842109', 1, '2024-02-15', 1600.00),
('88932098', 1, '2024-02-15', -450.00),
('89921987', 1, '2024-02-15', 1050.00),
('89921987', 2, '2024-02-15', 800.00),
('90111876', 1, '2024-02-15', -600.00);

-- March
 $\square$  INSERT INTO UNREALIZED_GAINLOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-03-15', 2200.00),
('81234567', 2, '2024-03-15', -1500.00),
('82345678', 1, '2024-03-15', 1750.00),
('83456789', 1, '2024-03-15', -600.00),
('83456789', 2, '2024-03-15', 700.00),
('84567890', 1, '2024-03-15', 2500.00),
('85678901', 1, '2024-03-15', -300.00),
('85678901', 2, '2024-03-15', 1800.00),
('86789012', 1, '2024-03-15', 1300.00),
('86789012', 2, '2024-03-15', -400.00),
('87890123', 1, '2024-03-15', 2100.00),
('88901234', 1, '2024-03-15', -750.00),
('88901234', 2, '2024-03-15', 2900.00),
('89912345', 1, '2024-03-15', -850.00),
('90123456', 1, '2024-03-15', 2200.00),
('90123456', 2, '2024-03-15', -900.00),
('81239876', 1, '2024-03-15', 1100.00),
('82347654', 1, '2024-03-15', -450.00),
('83456543', 1, '2024-03-15', 2700.00),
('83456543', 2, '2024-03-15', -750.00),
('84565432', 1, '2024-03-15', 1350.00),
('85654321', 1, '2024-03-15', 600.00),
('85654321', 2, '2024-03-15', -300.00),
('86743210', 1, '2024-03-15', 3500.00),
('87842109', 1, '2024-03-15', 1900.00),
('88932098', 1, '2024-03-15', -550.00),
('89921987', 1, '2024-03-15', 1200.00),
('89921987', 2, '2024-03-15', 950.00),
('90111876', 1, '2024-03-15', -500.00);

-- April
 $\square$  INSERT INTO UNREALIZED_GAINLOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-04-15', -500.00),
('81234567', 2, '2024-04-15', 1600.00),
('82345678', 1, '2024-04-15', -850.00),
('83456789', 1, '2024-04-15', 900.00),
('83456789', 2, '2024-04-15', -600.00),
('84567890', 1, '2024-04-15', 1900.00),
('85678901', 1, '2024-04-15', -400.00),
('85678901', 2, '2024-04-15', 2700.00),
('86789012', 1, '2024-04-15', 1100.00),
('86789012', 2, '2024-04-15', -500.00),
('87890123', 1, '2024-04-15', 2500.00),
('88901234', 1, '2024-04-15', -650.00),
('88901234', 2, '2024-04-15', 3100.00),
('89912345', 1, '2024-04-15', -900.00),
('90123456', 1, '2024-04-15', 2000.00),
('90123456', 2, '2024-04-15', -850.00),
('81239876', 1, '2024-04-15', 1400.00),
('82347654', 1, '2024-04-15', -500.00),
('83456543', 1, '2024-04-15', 2500.00),
('83456543', 2, '2024-04-15', -750.00),
('84565432', 1, '2024-04-15', 1550.00),
('85654321', 1, '2024-04-15', 700.00),
('85654321', 2, '2024-04-15', -300.00),
('86743210', 1, '2024-04-15', 3400.00),
('87842109', 1, '2024-04-15', 1800.00),
('88932098', 1, '2024-04-15', -500.00),
('89921987', 1, '2024-04-15', 1250.00),
('89921987', 2, '2024-04-15', 800.00),
('90111876', 1, '2024-04-15', -600.00);
```

```

-- May
INSERT INTO UNREALIZED_GAIN_LOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-05-15', 1750.00),
('81234567', 2, '2024-05-15', -300.00),
('82345678', 1, '2024-05-15', 1100.00),
('83456789', 1, '2024-05-15', -400.00),
('83456789', 2, '2024-05-15', 1300.00),
('84567890', 1, '2024-05-15', 2200.00),
('85678901', 1, '2024-05-15', -600.00),
('85678901', 2, '2024-05-15', 2000.00),
('86789012', 1, '2024-05-15', 1600.00),
('86789012', 2, '2024-05-15', -400.00),
('87890123', 1, '2024-05-15', 2400.00),
('88901234', 1, '2024-05-15', -850.00),
('88901234', 2, '2024-05-15', 3300.00),
('89912345', 1, '2024-05-15', -950.00),
('90123456', 1, '2024-05-15', 1700.00),
('90123456', 2, '2024-05-15', -700.00),
('81239876', 1, '2024-05-15', 1000.00),
('82347654', 1, '2024-05-15', -400.00),
('83456543', 1, '2024-05-15', 2700.00),
('83456543', 2, '2024-05-15', -850.00),
('84565432', 1, '2024-05-15', 1400.00),
('85654321', 1, '2024-05-15', 500.00),
('85654321', 2, '2024-05-15', -250.00),
('86743210', 1, '2024-05-15', 3700.00),
('87842109', 1, '2024-05-15', 1900.00),
('88932098', 1, '2024-05-15', -500.00),
('89921987', 1, '2024-05-15', 1100.00),
('89921987', 2, '2024-05-15', 900.00),
('90111876', 1, '2024-05-15', -650.00);

-- June
INSERT INTO UNREALIZED_GAIN_LOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-06-15', -700.00),
('81234567', 2, '2024-06-15', 1400.00),
('82345678', 1, '2024-06-15', 1250.00),
('83456789', 1, '2024-06-15', -500.00),
('83456789', 2, '2024-06-15', 600.00),
('84567890', 1, '2024-06-15', 2000.00),
('85678901', 1, '2024-06-15', -300.00),
('85678901', 2, '2024-06-15', 1700.00),
('86789012', 1, '2024-06-15', 1200.00),
('86789012', 2, '2024-06-15', -450.00),
('87890123', 1, '2024-06-15', 2300.00),
('88901234', 1, '2024-06-15', -800.00),
('88901234', 2, '2024-06-15', 2400.00),
('89912345', 1, '2024-06-15', -950.00),
('90123456', 1, '2024-06-15', 2500.00),
('90123456', 2, '2024-06-15', -850.00),
('81239876', 1, '2024-06-15', 1050.00),
('82347654', 1, '2024-06-15', -600.00),
('83456543', 1, '2024-06-15', 2700.00),
('83456543', 2, '2024-06-15', -700.00),
('84565432', 1, '2024-06-15', 1250.00),
('85654321', 1, '2024-06-15', 400.00),
('85654321', 2, '2024-06-15', -350.00),
('86743210', 1, '2024-06-15', 3300.00),
('87842109', 1, '2024-06-15', 1600.00),
('88932098', 1, '2024-06-15', -500.00),
('89921987', 1, '2024-06-15', 1300.00),
('89921987', 2, '2024-06-15', 1000.00),
('90111876', 1, '2024-06-15', -450.00);

-- July
INSERT INTO UNREALIZED_GAIN_LOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-07-15', 1800.00),
('81234567', 2, '2024-07-15', -1200.00),
('82345678', 1, '2024-07-15', 950.00),
('83456789', 1, '2024-07-15', -600.00),
('83456789', 2, '2024-07-15', 750.00),
('84567890', 1, '2024-07-15', 2300.00),
('85678901', 1, '2024-07-15', -500.00),
('85678901', 2, '2024-07-15', 2100.00),
('86789012', 1, '2024-07-15', 1400.00),
('86789012', 2, '2024-07-15', -300.00),
('87890123', 1, '2024-07-15', 2600.00),
('88901234', 1, '2024-07-15', -900.00),
('88901234', 2, '2024-07-15', 2700.00),
('89912345', 1, '2024-07-15', -750.00),
('90123456', 1, '2024-07-15', 2800.00),
('90123456', 2, '2024-07-15', -900.00),
('81239876', 1, '2024-07-15', 1250.00),
('82347654', 1, '2024-07-15', -550.00),
('83456543', 1, '2024-07-15', 2900.00),
('83456543', 2, '2024-07-15', -850.00),
('84565432', 1, '2024-07-15', 1350.00),
('85654321', 1, '2024-07-15', 500.00),
('85654321', 2, '2024-07-15', -400.00),
('86743210', 1, '2024-07-15', 3600.00),
('87842109', 1, '2024-07-15', 1900.00),
('88932098', 1, '2024-07-15', -450.00),
('89921987', 1, '2024-07-15', 1400.00),
('89921987', 2, '2024-07-15', 1100.00),
('90111876', 1, '2024-07-15', -400.00);

-- August
INSERT INTO UNREALIZED_GAIN_LOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-08-15', -1200.00),
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('84567890', 1, '2024-08-15', 2200.00),
('85678901', 1, '2024-08-15', -400.00),
('85678901', 2, '2024-08-15', 1800.00),
('86789012', 1, '2024-08-15', 1200.00),
('86789012', 2, '2024-08-15', -500.00),
('87890123', 1, '2024-08-15', 2500.00),
('88901234', 1, '2024-08-15', -900.00),
('88901234', 2, '2024-08-15', 2800.00),
('89912345', 1, '2024-08-15', -700.00),
('90123456', 1, '2024-08-15', 2400.00),
('90123456', 2, '2024-08-15', -950.00),
('81239876', 1, '2024-08-15', 1150.00),
('82347654', 1, '2024-08-15', -650.00),
('83456543', 1, '2024-08-15', 2600.00),
('83456543', 2, '2024-08-15', -750.00),
('84565432', 1, '2024-08-15', 1450.00),
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('85654321', 2, '2024-08-15', -350.00),
('86743210', 1, '2024-08-15', 3400.00),
('87842109', 1, '2024-08-15', 1800.00),
('88932098', 1, '2024-08-15', -500.00),
('89921987', 1, '2024-08-15', 1350.00),
('89921987', 2, '2024-08-15', 950.00),
('90111876', 1, '2024-08-15', -600.00);

-- September
INSERT INTO UNREALIZED_GAIN_LOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-09-15', 2000.00),
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('84567890', 1, '2024-09-15', 2500.00),
('85678901', 1, '2024-09-15', -650.00),
('85678901', 2, '2024-09-15', 2200.00),
('86789012', 1, '2024-09-15', 1700.00),
('86789012', 2, '2024-09-15', -550.00),
('87890123', 1, '2024-09-15', 2800.00),
('88901234', 1, '2024-09-15', -950.00),
('88901234', 2, '2024-09-15', 3000.00),
('89912345', 1, '2024-09-15', -600.00),
('90123456', 1, '2024-09-15', 2700.00),
('90123456', 2, '2024-09-15', -800.00),
('81239876', 1, '2024-09-15', 1300.00),
('82347654', 1, '2024-09-15', -500.00),
('83456543', 1, '2024-09-15', 2800.00),
('83456543', 2, '2024-09-15', -850.00),
('84565432', 1, '2024-09-15', 1550.00),
('85654321', 1, '2024-09-15', 600.00),
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('86743210', 1, '2024-09-15', 3600.00),
('87842109', 1, '2024-09-15', 2000.00),
('88932098', 1, '2024-09-15', -400.00),
('89921987', 1, '2024-09-15', 1450.00),
('89921987', 2, '2024-09-15', 1100.00),
('90111876', 1, '2024-09-15', -500.00);

-- October
INSERT INTO UNREALIZED_GAIN_LOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-10-15', -650.00),
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('83456789', 2, '2024-10-15', 500.00),
('84567890', 1, '2024-10-15', 2700.00),
('85678901', 1, '2024-10-15', -700.00),
('85678901', 2, '2024-10-15', 2500.00),
('86789012', 1, '2024-10-15', 1600.00),
('86789012', 2, '2024-10-15', -450.00),
('87890123', 1, '2024-10-15', 2900.00),
('88901234', 1, '2024-10-15', -850.00),
('88901234', 2, '2024-10-15', 3100.00),
('89912345', 1, '2024-10-15', -700.00),
('90123456', 1, '2024-10-15', 2800.00),
('90123456', 2, '2024-10-15', -750.00),
('81239876', 1, '2024-10-15', 1400.00),
('82347654', 1, '2024-10-15', -500.00),
('83456543', 1, '2024-10-15', 2900.00),
('83456543', 2, '2024-10-15', -750.00),
('84565432', 1, '2024-10-15', 1650.00),
('85654321', 1, '2024-10-15', 700.00),
('85654321', 2, '2024-10-15', -500.00),
('86743210', 1, '2024-10-15', 3700.00),
('87842109', 1, '2024-10-15', 2100.00),
('88932098', 1, '2024-10-15', -300.00),
('89921987', 1, '2024-10-15', 1550.00),
('89921987', 2, '2024-10-15', 1200.00),
('90111876', 1, '2024-10-15', -550.00);
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-- November
INSERT INTO UNREALIZED_GAIN_LOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-11-15', 1700.00),
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('83456789', 1, '2024-11-15', -350.00),
('83456789', 2, '2024-11-15', 600.00),
('84567890', 1, '2024-11-15', 2800.00),
('85678901', 1, '2024-11-15', -500.00),
('85678901', 2, '2024-11-15', 2700.00),
('86789012', 1, '2024-11-15', 1400.00),
('86789012', 2, '2024-11-15', -600.00),
('87890123', 1, '2024-11-15', 3000.00),
('88901234', 1, '2024-11-15', -900.00),
('88901234', 2, '2024-11-15', 3200.00),
('89912345', 1, '2024-11-15', -450.00),
('90123456', 1, '2024-11-15', 2600.00),
('90123456', 2, '2024-11-15', -850.00),
('81239876', 1, '2024-11-15', 1300.00),
('82347654', 1, '2024-11-15', -400.00),
('83456543', 1, '2024-11-15', 3000.00),
('83456543', 2, '2024-11-15', -700.00),
('84565432', 1, '2024-11-15', 1750.00),
('85654321', 1, '2024-11-15', 800.00),
('85654321', 2, '2024-11-15', -450.00),
('86743210', 1, '2024-11-15', 3800.00),
('87842109', 1, '2024-11-15', 2200.00),
('88932098', 1, '2024-11-15', -250.00),
('89921987', 1, '2024-11-15', 1650.00),
('89921987', 2, '2024-11-15', 1300.00),
('90111876', 1, '2024-11-15', -400.00);

-- December
INSERT INTO UNREALIZED_GAIN_LOSS (Phone, PID, Date, Amount) VALUES
('81234567', 1, '2024-12-15', -550.00),
('81234567', 2, '2024-12-15', 1700.00),
('82345678', 1, '2024-12-15', 950.00),
('83456789', 1, '2024-12-15', -500.00),
('83456789', 2, '2024-12-15', 800.00),
('84567890', 1, '2024-12-15', 2600.00),
('85678901', 1, '2024-12-15', -600.00),
('85678901', 2, '2024-12-15', 2400.00),
('86789012', 1, '2024-12-15', 1500.00),
('86789012', 2, '2024-12-15', -700.00),
('87890123', 1, '2024-12-15', 2800.00),
('88901234', 1, '2024-12-15', -950.00),
('88901234', 2, '2024-12-15', 3100.00),
('89912345', 1, '2024-12-15', -400.00),
('90123456', 1, '2024-12-15', 2900.00),
('90123456', 2, '2024-12-15', -750.00),
('81239876', 1, '2024-12-15', 1350.00),
('82347654', 1, '2024-12-15', -500.00),
('83456543', 1, '2024-12-15', 2900.00),
('83456543', 2, '2024-12-15', -650.00),
('84565432', 1, '2024-12-15', 1500.00),
('85654321', 1, '2024-12-15', 700.00),
('85654321', 2, '2024-12-15', -300.00),
('86743210', 1, '2024-12-15', 3500.00),
('87842109', 1, '2024-12-15', 2000.00),
('88932098', 1, '2024-12-15', -450.00),
('89921987', 1, '2024-12-15', 1400.00),
('89921987', 2, '2024-12-15', 1200.00),
('90111876', 1, '2024-12-15', -600.00);

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	Phone	PID	Date	Amount		Phone	PID	Date	Amount		Phone	PID	Date	Amount		
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2	81234567	1	2024-02-15	-600.00		38	82345678	1	2024-02-15	-750.00		74	83456543	2	2024-02-15	-800.00
3	81234567	1	2024-03-15	2200.00		39	82345678	1	2024-03-15	1750.00		75	83456543	2	2024-03-15	-750.00
4	81234567	1	2024-04-15	-500.00		40	82345678	1	2024-04-15	-850.00		76	83456543	2	2024-04-15	-750.00
5	81234567	1	2024-05-15	1750.00		41	82345678	1	2024-05-15	1100.00		77	83456543	2	2024-05-15	-850.00
6	81234567	1	2024-06-15	-700.00		42	82345678	1	2024-06-15	1250.00		78	83456543	2	2024-06-15	-700.00
7	81234567	1	2024-07-15	1800.00		43	82345678	1	2024-07-15	950.00		79	83456543	2	2024-07-15	-850.00
8	81234567	1	2024-08-15	-1200.00		44	82345678	1	2024-08-15	-750.00		80	83456543	2	2024-08-15	-750.00
9	81234567	1	2024-09-15	2000.00		45	82345678	1	2024-09-15	1400.00		81	83456543	2	2024-09-15	-850.00
10	81234567	1	2024-10-15	-650.00		46	82345678	1	2024-10-15	1100.00		82	83456543	2	2024-10-15	-750.00
11	81234567	1	2024-11-15	1700.00		47	82345678	1	2024-11-15	1300.00		83	83456543	2	2024-11-15	-700.00
12	81234567	1	2024-12-15	-550.00		48	82345678	1	2024-12-15	950.00		84	83456543	2	2024-12-15	-650.00
13	81234567	2	2024-01-15	-2000.00		49	82347654	1	2024-01-15	-400.00		85	83456789	1	2024-01-15	-750.00
14	81234567	2	2024-02-15	2100.00		50	82347654	1	2024-02-15	-550.00		86	83456789	1	2024-02-15	1700.00
15	81234567	2	2024-03-15	-1500.00		51	82347654	1	2024-03-15	-450.00		87	83456789	1	2024-03-15	-600.00
16	81234567	2	2024-04-15	1600.00		52	82347654	1	2024-04-15	-500.00		88	83456789	1	2024-04-15	900.00
17	81234567	2	2024-05-15	-300.00		53	82347654	1	2024-05-15	-400.00		89	83456789	1	2024-05-15	-400.00
18	81234567	2	2024-06-15	1400.00		54	82347654	1	2024-06-15	-600.00		90	83456789	1	2024-06-15	-500.00
19	81234567	2	2024-07-15	-1200.00		55	82347654	1	2024-07-15	-550.00		91	83456789	1	2024-07-15	-600.00
20	81234567	2	2024-08-15	1600.00		56	82347654	1	2024-08-15	-650.00		92	83456789	1	2024-08-15	850.00
21	81234567	2	2024-09-15	-900.00		57	82347654	1	2024-09-15	-500.00		93	83456789	1	2024-09-15	-500.00
22	81234567	2	2024-10-15	1300.00		58	82347654	1	2024-10-15	-500.00		94	83456789	1	2024-10-15	-400.00
23	81234567	2	2024-11-15	-400.00		59	82347654	1	2024-11-15	-400.00		95	83456789	1	2024-11-15	-350.00
24	81234567	2	2024-12-15	1700.00		60	82347654	1	2024-12-15	-500.00		96	83456789	1	2024-12-15	-500.00
25	81239876	1	2024-01-15	600.00		61	83456543	1	2024-01-15	2200.00		97	83456789	2	2024-01-15	500.00
26	81239876	1	2024-02-15	900.00		62	83456543	1	2024-02-15	2300.00		98	83456789	2	2024-02-15	-500.00
27	81239876	1	2024-03-15	1100.00		63	83456543	1	2024-03-15	2700.00		99	83456789	2	2024-03-15	700.00
28	81239876	1	2024-04-15	1400.00		64	83456543	1	2024-04-15	2500.00		100	83456789	2	2024-04-15	-600.00
29	81239876	1	2024-05-15	1000.00		65	83456543	1	2024-05-15	2700.00		101	83456789	2	2024-05-15	1300.00
30	81239876	1	2024-06-15	1050.00		66	83456543	1	2024-06-15	2700.00		102	83456789	2	2024-06-15	600.00
31	81239876	1	2024-07-15	1250.00		67	83456543	1	2024-07-15	2900.00		103	83456789	2	2024-07-15	750.00
32	81239876	1	2024-08-15	1150.00		68	83456543	1	2024-08-15	2600.00		104	83456789	2	2024-08-15	-600.00
33	81239876	1	2024-09-15	1300.00		69	83456543	1	2024-09-15	2800.00		105	83456789	2	2024-09-15	950.00
34	81239876	1	2024-10-15	1400.00		70	83456543	1	2024-10-15	2900.00		106	83456789	2	2024-10-15	500.00
35	81239876	1	2024-11-15	1300.00		71	83456543	1	2024-11-15	3000.00		107	83456789	2	2024-11-15	600.00
36	81239876	1	2024-12-15	1350.00		72	83456543	1	2024-12-15	2900.00		108	83456789	2	2024-12-15	800.00

	Phone	PID	Date	Amount		Phone	PID	Date	Amount		Phone	PID	Date	Amount		
109	84565432	1	2024-01-15	1400.00		145	85654321	2	2024-01-15	-200.00		181	86743210	1	2024-01-15	3200.00
110	84565432	1	2024-02-15	1200.00		146	85654321	2	2024-02-15	-250.00		182	86743210	1	2024-02-15	3100.00
111	84565432	1	2024-03-15	1350.00		147	85654321	2	2024-03-15	-300.00		183	86743210	1	2024-03-15	3500.00
112	84565432	1	2024-04-15	1550.00		148	85654321	2	2024-04-15	-300.00		184	86743210	1	2024-04-15	3400.00
113	84565432	1	2024-05-15	1400.00		149	85654321	2	2024-05-15	-250.00		185	86743210	1	2024-05-15	3700.00
114	84565432	1	2024-06-15	1250.00		150	85654321	2	2024-06-15	-350.00		186	86743210	1	2024-06-15	3300.00
115	84565432	1	2024-07-15	1350.00		151	85654321	2	2024-07-15	-400.00		187	86743210	1	2024-07-15	3600.00
116	84565432	1	2024-08-15	1450.00		152	85654321	2	2024-08-15	-350.00		188	86743210	1	2024-08-15	3400.00
117	84565432	1	2024-09-15	1550.00		153	85654321	2	2024-09-15	-400.00		189	86743210	1	2024-09-15	3600.00
118	84565432	1	2024-10-15	1650.00		154	85654321	2	2024-10-15	-500.00		190	86743210	1	2024-10-15	3700.00
119	84565432	1	2024-11-15	1750.00		155	85654321	2	2024-11-15	-450.00		191	86743210	1	2024-11-15	3800.00
120	84565432	1	2024-12-15	1500.00		156	85654321	2	2024-12-15	-300.00		192	86743210	1	2024-12-15	3500.00
121	84567890	1	2024-01-15	1800.00		157	85678901	1	2024-01-15	-500.00		193	86789012	1	2024-01-15	900.00
122	84567890	1	2024-02-15	1300.00		158	85678901	1	2024-02-15	-400.00		194	86789012	1	2024-02-15	800.00
123	84567890	1	2024-03-15	2500.00		159	85678901	1	2024-03-15	-300.00		195	86789012	1	2024-03-15	1300.00
124	84567890	1	2024-04-15	1900.00		160	85678901	1	2024-04-15	-400.00		196	86789012	1	2024-04-15	1100.00
125	84567890	1	2024-05-15	2200.00		161	85678901	1	2024-05-15	-600.00		197	86789012	1	2024-05-15	1600.00
126	84567890	1	2024-06-15	2000.00		162	85678901	1	2024-06-15	-300.00		198	86789012	1	2024-06-15	1200.00
127	84567890	1	2024-07-15	2300.00		163	85678901	1	2024-07-15	-500.00		199	86789012	1	2024-07-15	1400.00
128	84567890	1	2024-08-15	2200.00		164	85678901	1	2024-08-15	-400.00		200	86789012	1	2024-08-15	1200.00
129	84567890	1	2024-09-15	2500.00		165	85678901	1	2024-09-15	-650.00		201	86789012	1	2024-09-15	1700.00
130	84567890	1	2024-10-15	2700.00		166	85678901	1	2024-10-15	-700.00		202	86789012	1	2024-10-15	1600.00
131	84567890	1	2024-11-15	2800.00		167	85678901	1	2024-11-15	-500.00		203	86789012	1	2024-11-15	1400.00
132	84567890	1	2024-12-15	2600.00		168	85678901	1	2024-12-15	-600.00		204	86789012	1	2024-12-15	1500.00
133	85654321	1	2024-01-15	300.00		169	85678901	2	2024-01-15	2100.00		205	86789012	2	2024-01-15	-300.00
134	85654321	1	2024-02-15	400.00		170	85678901	2	2024-02-15	2500.00		206	86789012	2	2024-02-15	-300.00
135	85654321	1	2024-03-15	600.00		171	85678901	2	2024-03-15	1800.00		207	86789012	2	2024-03-15	-400.00
136	85654321	1	2024-04-15	700.00		172	85678901	2	2024-04-15	2700.00		208	86789012	2	2024-04-15	-500.00
137	85654321	1	2024-05-15	500.00		173	85678901	2	2024-05-15	2000.00		209	86789012	2	2024-05-15	-400.00
138	85654321	1	2024-06-15	400.00		174	85678901	2	2024-06-15	1700.00		210	86789012	2	2024-06-15	-450.00
139	85654321	1	2024-07-15	500.00		175	85678901	2	2024-07-15	2100.00		211	86789012	2	2024-07-15	-300.00
140	85654321	1	2024-08-15	450.00		176	85678901	2	2024-08-15	1800.00		212	86789012	2	2024-08-15	-500.00
141	85654321	1	2024-09-15	600.00		177	85678901	2	2024-09-15	2200.00		213	86789012	2	2024-09-15	-550.00
142	85654321	1	2024-10-15	700.00		178	85678901	2	2024-10-15	2500.00		214	86789012	2	2024-10-15	-450.00
143	85654321	1	2024-11-15	800.00		179	85678901	2	2024-11-15	2700.00		215	86789012	2	2024-11-15	-600.00
144	85654321	1	2024-12-15	700.00		180	85678901	2	2024-12-15	2400.00		216	86789012	2	2024-12-15	-700.00

	Phone	PID	Date	Amount		Phone	PID	Date	Amount		Phone	PID	Date	Amount		
217	87842109	1	2024-01-15	1700.00		253	88901234	2	2024-01-15	-1200.00		289	89921987	1	2024-01-15	1100.00
218	87842109	1	2024-02-15	1600.00		254	88901234	2	2024-02-15	2600.00		290	89921987	1	2024-02-15	1050.00
219	87842109	1	2024-03-15	1900.00		255	88901234	2	2024-03-15	2900.00		291	89921987	1	2024-03-15	1200.00
220	87842109	1	2024-04-15	1800.00		256	88901234	2	2024-04-15	3100.00		292	89921987	1	2024-04-15	1250.00
221	87842109	1	2024-05-15	1900.00		257	88901234	2	2024-05-15	3300.00		293	89921987	1	2024-05-15	1100.00
222	87842109	1	2024-06-15	1600.00		258	88901234	2	2024-06-15	2400.00		294	89921987	1	2024-06-15	1300.00
223	87842109	1	2024-07-15	1900.00		259	88901234	2	2024-07-15	2700.00		295	89921987	1	2024-07-15	1400.00
224	87842109	1	2024-08-15	1800.00		260	88901234	2	2024-08-15	2800.00		296	89921987	1	2024-08-15	1350.00
225	87842109	1	2024-09-15	2000.00		261	88901234	2	2024-09-15	3000.00		297	89921987	1	2024-09-15	1450.00
226	87842109	1	2024-10-15	2100.00		262	88901234	2	2024-10-15	3100.00		298	89921987	1	2024-10-15	1550.00
227	87842109	1	2024-11-15	2200.00		263	88901234	2	2024-11-15	3200.00		299	89921987	1	2024-11-15	1650.00
228	87842109	1	2024-12-15	2000.00		264	88901234	2	2024-12-15	3100.00		300	89921987	1	2024-12-15	1400.00
229	87890123	1	2024-01-15	1100.00		265	88932098	1	2024-01-15	-500.00		301	89921987	2	2024-01-15	900.00
230	87890123	1	2024-02-15	1900.00		266	88932098	1	2024-02-15	-450.00		302	89921987	2	2024-02-15	800.00
231	87890123	1	2024-03-15	2100.00		267	88932098	1	2024-03-15	-550.00		303	89921987	2	2024-03-15	950.00
232	87890123	1	2024-04-15	2500.00		268	88932098	1	2024-04-15	-500.00		304	89921987	2	2024-04-15	800.00
233	87890123	1	2024-05-15	2400.00		269	88932098	1	2024-05-15	-500.00		305	89921987	2	2024-05-15	900.00
234	87890123	1	2024-06-15	2300.00		270	88932098	1	2024-06-15	-500.00		306	89921987	2	2024-06-15	1000.00
235	87890123	1	2024-07-15	2600.00		271	88932098	1	2024-07-15	-450.00		307	89921987	2	2024-07-15	1100.00
236	87890123	1	2024-08-15	2500.00		272	88932098	1	2024-08-15	-500.00		308	89921987	2	2024-08-15	950.00
237	87890123	1	2024-09-15	2800.00		273	88932098	1	2024-09-15	-400.00		309	89921987	2	2024-09-15	1100.00
238	87890123	1	2024-10-15	2900.00		274	88932098	1	2024-10-15	-300.00		310	89921987	2	2024-10-15	1200.00
239	87890123	1	2024-11-15	3000.00		275	88932098	1	2024-11-15	-250.00		311	89921987	2	2024-11-15	1300.00
240	87890123	1	2024-12-15	2800.00		276	88932098	1	2024-12-15	-450.00		312	89921987	2	2024-12-15	1200.00

7. * Updating PORTFOLIO

In portfolio, we have MarketValue, Fee and AnnualizedReturn respectively. Here are the relationships among these attributes with Invested_Value and Unrealized_Gain/Loss:

- MarketValue = Latest(Invested_Value) + Sum(Unrealized_Gain/Loss)
- Fee = Latest(Invested_Value) * 0.88%
- AnnualizedReturn = (MarketValue - Invested_Value)/Invested_Value

First we need to calculate the Sum(Unrealized_Gain/Loss). We need to Create a VIEW Portfolio_Gain_Loss as below to check the correctness of total gain/loss and prepare for next updating. The resulting records of the view are shown on the right.

```
CREATE VIEW Portfolio_Gain_Loss AS
SELECT
    P.Phone,
    P.PID,
    SUM(GL.Amount) AS Total_Gain_Loss
FROM
    UNREALIZED_GAIN_LOSS AS GL,
    PORTFOLIO AS P
WHERE
    P.Phone = GL.Phone
    AND P.PID = GL.PID
GROUP BY
    P.Phone, P.PID;
GO
```

	Phone	PID	Total_Gain_Loss
1	81234567	1	6750.00
2	81234567	2	3400.00
3	81239876	1	13800.00
4	82345678	1	8650.00
5	82347654	1	-6000.00
6	83456543	1	32200.00
7	83456543	2	-9100.00
8	83456789	1	-1150.00
9	83456789	2	5000.00
10	84565432	1	17400.00
11	84567890	1	26800.00
12	85654321	1	6650.00
13	85654321	2	-4050.00
14	85678901	1	-5850.00
15	85678901	2	26500.00
16	86743210	1	41800.00
17	86789012	1	15700.00
18	86789012	2	-5450.00
19	87842109	1	22500.00
20	87890123	1	28900.00
21	88901234	1	-7000.00
22	88901234	2	31000.00
23	88932098	1	-5350.00
24	89912345	1	-6900.00
25	89921987	1	15800.00
26	89921987	2	12200.00
27	90111876	1	-6500.00
28	90123456	1	27200.00
29	90123456	2	-9950.00

Next we need to calculate the Latest(Invested_Value) for each portfolio. We use MAX(Date) to identify the most recent entry for each portfolio, and apply a JOIN to retrieve the corresponding values. The created view Latest_Invested_Value are listed on the right.

```
CREATE VIEW Latest_Invested_Value AS
SELECT
    I.Phone,
    I.PID,
    I.Date,
    I.Amount
FROM INVESTED_VALUE AS I
JOIN (
    -- Subquery to get the latest date for each (Phone, PID)
    SELECT Phone, PID, MAX(Date) AS LatestDate
    FROM INVESTED_VALUE
    GROUP BY Phone, PID
) AS Latest ON I.Phone = Latest.Phone
    AND I.PID = Latest.PID
    AND I.Date = Latest.LatestDate;
GO
```

	Phone	PID	Date	Amount
1	90123456	2	2024-12-18	390000.00
2	90123456	1	2024-11-25	380000.00
3	90111876	1	2024-12-05	220000.00
4	89921987	2	2024-11-18	165000.00
5	89921987	1	2024-04-22	175000.00
6	89912345	1	2024-10-05	280000.00
7	88932098	1	2024-07-15	225000.00
8	88901234	2	2024-12-18	220000.00
9	88901234	1	2024-11-25	190000.00
10	87890123	1	2024-11-10	180000.00
11	87842109	1	2024-09-20	140000.00
12	86789012	2	2024-11-29	100000.00
13	86789012	1	2024-12-13	94000.00
14	86743210	1	2024-05-07	500000.00
15	85678901	2	2024-12-02	134000.00
16	85678901	1	2024-11-05	128000.00
17	85654321	2	2024-10-15	45000.00
18	85654321	1	2024-04-02	40000.00
19	84567890	1	2024-12-15	180000.00
20	84565432	1	2024-11-29	65000.00
21	83456789	2	2024-12-18	90000.00
22	83456789	1	2024-11-16	85000.00
23	83456543	2	2024-12-05	140000.00
24	83456543	1	2024-09-18	135000.00
25	82347654	1	2024-08-14	85000.00
26	82345678	1	2024-12-02	95000.00
27	81239876	1	2024-10-20	85000.00
28	81234567	2	2024-12-03	150000.00
29	81234567	1	2024-11-01	80000.00

Now we can start to update the attribute **MarketValue**, **Fee** and **AnnualizedReturn** of **PORTFOLIO** respectively as below.

```

| UPDATE P
|   SET P.MarketValue = PG.Total_Gain_Loss + L.Amount
|   FROM PORTFOLIO AS P
|   JOIN Portfolio_Gain_Loss AS PG ON P.Phone = PG.Phone AND P.PID = PG.PID
|   JOIN Latest_Invested_Value AS L ON P.Phone = L.Phone AND P.PID = L.PID;

| UPDATE P
|   SET P.Fee = P.MarketValue * 0.0088
|   FROM PORTFOLIO AS P

| UPDATE P
|   SET P.AnnualizedReturn = PG.Total_Gain_Loss / L.Amount
|   FROM PORTFOLIO AS P
|   JOIN Portfolio_Gain_Loss AS PG ON P.Phone = PG.Phone AND P.PID = PG.PID
|   JOIN Latest_Invested_Value AS L ON P.Phone = L.Phone AND P.PID = L.PID;

```

And here is the final updated **PORTFOLIO** table below:

	Phone	PID	InceptionDate	AnnualizedReturn	MarketValue	Fee
1	81234567	1	2023-01-01	0.08	86750.00	763.40
2	81234567	2	2023-02-10	0.02	153400.00	1349.92
3	81239876	1	2023-02-25	0.16	98800.00	869.44
4	82345678	1	2023-02-15	0.09	103650.00	912.12
5	82347654	1	2023-01-10	-0.07	79000.00	695.20
6	83456543	1	2023-03-25	0.24	167200.00	1471.36
7	83456543	2	2023-04-05	-0.07	130900.00	1151.92
8	83456789	1	2023-03-10	-0.01	83850.00	737.88
9	83456789	2	2023-04-01	0.06	95000.00	836.00
10	84565432	1	2023-04-05	0.27	82400.00	725.12
11	84567890	1	2023-02-20	0.15	206800.00	1819.84
12	85654321	1	2023-02-15	0.17	46650.00	410.52
13	85654321	2	2023-03-20	-0.09	40950.00	360.36
14	85678901	1	2023-01-25	-0.05	122150.00	1074.92
15	85678901	2	2023-02-15	0.20	160500.00	1412.40
16	86743210	1	2023-03-10	0.08	541800.00	4767.84
17	86789012	1	2023-03-05	0.17	109700.00	965.36
18	86789012	2	2023-04-10	-0.05	94550.00	832.04
19	87842109	1	2023-01-20	0.16	162500.00	1430.00
20	87890123	1	2023-04-15	0.16	208900.00	1838.32
21	88901234	1	2023-02-10	-0.04	183000.00	1610.40
22	88901234	2	2023-03-01	0.14	251000.00	2208.80
23	88932098	1	2023-02-05	-0.02	219650.00	1932.92
24	89912345	1	2023-03-30	-0.02	273100.00	2403.28
25	89921987	1	2023-03-01	0.09	190800.00	1679.04
26	89921987	2	2023-03-25	0.07	177200.00	1559.36
27	90111876	1	2023-04-01	-0.03	213500.00	1878.80
28	90123456	1	2023-01-15	0.07	407200.00	3583.36
29	90123456	2	2023-02-25	-0.03	380050.00	3344.44

8. ASSET (STOCK & BOND & FUND)

A total of 30 assets are randomly generated, evenly divided among three types: STOCK, BOND, and FUND, with 10 assets in each category.

```
-- ASSET (ID, Name, Price)
INSERT INTO ASSET (ID, Name, Price) VALUES
(1, 'Apple Inc. (AAPL)', 195.20),
(2, 'Microsoft Corp. (MSFT)', 345.10),
(3, 'Tesla Inc. (TSLA)', 245.90),
(4, 'NVIDIA Corp. (NVDA)', 600.00),
(5, 'Alphabet Inc. (GOOGL)', 132.80),
(6, 'Amazon.com Inc. (AMZN)', 145.25),
(7, 'Meta Platforms (META)', 340.50),
(8, 'Netflix Inc. (NFLX)', 475.75),
(9, 'Intel Corp. (INTC)', 38.45),
(10, 'Adobe Inc. (ADBE)', 520.60),

(11, '10-Year Treasury Note', 100.00),
(12, 'iShares iBoxx $ High Yield Corp (HYG)', 77.25),
(13, 'SPDR Bloomberg Convertible Sec (CWB)', 69.40),
(14, 'Vanguard Total Bond Market ETF (BND)', 73.15),
(15, 'iShares TIPS Bond ETF (TIP)', 107.90),
(16, 'PIMCO Investment Grade Corp Bond (CORP)', 101.65),
(17, 'iShares 1-3 Year Treasury Bond (SHY)', 82.70),
(18, 'Schwab Intermediate-Term US Treasury (SCHR)', 51.10),
(19, 'SPDR Portfolio Long Term Treasury ETF (SPTL)', 29.90),
(20, 'Invesco Senior Loan ETF (BKLN)', 21.30),

(21, 'Vanguard S&P 500 ETF (VOO)', 430.45),
(22, 'iShares Core MSCI EM ETF (IEMG)', 54.35),
(23, 'Schwab US Small-Cap ETF (SCHA)', 47.80),
(24, 'SPDR S&P Dividend ETF (SDY)', 120.65),
(25, 'Fidelity MSCI Info Tech ETF (FTEC)', 136.40),
(26, 'Vanguard Total Stock Market ETF (VTI)', 230.75),
(27, 'iShares Russell 2000 ETF (IWM)', 190.55),
(28, 'Vanguard FTSE Developed Markets ETF (VEA)', 45.20),
(29, 'Invesco QQQ Trust (QQQ)', 390.90),
(30, 'ARK Innovation ETF (ARKK)', 49.95);

-- STOCK (ID, P_E, EPS, EBITDA)
INSERT INTO STOCK (ID, P_E, EPS, EBITDA) VALUES
(1, 28.5, 6.84, 1200000.00),
(2, 34.2, 9.50, 1800000.00),
(3, 70.1, 3.20, 90000.00),
(4, 52.3, 7.10, 160000.00),
(5, 25.6, 5.90, 140000.00),
(6, 72.8, 2.85, 100000.00),
(7, 21.9, 9.80, 150000.00),
(8, 38.7, 6.10, 130000.00),
(9, 14.2, 2.15, 80000.00),
(10, 45.0, 4.70, 110000.00);

-- BOND (ID, InterestRate, MaturityDate)
INSERT INTO BOND (ID, InterestRate, MaturityDate) VALUES
(11, 3.45, '2034-01-01'),
(12, 5.25, '2029-06-15'),
(13, 4.10, '2031-03-30'),
(14, 3.80, '2033-10-01'),
(15, 2.75, '2028-07-20'),
(16, 4.60, '2030-12-31'),
(17, 2.35, '2026-04-15'),
(18, 2.90, '2027-08-01'),
(19, 3.15, '2040-11-10'),
(20, 6.25, '2032-02-05');

-- FUND (ID, ExpenseRatio, DividendYield)
INSERT INTO FUND (ID, ExpenseRatio, DividendYield) VALUES
(21, 0.03, 1.45),
(22, 0.11, 2.20),
(23, 0.04, 1.80),
(24, 0.35, 3.10),
(25, 0.08, 1.90),
(26, 0.04, 1.70),
(27, 0.19, 2.40),
(28, 0.05, 2.00),
(29, 0.20, 1.65),
(30, 0.75, 0.90);
```

ID	Name	Price
1	Apple Inc. (AAPL)	195.20
2	Microsoft Corp. (MSFT)	345.10
3	Tesla Inc. (TSLA)	245.90
4	NVIDIA Corp. (NVDA)	600.00
5	Alphabet Inc. (GOOGL)	132.80
6	Amazon.com Inc. (AMZN)	145.25
7	Meta Platforms (META)	340.50
8	Netflix Inc. (NFLX)	475.75
9	Intel Corp. (INTC)	38.45
10	Adobe Inc. (ADBE)	520.60
11	10-Year Treasury Note	100.00
12	iShares iBoxx \$ High Yield Corp (HYG)	77.25
13	SPDR Bloomberg Convertible Sec (CWB)	69.40
14	Vanguard Total Bond Market ETF (BND)	73.15
15	iShares TIPS Bond ETF (TIP)	107.90
16	PIMCO Investment Grade Corp Bond (CORP)	101.65
17	iShares 1-3 Year Treasury Bond (SHY)	82.70
18	Schwab Intermediate-Term US Treasury (SCHR)	51.10
19	SPDR Portfolio Long Term Treasury ETF (SPTL)	29.90
20	Invesco Senior Loan ETF (BKLN)	21.30
21	Vanguard S&P 500 ETF (VOO)	430.45
22	iShares Core MSCI EM ETF (IEMG)	54.35
23	Schwab US Small-Cap ETF (SCHA)	47.80
24	SPDR S&P Dividend ETF (SDY)	120.65
25	Fidelity MSCI Info Tech ETF (FTEC)	136.40
26	Vanguard Total Stock Market ETF (VTI)	230.75
27	iShares Russell 2000 ETF (IWM)	190.55
28	Vanguard FTSE Developed Markets ETF (VEA)	45.20
29	Invesco QQQ Trust (QQQ)	390.90
30	ARK Innovation ETF (ARKK)	49.95

ID	P_E	EPS	EBITDA
1	1	28.50	6.84 1200000.00
2	2	34.20	9.50 1800000.00
3	3	70.10	3.20 90000.00
4	4	52.30	7.10 160000.00
5	5	25.60	5.90 140000.00
6	6	72.80	2.85 100000.00
7	7	21.90	9.80 150000.00
8	8	38.70	6.10 130000.00
9	9	14.20	2.15 80000.00
10	10	45.00	4.70 110000.00

ID	InterestRate	MaturityDate
1	11	3.45 2034-01-01
2	12	5.25 2029-06-15
3	13	4.10 2031-03-30
4	14	3.80 2033-10-01
5	15	2.75 2028-07-20
6	16	4.60 2030-12-31
7	17	2.35 2026-04-15
8	18	2.90 2027-08-01
9	19	3.15 2040-11-10
10	20	6.25 2032-02-05

ID	ExpenseRatio	DividendYield
1	21	0.03 1.45
2	22	0.11 2.20
3	23	0.04 1.80
4	24	0.35 3.10
5	25	0.08 1.90
6	26	0.04 1.70
7	27	0.19 2.40
8	28	0.05 2.00
9	29	0.20 1.65
10	30	0.75 0.90

9. STOCK/BOND/FUND_POST_COMPANY

Each asset is linked to a post-trade company. For simplicity, we use the three companies mentioned in the text — **Saxo**, **Clearstream**, and **Interactive Broker** — and assign them randomly across the assets.

-- STOCK_POST_TRADE_COMPANY		StockID	PostTradeCO
	INSERT INTO STOCK_POST_TRADE_COMPANY (StockID, PostTradeCO) VALUES	1	Saxo
	(1, 'Saxo'),	2	Clearstream
	(2, 'Clearstream'),	3	Interactive Brokers
	(3, 'Interactive Brokers'),	4	Clearstream
	(4, 'Clearstream'),	5	Saxo
	(5, 'Saxo'),	6	Interactive Brokers
	(6, 'Interactive Brokers'),	7	Clearstream
	(7, 'Clearstream'),	8	Saxo
	(8, 'Saxo'),	9	Interactive Brokers
	(9, 'Interactive Brokers'),	10	Clearstream
	(10, 'Clearstream');		

-- BOND_POST_TRADE_COMPANY		BondID	PostTradeCO
	INSERT INTO BOND_POST_TRADE_COMPANY (BondID, PostTradeCO) VALUES	1	Clearstream
	(11, 'Clearstream'),	2	Saxo
	(12, 'Saxo'),	3	Interactive Brokers
	(13, 'Interactive Brokers'),	4	Saxo
	(14, 'Saxo'),	5	Clearstream
	(15, 'Clearstream'),	6	Interactive Brokers
	(16, 'Interactive Brokers'),	7	Saxo
	(17, 'Saxo'),	8	Clearstream
	(18, 'Clearstream'),	9	Interactive Brokers
	(19, 'Interactive Brokers'),	10	Saxo
	(20, 'Saxo');		

-- FUND_POST_TRADE_COMPANY		FundID	PostTradeCO
	INSERT INTO FUND_POST_TRADE_COMPANY (FundID, PostTradeCO) VALUES	1	Saxo
	(21, 'Saxo'),	2	Clearstream
	(22, 'Clearstream'),	3	Interactive Brokers
	(23, 'Interactive Brokers'),	4	Clearstream
	(24, 'Clearstream'),	5	Saxo
	(25, 'Saxo'),	6	Interactive Brokers
	(26, 'Interactive Brokers'),	7	Clearstream
	(27, 'Clearstream'),	8	Saxo
	(28, 'Saxo'),	9	Interactive Brokers
	(29, 'Interactive Brokers'),	10	Clearstream
	(30, 'Clearstream');		

10. PORTFOLIO_STOCK/BOND/FOND_DETAILS

Each portfolio consists of a mix of assets. For example, USER 1's first portfolio (PID=1) is composed of 40% stock_1, 20% stock_2, 10% stock_3, 20% bond_1, and 10% bond_2, totaling 100%.

We advance five portfolios at a time and an additional table is provided in every five portfolios to illustrate the asset composition of each portfolio.

Phone	PID	Stocks	Bonds	Funds	Total
81234567	1	0.4+0.2+0.1	0.2+0.1	0	1.0
81234567	2	1.0	0	0	1.0
82345678	1	0.5+0.2	0.3	0	1.0
83456789	1	0	0	0.5+0.3+0.2	1.0
83456789	2	0	0	0.6+0.4	1.0

```
---- First 1-5 Portfolios
INSERT INTO PORTFOLIO_STOCK_DETAILS (ID, StockID, Phone, PID, StartDate, AllocationRatio) VALUES
(1, 1, '81234567', 1, '2023-01-15', 0.4),
(2, 2, '81234567', 1, '2023-01-20', 0.2),
(3, 3, '81234567', 1, '2023-01-25', 0.1), -- total: 0.7

(4, 1, '81234567', 2, '2023-02-15', 1.0), -- pure stock

(5, 2, '82345678', 1, '2023-02-20', 0.5),
(6, 3, '82345678', 1, '2023-02-25', 0.2); -- total in stock = 0.7

INSERT INTO PORTFOLIO_BOND_DETAILS (ID, BondID, Phone, PID, StartDate, AllocationRatio) VALUES
(1, 11, '81234567', 1, '2023-01-30', 0.2),
(2, 12, '81234567', 1, '2023-02-05', 0.1), -- total + stock = 1.0

(3, 11, '82345678', 1, '2023-02-28', 0.3); -- total = 0.7 (stock) + 0.3 = 1.0

INSERT INTO PORTFOLIO_FUND_DETAILS (ID, FundID, Phone, PID, StartDate, AllocationRatio) VALUES
(1, 21, '83456789', 1, '2023-03-15', 0.5),
(2, 22, '83456789', 1, '2023-03-20', 0.3),
(3, 23, '83456789', 1, '2023-03-25', 0.2), -- total = 1.0

(4, 24, '83456789', 2, '2023-04-10', 0.6),
(5, 25, '83456789', 2, '2023-04-15', 0.4); -- total = 1.0
```

Phone	PID	Stocks	Bonds	Funds	Total
84567890	1	0.5+0.2	0.3	0	1.0
85678901	1	0.6	0	0.4	1.0
85678901	2	0.5+0.2	0.3	0	1.0
86789012	1	0.3	0.2	0.5	1.0
86789012	2	0	0	1.0	1.0

```

-- 6-10 Portfolios
INSERT INTO PORTFOLIO_STOCK_DETAILS (ID, StockID, Phone, PID, StartDate, AllocationRatio) VALUES
(7, 4, '84567890', 1, '2023-03-01', 0.5),
(8, 5, '84567890', 1, '2023-03-10', 0.2),

(9, 1, '85678901', 1, '2023-02-01', 0.6),

(10, 3, '85678901', 2, '2023-03-01', 0.5),
(11, 2, '85678901', 2, '2023-03-10', 0.2),

(12, 2, '86789012', 1, '2023-04-01', 0.3);

INSERT INTO PORTFOLIO_BOND_DETAILS (ID, BondID, Phone, PID, StartDate, AllocationRatio) VALUES
(5, 13, '84567890', 1, '2023-03-20', 0.3), -- 0.5 + 0.2 + 0.3 = 1.0

(6, 11, '85678901', 2, '2023-03-15', 0.3), -- 0.5 + 0.2 + 0.3 = 1.0

(7, 12, '86789012', 1, '2023-04-10', 0.2); -- 0.3 + 0.2 = 0.5 (rest in fund)

INSERT INTO PORTFOLIO_FUND_DETAILS (ID, FundID, Phone, PID, StartDate, AllocationRatio) VALUES
(6, 26, '85678901', 1, '2023-02-10', 0.4), -- 0.6 + 0.4 = 1.0

(7, 27, '86789012', 1, '2023-04-20', 0.5), -- 0.3 + 0.2 + 0.5 = 1.0

(8, 28, '86789012', 2, '2023-05-01', 1.0); -- Pure Fund

```

Phone	PID	Stocks	Bonds	Funds	Total
87890123	1	0.7	0.3	0	1.0
88901234	1	1.0	0	0	1.0
88901234	2	0.7	0.3	0	1.0
89912345	1	0	0	1.0	1.0
83456543	2	0.2	0.3	0.5	1.0

```
-- 11-15 Portfolios
INSERT INTO PORTFOLIO_STOCK_DETAILS (ID, StockID, Phone, PID, StartDate, AllocationRatio) VALUES
(13, 5, '87890123', 1, '2023-05-01', 0.3),
(14, 3, '87890123', 1, '2023-05-10', 0.2),

(15, 4, '88901234', 1, '2023-03-01', 0.4),
(16, 2, '88901234', 2, '2023-03-15', 0.2),
(17, 1, '89912345', 1, '2023-04-10', 0.5),
(27, 6, '83456543', 2, '2023-03-20', 0.2);

INSERT INTO PORTFOLIO_BOND_DETAILS (ID, BondID, Phone, PID, StartDate, AllocationRatio) VALUES
(8, 14, '87890123', 1, '2023-05-20', 0.3), -- 0.3 + 0.2 + 0.3 = 0.8 (rest in fund)
(9, 11, '88901234', 1, '2023-03-08', 0.3), -- 0.4 + 0.3 = 0.7
(10, 13, '89912345', 1, '2023-04-15', 0.3), -- 0.5 + 0.3 = 0.8
(22, 12, '83456543', 2, '2023-03-20', 0.3);

INSERT INTO PORTFOLIO_FUND_DETAILS (ID, FundID, Phone, PID, StartDate, AllocationRatio) VALUES
(9, 29, '87890123', 1, '2023-05-25', 0.2), -- 0.3 + 0.2 + 0.3 + 0.2 = 1.0
(10, 21, '88901234', 1, '2023-03-20', 0.3), -- 0.4 + 0.3 + 0.3 = 1.0
(11, 22, '88901234', 2, '2023-03-20', 0.8), -- 0.2 + 0.8 = 1.0
(12, 23, '89912345', 1, '2023-04-20', 0.2), -- 0.5 + 0.3 + 0.2 = 1.0
(27, 6, '83456543', 2, '2023-03-20', 0.5); -- 0.2 + 0.3 + 0.5 = 1.0
```

Phone	PID	Stocks	Bonds	Funds	Total
90123456	1	0.3+0.3	0.2	0.2	1.0
90123456	2	0.5	0.3	0.2	1.0
81239876	1	0.4	0.3	0.3	1.0
82347654	1	0.4	0.2	0.4	1.0
83456543	1	0	0	1.0	1.0

```
-- 16-20 Portfolios
INSERT INTO PORTFOLIO_STOCK_DETAILS (ID, StockID, Phone, PID, StartDate, AllocationRatio) VALUES
(18, 3, '90123456', 1, '2023-02-01', 0.3),
(19, 4, '90123456', 1, '2023-02-08', 0.3),

(20, 1, '90123456', 2, '2023-03-01', 0.5),

(21, 5, '81239876', 1, '2023-03-05', 0.4),

(22, 2, '82347654', 1, '2023-02-01', 0.4);

INSERT INTO PORTFOLIO_BOND_DETAILS (ID, BondID, Phone, PID, StartDate, AllocationRatio) VALUES
(11, 11, '90123456', 1, '2023-02-15', 0.2), -- 0.3 + 0.3 + 0.2 = 0.8

(12, 14, '90123456', 2, '2023-03-10', 0.3), -- 0.5 + 0.3 = 0.8

(13, 12, '81239876', 1, '2023-03-10', 0.3), -- 0.4 + 0.3 = 0.7

(14, 13, '82347654', 1, '2023-02-08', 0.2); -- 0.4 + 0.2 = 0.6

INSERT INTO PORTFOLIO_FUND_DETAILS (ID, FundID, Phone, PID, StartDate, AllocationRatio) VALUES
(13, 27, '90123456', 1, '2023-02-20', 0.2), -- 0.3 + 0.3 + 0.2 + 0.2 = 1.0

(14, 28, '90123456', 2, '2023-03-15', 0.2), -- 0.5 + 0.3 + 0.2 = 1.0

(15, 26, '81239876', 1, '2023-03-20', 0.3), -- 0.4 + 0.3 + 0.3 = 1.0

(16, 21, '82347654', 1, '2023-02-15', 0.4), -- 0.4 + 0.2 + 0.4 = 1.0

(17, 22, '83456543', 1, '2023-04-01', 1.0); -- All fund (pure fund portfolio)
```

Phone	PID	Stocks	Bonds	Funds	Total
84565432	1	0.4	0.3	0.3	1.0
85654321	1	0.3	0.4	0.3	1.0
85654321	2	0.2	0.3	0.5	1.0
86743210	1	0.4	0	0.6	1.0
87842109	1	0.3	0.4	0.3	1.0

```

-- 21-25 Portfolios
INSERT INTO PORTFOLIO_STOCK_DETAILS (ID, StockID, Phone, PID, StartDate, AllocationRatio) VALUES
(23, 2, '84565432', 1, '2023-04-10', 0.4),
(24, 1, '85654321', 1, '2023-02-20', 0.3),
(25, 4, '85654321', 2, '2023-03-25', 0.2),
(26, 3, '86743210', 1, '2023-03-15', 0.4),
(27, 5, '87842109', 1, '2023-01-25', 0.3);

INSERT INTO PORTFOLIO_BOND_DETAILS (ID, BondID, Phone, PID, StartDate, AllocationRatio) VALUES
(15, 12, '84565432', 1, '2023-04-15', 0.3), -- 0.4 + 0.3 = 0.7
(16, 13, '85654321', 1, '2023-02-25', 0.4),
(17, 11, '85654321', 2, '2023-03-28', 0.3), -- 0.2 + 0.3 = 0.5
(18, 14, '87842109', 1, '2023-02-01', 0.4); -- 0.3 + 0.4 = 0.7

INSERT INTO PORTFOLIO_FUND_DETAILS (ID, FundID, Phone, PID, StartDate, AllocationRatio) VALUES
(18, 23, '84565432', 1, '2023-04-20', 0.3), -- 0.4 + 0.3 + 0.3 = 1.0
(19, 21, '85654321', 1, '2023-03-01', 0.3), -- 0.3 + 0.4 + 0.3 = 1.0
(20, 26, '85654321', 2, '2023-03-30', 0.5), -- 0.2 + 0.3 + 0.5 = 1.0
(21, 24, '86743210', 1, '2023-03-20', 0.6), -- 0.4 + 0.6 = 1.0
(22, 28, '87842109', 1, '2023-02-10', 0.3); -- 0.3 + 0.4 + 0.3 = 1.0

```

Phone	PID	Stocks	Bonds	Funds	Total
88932098	1	0.3	0.4	0.3	1.0
89921987	1	0.25	0.35	0.4	1.0
89921987	2	0.3	0	0.7	1.0
90111876	1	0.4	0.2	0.4	1.0

```
-- 26-29 Portfolios

[ ] INSERT INTO PORTFOLIO_STOCK_DETAILS (ID, StockID, Phone, PID, StartDate, AllocationRatio) VALUES
(28, 6, '88932098', 1, '2023-02-10', 0.3),

(29, 2, '89921987', 1, '2023-03-05', 0.25),
(30, 5, '89921987', 2, '2023-03-28', 0.3),

(31, 1, '90111876', 1, '2023-04-05', 0.4);

[ ] INSERT INTO PORTFOLIO_BOND_DETAILS (ID, BondID, Phone, PID, StartDate, AllocationRatio) VALUES
(19, 15, '88932098', 1, '2023-02-15', 0.4), -- 0.3 + 0.4 = 0.7

(20, 11, '89921987', 1, '2023-03-10', 0.35), -- 0.25 + 0.35 = 0.6

(21, 13, '90111876', 1, '2023-04-12', 0.2); -- 0.4 + 0.2 = 0.6

[ ] INSERT INTO PORTFOLIO_FUND_DETAILS (ID, FundID, Phone, PID, StartDate, AllocationRatio) VALUES
(23, 25, '88932098', 1, '2023-02-20', 0.3), -- 0.3 + 0.4 + 0.3 = 1.0

(24, 27, '89921987', 1, '2023-03-20', 0.4), -- 0.25 + 0.35 + 0.4 = 1.0
(25, 28, '89921987', 2, '2023-03-30', 0.7), -- 0.3 + 0.7 = 1.0

(26, 24, '90111876', 1, '2023-04-18', 0.4); -- 0.4 + 0.2 + 0.4 = 1.0
```

Here are the complete tables of PORTFOLIO_STOCK/FUND/BOND_DETAILS

11. TRANSACTION_STOCK/BOND/FOND

Transaction records are tied to INVESTED_VALUE, as users top up or withdraw funds from specific portfolios. For instance, if USER 1 adds \$10,000 to their first portfolio (PID = 1), and the portfolio's composition is 40% stock_1, 20% stock_2, 10% stock_3, 20% bond_1, and 10% bond_2, this implies purchases of \$4,000 in stock_1, \$2,000 in stock_2, \$1,000 in stock_3, \$2,000 in bond_1, and \$1,000 in bond_2.

The first step is to calculate the change in INVESTED_VALUE in order to track the amount added or withdrawn during each transaction. Hence, we create the view

Invested_Value_Change to capture the difference in invested value over time, allowing us to track each top-up or withdrawal per portfolio.

```
|=CREATE VIEW Invested_Value_Change AS
SELECT
    Phone,
    PID,
    Date,
    Amount,
    LAG(Amount) OVER (PARTITION BY Phone, PID ORDER BY Date) AS Prev_Amount,
    Amount - LAG(Amount) OVER (PARTITION BY Phone, PID ORDER BY Date) AS Change
FROM INVESTED_VALUE
```

We use the **LAG()** function to capture the previous value of Amount, and calculate Amount - LAG(Amount) to track the difference—representing the amount added or withdrawn. Below are the view of **Invested_Value_Change** (129 entries in total, same as INVESTED_VALUE)

	Phone	PID	Date	Amount	Prev_Amount	Change	Phone	PID	Date	Amount	Prev_Amount	Change	Phone	PID	Date	Amount	Prev_Amount	Change		
1	81234567	1	2024-01-03	55000.00	NULL	NULL	35	83456789	1	2024-01-12	55000.00	NULL	NULL	70	85678901	2	2024-04-03	86000.00	NULL	
2	81234567	1	2024-03-04	60000.00	55000.00	5000.00	36	83456789	1	2024-02-15	50000.00	55000.00	-5000.00	71	85678901	2	2024-06-04	98000.00	86000.00	12000.00
3	81234567	1	2024-05-01	65000.00	60000.00	5000.00	37	83456789	1	2024-03-18	60000.00	60000.00	10000.00	72	85678901	2	2024-08-03	110000.00	98000.00	12000.00
4	81234567	1	2024-07-02	70000.00	65000.00	5000.00	38	83456789	1	2024-05-08	75000.00	60000.00	15000.00	73	85678901	2	2024-11-17	120000.00	110000.00	10000.00
5	81234567	1	2024-09-09	75000.00	70000.00	5000.00	39	83456789	1	2024-07-17	72000.00	75000.00	-3000.00	74	85678901	2	2024-02-02	124000.00	120000.00	12000.00
6	81234567	1	2024-11-01	80000.00	75000.00	5000.00	40	83456789	1	2024-09-12	73000.00	72000.00	1000.00	75	86742120	1	2024-05-07	50000.00	NULL	NULL
7	81234567	2	2024-02-02	100000.00	NULL	41	83456789	1	2024-09-12	73000.00	72000.00	1000.00	76	86789012	1	2024-01-08	75000.00	NULL	NULL	
8	81234567	2	2024-04-04	110000.00	100000.00	10000.00	42	83456789	2	2024-02-09	72000.00	73000.00	-1000.00	77	86789012	1	2024-05-12	86000.00	75000.00	1000.00
9	81234567	2	2024-06-03	120000.00	110000.00	10000.00	43	83456789	2	2024-03-15	70000.00	72000.00	-2000.00	78	86789012	1	2024-04-18	78000.00	80000.00	-2000.00
10	81234567	2	2024-08-05	130000.00	120000.00	10000.00	44	83456789	2	2024-04-22	70000.00	68000.00	2000.00	79	86789012	1	2024-06-05	85000.00	78000.00	7000.00
11	81234567	2	2024-10-05	140000.00	130000.00	10000.00	45	83456789	2	2024-10-14	90000.00	77000.00	3000.00	80	86789012	1	2024-08-17	99000.00	85000.00	4000.00
12	81234567	2	2024-12-03	150000.00	140000.00	10000.00	46	83456789	2	2024-12-18	90000.00	90000.00	1000.00	81	86789012	1	2024-10-24	101000.00	90000.00	2000.00
13	81239876	1	2024-01-14	70000.00	NULL	47	84565432	1	2024-01-17	60000.00	NULL	NULL	82	86789012	1	2024-12-13	94000.00	91000.00	3000.00	
14	81239876	1	2024-04-10	75000.00	70000.00	5000.00	48	84565432	1	2024-11-29	65000.00	60000.00	5000.00	83	86789012	2	2024-01-10	120000.00	NULL	NULL
15	81239876	1	2024-07-15	80000.00	75000.00	5000.00	49	84567890	1	2024-02-10	120000.00	NULL	NULL	84	86789012	2	2024-03-15	85000.00	NULL	113
16	81239876	1	2024-10-20	85000.00	80000.00	5000.00	50	84567890	1	2024-02-14	110000.00	120000.00	-10000.00	85	86789012	2	2024-05-20	90000.00	85000.00	5000.00
17	82345678	1	2024-01-02	40000.00	NULL	51	84567890	1	2024-01-03	40000.00	NULL	NULL	86	86789012	2	2024-07-11	95000.00	90000.00	5000.00	
18	82345678	1	2024-02-02	45000.00	40000.00	5000.00	52	84567890	1	2024-04-27	150000.00	150000.00	10000.00	87	86789012	2	2024-09-22	98000.00	95000.00	3000.00
19	82345678	1	2024-03-02	50000.00	45000.00	5000.00	53	84567890	1	2024-05-25	140000.00	130000.00	3000.00	88	86789012	2	2024-11-21	100000.00	98000.00	2000.00
20	82345678	1	2024-04-01	55000.00	50000.00	5000.00	54	84567890	1	2024-07-14	143000.00	130000.00	7000.00	89	87841209	1	2024-02-14	150000.00	NULL	111
21	82345678	1	2024-05-06	60000.00	55000.00	5000.00	55	84567890	1	2024-08-17	150000.00	145000.00	5000.00	90	87841209	1	2024-09-20	140000.00	150000.00	-1000...
22	82345678	1	2024-06-07	65000.00	60000.00	5000.00	56	84567890	1	2024-09-15	150000.00	150000.00	5000.00	91	87841209	1	2024-01-14	130000.00	NULL	119
23	82345678	1	2024-07-01	70000.00	65000.00	5000.00	58	84567890	1	2024-10-24	160000.00	150000.00	5000.00	92	87841209	1	2024-05-17	150000.00	140000.00	10000.00
24	82345678	1	2024-09-07	75000.00	70000.00	5000.00	59	84567890	1	2024-11-15	170000.00	160000.00	10000.00	93	87841209	1	2024-07-20	160000.00	150000.00	10000.00
25	82345678	1	2024-10-02	80000.00	75000.00	5000.00	60	84567890	1	2024-09-27	180000.00	170000.00	10000.00	94	87841209	1	2024-09-14	170000.00	160000.00	10000.00
26	82345678	1	2024-10-13	85000.00	80000.00	5000.00	61	85045421	1	2024-09-21	40000.00	NULL	NULL	95	87841209	1	2024-11-11	180000.00	170000.00	10000.00
27	82345678	1	2024-11-04	90000.00	85000.00	5000.00	62	85045421	1	2024-10-15	40000.00	NULL	NULL	96	88901234	1	2024-01-09	180000.00	NULL	124
28	82345678	1	2024-12-02	90000.00	90000.00	5000.00	63	85678901	1	2024-01-02	60000.00	NULL	NULL	97	88901234	2	2024-03-10	175000.00	180000.00	-5000...
29	82345678	1	2024-02-22	90000.00	NULL	64	85678901	1	2024-02-04	74000.00	68000.00	6000.00	98	88901234	2	2024-04-12	320000.00	NULL	125	
30	82345678	1	2024-08-14	95000.00	90000.00	-5000.00	65	85678901	1	2024-03-01	89000.00	74000.00	6000.00	99	88901234	2	2024-06-25	340000.00	320000.00	20000.00
31	83456543	1	2024-03-10	125000.00	NULL	66	85678901	1	2024-05-02	92000.00	88000.00	12000.00	100	88901234	2	2024-04-18	185000.00	190000.00	-5000.00	
32	83456543	1	2024-09-18	135000.00	125000.00	10000.00	67	85678901	1	2024-07-01	104000.00	92000.00	12000.00	101	88901234	2	2024-06-25	195000.00	185000.00	10000.00
33	83456543	2	2024-06-25	130000.00	NULL	68	85678901	1	2024-09-02	116000.00	104000.00	12000.00	102	88901234	1	2024-09-23	180000.00	165000.00	15000.00	
34	83456543	2	2024-12-05	140000.00	130000.00	10000.00	69	85678901	1	2024-11-05	125000.00	116000.00	12000.00	103	89012345	2	2024-12-18	390000.00	370000.00	20000.00

After successfully creating `Invested_Value_Change`, we insert records into `TRANSACTION_STOCK`, `TRANSACTION_BOND`, or `TRANSACTION_FUND` respectively, using the corresponding `AllocationRatio`

For: `TRANSACTION_STOCK`

```
[-] INSERT INTO TRANSACTION_STOCK (Date, ID, Fee)
  SELECT
    IV.Date,
    PSD.ID,
    IV.Change * PSD.AllocationRatio
  FROM Invested_Value_Change AS IV, PORTFOLIO_STOCK_DETAILS AS PSD
  WHERE IV.Phone = PSD.Phone AND IV.PID = PSD.PID AND IV.Change IS NOT NULL

[-] INSERT INTO TRANSACTION_STOCK (Date, ID, Fee)
  SELECT
    Date,
    ID,
    Amount * PSD.AllocationRatio
  FROM Invested_Value_Change AS IV JOIN PORTFOLIO_STOCK_DETAILS AS PSD
  ON PSD.Phone = IV.Phone AND PSD.PID = IV.PID AND IV.Prev_Amount IS NULL
  WHERE ID = PSD.ID

[-] UPDATE TRANSACTION_STOCK
  SET TYPE = 'Buy'
  WHERE Fee > 0

[-] UPDATE TRANSACTION_STOCK
  SET TYPE = 'Sell'
  WHERE Fee < 0
```

For `TRANSACTION_BOND`:

```
[-] INSERT INTO TRANSACTION_BOND (Date, ID, Fee)
  SELECT
    IV.Date,
    PBD.ID,
    IV.Change * PBD.AllocationRatio
  FROM Invested_Value_Change AS IV, PORTFOLIO_BOND_DETAILS AS PBD
  WHERE IV.Phone = PBD.Phone AND IV.PID = PBD.PID AND IV.Change IS NOT NULL

[-] INSERT INTO TRANSACTION_BOND (Date, ID, Fee)
  SELECT
    Date,
    ID,
    Amount * PBD.AllocationRatio
  FROM Invested_Value_Change AS IV JOIN PORTFOLIO_BOND_DETAILS AS PBD
  ON PBD.Phone = IV.Phone AND PBD.PID = IV.PID AND IV.Prev_Amount IS NULL
  WHERE ID = PBD.ID

[-] UPDATE TRANSACTION_BOND
  SET TYPE = 'Buy'
  WHERE Fee > 0

[-] UPDATE TRANSACTION_BOND
  SET TYPE = 'Sell'
  WHERE Fee < 0

[-] SELECT * FROM TRANSACTION_BOND
```

For TRANSACTION_FUND:

```

[+] INSERT INTO TRANSACTION_FUND (Date, ID, Fee)
SELECT
    IV.Date,
    PFD.ID,
    IV.Change * PFD.AllocationRatio
FROM Invested_Value_Change AS IV, PORTFOLIO_FUND_DETAILS AS PFD
WHERE IV.Phone = PFD.Phone AND IV.PID = PFD.PID AND IV.Change IS NOT NULL

[+] INSERT INTO TRANSACTION_FUND (Date, ID, Fee)
SELECT
    Date,
    ID,
    Amount * PFD.AllocationRatio
FROM Invested_Value_Change AS IV JOIN PORTFOLIO_FUND_DETAILS AS PFD
ON PFD.Phone = IV.Phone AND PFD.PID = IV.PID AND IV.Prev_Amount IS NULL
WHERE ID = PFD.ID

[+] UPDATE TRANSACTION_FUND
SET TYPE = 'Buy'
WHERE Fee > 0

[+] UPDATE TRANSACTION_FUND
SET TYPE = 'Sell'
WHERE Fee < 0

```

Below is the resulting table of TRANSACTION_STOCK:

	Date	ID	Type	Fee		Date	ID	Type	Fee		Date	ID	Type	Fee
1	2024-01-02	5	Buy	20000.00	42	2024-03-20	7	Buy	5000.00	83	2024-07-01	5	Buy	2500.00
2	2024-01-02	6	Buy	8000.00	43	2024-03-20	8	Buy	2000.00	84	2024-07-01	6	Buy	1000.00
3	2024-01-02	9	Buy	40800.00	44	2024-04-01	5	Buy	2500.00	85	2024-07-01	9	Buy	7200.00
4	2024-01-03	1	Buy	22000.00	45	2024-04-01	6	Buy	1000.00	86	2024-07-02	1	Buy	2000.00
5	2024-01-03	2	Buy	11000.00	46	2024-04-02	4	Buy	10000.00	87	2024-07-02	2	Buy	1000.00
6	2024-01-03	3	Buy	5500.00	47	2024-04-02	24	Buy	12000.00	88	2024-07-02	3	Buy	500.00
7	2024-01-08	12	Buy	22500.00	48	2024-04-03	10	Buy	43000.00	89	2024-07-10	17	Buy	5000.00
8	2024-01-09	15	Buy	72000.00	49	2024-04-03	11	Buy	17200.00	90	2024-07-12	18	Buy	1500.00
9	2024-01-10	7	Buy	60000.00	50	2024-04-10	21	Buy	2000.00	91	2024-07-12	19	Buy	1500.00
10	2024-01-10	8	Buy	24000.00	51	2024-04-12	17	Buy	5000.00	92	2024-07-13	15	Sell	-20000.00
11	2024-01-14	13	Buy	39000.00	52	2024-04-12	20	Buy	160000.00	93	2024-07-14	7	Buy	3500.00
12	2024-01-14	14	Buy	26000.00	53	2024-04-18	12	Sell	-600.00	94	2024-07-14	8	Buy	1400.00
13	2024-01-14	21	Buy	28000.00	54	2024-04-18	16	Sell	-1000.00	95	2024-07-15	21	Buy	2000.00
14	2024-01-16	17	Buy	125000.00	55	2024-04-22	7	Buy	5000.00	96	2024-07-15	28	Buy	1500.00
15	2024-01-17	23	Buy	24000.00	56	2024-04-22	8	Buy	2000.00	97	2024-07-20	13	Buy	3000.00
16	2024-01-18	18	Buy	90000.00	57	2024-04-22	29	Buy	43750.00	98	2024-07-20	14	Buy	2000.00
17	2024-01-18	19	Buy	90000.00	58	2024-05-01	1	Buy	2000.00	99	2024-08-01	4	Buy	10000.00
18	2024-02-02	4	Buy	100000.00	59	2024-05-01	2	Buy	1000.00	100	2024-08-03	5	Buy	2500.00
19	2024-02-03	5	Buy	2500.00	60	2024-05-01	3	Buy	500.00	101	2024-08-03	6	Buy	1000.00
20	2024-02-03	6	Buy	1000.00	61	2024-05-02	5	Buy	2500.00	102	2024-08-03	10	Buy	6000.00
21	2024-02-04	9	Buy	3600.00	62	2024-05-02	6	Buy	1000.00	103	2024-08-03	11	Buy	2400.00
22	2024-02-12	12	Buy	1500.00	63	2024-05-02	9	Buy	7200.00	104	2024-08-14	16	Buy	1000.00
23	2024-02-14	7	Sell	-2500.00	64	2024-05-07	26	Buy	200000.00	105	2024-08-14	22	Sell	-2000.00
24	2024-02-14	8	Sell	-1000.00	65	2024-05-17	13	Buy	3000.00	106	2024-08-15	20	Buy	5000.00
25	2024-02-14	27	Buy	45000.00	66	2024-05-17	14	Buy	2000.00	107	2024-08-17	7	Buy	2500.00
26	2024-02-15	16	Buy	38000.00	67	2024-05-22	15	Sell	-20000.00	108	2024-08-17	8	Buy	1000.00
27	2024-02-20	18	Buy	3000.00	68	2024-05-22	18	Buy	7500.00	109	2024-08-17	12	Buy	1200.00
28	2024-02-20	19	Buy	3000.00	69	2024-05-22	19	Buy	7500.00	110	2024-09-02	5	Buy	2500.00
29	2024-02-22	22	Buy	36000.00	70	2024-05-25	7	Buy	2500.00	111	2024-09-02	6	Buy	1000.00
30	2024-03-01	9	Buy	3600.00	71	2024-05-25	8	Buy	1000.00	112	2024-09-02	9	Buy	7200.00
31	2024-03-02	5	Buy	2500.00	72	2024-06-03	4	Buy	10000.00	113	2024-09-03	1	Buy	2000.00
32	2024-03-02	6	Buy	1000.00	73	2024-06-04	5	Buy	2500.00	114	2024-09-03	2	Buy	1000.00
33	2024-03-04	1	Buy	2000.00	74	2024-06-04	6	Buy	1000.00	115	2024-09-03	3	Buy	500.00
34	2024-03-04	2	Buy	1000.00	75	2024-06-04	10	Buy	6000.00	116	2024-09-14	13	Buy	3000.00
35	2024-03-04	3	Buy	500.00	76	2024-06-04	11	Buy	2400.00	117	2024-09-14	14	Buy	2000.00
36	2024-03-10	15	Sell	-20000.00	77	2024-06-10	7	Sell	-10000.00	118	2024-09-20	7	Buy	2500.00
37	2024-03-10	28	Buy	66000.00	78	2024-06-10	8	Sell	-400.00	119	2024-09-20	8	Buy	1000.00
38	2024-03-12	13	Buy	3000.00	79	2024-06-12	31	Buy	80000.00	120	2024-09-20	27	Sell	-3000.00
39	2024-03-12	14	Buy	2000.00	80	2024-06-25	12	Buy	2100.00	121	2024-09-22	18	Buy	7500.00
40	2024-03-15	18	Sell	-1500.00	81	2024-06-25	16	Buy	2000.00	122	2024-09-22	19	Buy	7500.00
41	2024-03-15	19	Sell	-1500.00	82	2024-06-25	20	Buy	10000.00	123	2024-09-23	15	Buy	6000.00
122	2024-12-18	20	Buy	10000.00						123	2024-12-18	20	Buy	10000.00

Below is the resulting table of **TRANSACTION_FUND**:

	Date	ID	Type	Fee		Date	ID	Type	Fee		Date	ID	Type	Fee
1	2024-01-02	3	Buy	12000.00	32	2024-04-18	7	Sell	-400.00	64	2024-09-02	3	Buy	1500.00
2	2024-01-03	1	Buy	11000.00	33	2024-04-22	5	Buy	3000.00	65	2024-09-03	1	Buy	1000.00
3	2024-01-03	2	Buy	5500.00	34	2024-04-22	20	Buy	61250.00	66	2024-09-03	2	Buy	500.00
4	2024-01-08	7	Buy	15000.00	35	2024-05-01	1	Buy	1000.00	67	2024-09-14	8	Buy	3000.00
5	2024-01-09	9	Buy	54000.00	36	2024-05-01	2	Buy	500.00	68	2024-09-20	5	Buy	1500.00
6	2024-01-10	5	Buy	36000.00	37	2024-05-02	3	Buy	1500.00	69	2024-09-20	18	Sell	-4000.00
7	2024-01-14	8	Buy	39000.00	38	2024-05-17	8	Buy	3000.00	70	2024-09-22	11	Buy	5000.00
8	2024-01-14	13	Buy	21000.00	39	2024-05-22	9	Sell	-1500.00	71	2024-09-23	9	Buy	4500.00
9	2024-01-16	10	Buy	75000.00	40	2024-05-22	11	Buy	5000.00	72	2024-10-01	6	Buy	3600.00
10	2024-01-17	15	Buy	18000.00	41	2024-05-25	5	Buy	1500.00	73	2024-10-03	3	Buy	1500.00
11	2024-01-18	11	Buy	60000.00	42	2024-06-04	3	Buy	1500.00	74	2024-10-05	10	Buy	3000.00
12	2024-02-03	3	Buy	1500.00	43	2024-06-04	6	Buy	3600.00	75	2024-10-15	17	Buy	13500.00
13	2024-02-12	7	Buy	1000.00	44	2024-06-10	5	Sell	-600.00	76	2024-10-20	12	Buy	6000.00
14	2024-02-14	5	Sell	-1500.00	45	2024-06-12	21	Buy	40000.00	77	2024-10-20	13	Buy	1500.00
15	2024-02-14	18	Buy	60000.00	46	2024-06-25	7	Buy	1400.00	78	2024-10-24	5	Buy	1500.00
16	2024-02-20	11	Buy	2000.00	47	2024-06-25	12	Buy	6000.00	79	2024-10-24	7	Buy	400.00
17	2024-02-22	14	Buy	18000.00	48	2024-07-01	3	Buy	1500.00	80	2024-11-01	1	Buy	1000.00
18	2024-03-02	3	Buy	1500.00	49	2024-07-02	1	Buy	1000.00	81	2024-11-01	2	Buy	500.00
19	2024-03-04	1	Buy	1000.00	50	2024-07-02	2	Buy	500.00	82	2024-11-04	3	Buy	1500.00
20	2024-03-04	2	Buy	500.00	51	2024-07-10	10	Buy	3000.00	83	2024-11-10	8	Buy	3000.00
21	2024-03-10	9	Sell	-1500.00	52	2024-07-12	11	Buy	1000.00	84	2024-11-25	9	Buy	3000.00
22	2024-03-10	19	Buy	88000.00	53	2024-07-13	9	Sell	-1500.00	85	2024-11-25	11	Buy	4000.00
23	2024-03-12	8	Buy	3000.00	54	2024-07-14	5	Buy	2100.00	86	2024-11-28	5	Buy	3000.00
24	2024-03-15	11	Sell	-1000.00	55	2024-07-15	13	Buy	1500.00	87	2024-11-29	15	Buy	1500.00
25	2024-03-20	5	Buy	3000.00	56	2024-07-15	19	Buy	2000.00	88	2024-12-02	3	Buy	1500.00
26	2024-04-01	3	Buy	1500.00	57	2024-07-20	8	Buy	3000.00	89	2024-12-02	6	Buy	3600.00
27	2024-04-02	16	Buy	16000.00	58	2024-08-03	3	Buy	1500.00	90	2024-12-05	21	Buy	4000.00
28	2024-04-03	6	Buy	25800.00	59	2024-08-03	6	Buy	3600.00	91	2024-12-13	7	Buy	600.00
29	2024-04-10	13	Buy	1500.00	60	2024-08-14	14	Sell	-1000.00	92	2024-12-15	5	Buy	3000.00
30	2024-04-12	10	Buy	3000.00	61	2024-08-15	12	Buy	3000.00	93	2024-12-18	12	Buy	6000.00
31	2024-04-12	12	Buy	96000.00	62	2024-08-17	5	Buy	1500.00	94	2024-12-18	14	Buy	4000.00
					63	2024-08-17	7	Buy	800.00	95	2024-12-18	13	Buy	4000.00

Below is the resulting table of **TRANSACTION_BOND**:

	Date	ID	Type	Fee		Date	ID	Type	Fee		Date	ID	Type	Fee
1	2024-01-02	6	Buy	27200.00	27	2024-03-15	13	Sell	-1000.00	53	2024-06-25	11	Buy	8000.00
2	2024-01-08	7	Buy	37500.00	28	2024-03-18	1	Buy	5000.00	54	2024-06-25	14	Buy	4000.00
3	2024-01-09	10	Buy	54000.00	29	2024-03-18	2	Buy	3000.00	55	2024-07-01	6	Buy	4800.00
4	2024-01-12	1	Buy	27500.00	30	2024-03-18	3	Buy	2000.00	56	2024-07-10	12	Buy	2000.00
5	2024-01-12	2	Buy	16500.00	31	2024-04-02	19	Buy	12000.00	57	2024-07-11	8	Buy	5000.00
6	2024-01-12	3	Buy	11000.00	32	2024-04-10	4	Buy	42000.00	58	2024-07-12	13	Buy	1000.00
7	2024-01-14	9	Buy	26000.00	33	2024-04-10	5	Buy	28000.00	59	2024-07-13	10	Sell	-1500.00
8	2024-01-14	15	Buy	21000.00	34	2024-04-10	15	Buy	1500.00	60	2024-07-15	15	Buy	1500.00
9	2024-01-16	12	Buy	50000.00	35	2024-04-12	12	Buy	2000.00	61	2024-07-15	23	Buy	1500.00
10	2024-01-17	18	Buy	18000.00	36	2024-04-12	14	Buy	64000.00	62	2024-07-17	1	Sell	-1500.00
11	2024-01-18	13	Buy	60000.00	37	2024-04-18	7	Sell	-1000.00	63	2024-07-17	2	Sell	-900.00
12	2024-02-04	6	Buy	2400.00	38	2024-04-18	11	Sell	-4000.00	64	2024-07-17	3	Sell	-600.00
13	2024-02-12	7	Buy	2500.00	39	2024-04-22	24	Buy	70000.00	65	2024-07-20	9	Buy	2000.00
14	2024-02-14	22	Buy	45000.00	40	2024-05-02	6	Buy	4800.00	66	2024-08-14	11	Buy	4000.00
15	2024-02-15	1	Sell	-2500.00	41	2024-05-07	21	Buy	300000.00	67	2024-08-14	16	Sell	-2000.00
16	2024-02-15	2	Sell	-1500.00	42	2024-05-08	1	Buy	7500.00	68	2024-08-15	14	Buy	2000.00
17	2024-02-15	3	Sell	-1000.00	43	2024-05-08	2	Buy	4500.00	69	2024-08-17	7	Buy	2000.00
18	2024-02-15	11	Buy	152000.00	44	2024-05-08	3	Buy	3000.00	70	2024-08-21	4	Buy	5400.00
19	2024-02-20	13	Buy	2000.00	45	2024-05-17	9	Buy	2000.00	71	2024-08-21	5	Buy	3600.00
20	2024-02-22	16	Buy	36000.00	46	2024-05-20	8	Buy	5000.00	72	2024-09-02	6	Buy	4800.00
21	2024-03-01	6	Buy	2400.00	47	2024-05-22	10	Sell	-1500.00	73	2024-09-12	1	Buy	500.00
22	2024-03-10	10	Sell	-15000.00	48	2024-05-22	13	Buy	5000.00	74	2024-09-12	2	Buy	300.00
23	2024-03-10	17	Buy	125000.00	49	2024-06-12	4	Sell	-1200.00	75	2024-09-12	3	Buy	200.00
24	2024-03-10	23	Buy	66000.00	50	2024-06-12	5	Sell	-800.00	76	2024-09-14	9	Buy	2000.00
25	2024-03-12	9	Buy	2000.00	51	2024-06-12	26	Buy	80000.00	77	2024-09-18	17	Buy	10000.00
26	2024-03-15	8	Buy	85000.00	52	2024-06-25	7	Buy	3500.00	78	2024-09-20	22	Sell	-3000.00

Query Solution

1. Query 1

Find investors who are making on average a loss across all their portfolios in 2024.

A user is considered to have an average loss if the combined gain or loss across all their portfolios is negative. In other words, if the sum of all portfolio gains/losses for a user is less than zero, the user is making an overall loss.

To determine this, we first need to calculate the gain or loss for each of the user's portfolios using the formula:

$$\text{gain/loss} = \text{MarketValue} - \text{Latest_Invested_Value}$$

We can refer to the ***Updating PORTFOLIO in Data Population & Display** part to reuse the view `Latest_Invested_Value`.

```
CREATE VIEW Latest_Invested_Value AS
SELECT
    I.Phone,
    I.PID,
    I.Date,
    I.Amount
FROM INVESTED_VALUE AS I
JOIN (
    -- Subquery to get the latest date for each (Phone, PID)
    SELECT Phone, PID, MAX(Date) AS LatestDate
    FROM INVESTED_VALUE
    GROUP BY Phone, PID
) AS Latest ON I.Phone = Latest.Phone
            AND I.PID = Latest.PID
            AND I.Date = Latest.LatestDate;
GO
```

	Phone	PID	Date	Amount
1	90123456	2	2024-12-18	390000.00
2	90123456	1	2024-11-25	380000.00
3	90111876	1	2024-12-05	220000.00
4	89921987	2	2024-11-18	165000.00
5	89921987	1	2024-04-22	175000.00
6	89912345	1	2024-10-05	280000.00
7	88932098	1	2024-07-15	225000.00
8	88901234	2	2024-12-18	220000.00
9	88901234	1	2024-11-25	190000.00
10	87890123	1	2024-11-10	180000.00
11	87842109	1	2024-09-20	140000.00
12	86789012	2	2024-11-29	100000.00
13	86789012	1	2024-12-13	94000.00
14	86743210	1	2024-05-07	500000.00
15	85678901	2	2024-12-02	134000.00
16	85678901	1	2024-11-05	128000.00
17	85654321	2	2024-10-15	45000.00
18	85654321	1	2024-04-02	40000.00
19	84567890	1	2024-12-15	180000.00
20	84565432	1	2024-11-29	65000.00
21	83456789	2	2024-12-18	90000.00
22	83456789	1	2024-11-16	85000.00
23	83456543	2	2024-12-05	140000.00
24	83456543	1	2024-09-18	135000.00
25	82347654	1	2024-08-14	85000.00
26	82345678	1	2024-12-02	95000.00
27	81239876	1	2024-10-20	85000.00
28	81234567	2	2024-12-03	150000.00
29	81234567	1	2024-11-01	80000.00

Next, we create a temporary view `T` to record the gain/loss for each portfolio. Then, we select the user's Name and the sum of their gain/loss to identify users whose `total_gain_loss` is negative.

```
WITH T AS(
    SELECT P.Phone, P.PID, (P.MarketValue - LIV.Amount) AS gain_loss
    FROM INVESTOR AS I
    JOIN PORTFOLIO AS P
    ON I.Phone = P.Phone
    JOIN Latest_Invested_Value AS LIV
    ON LIV.Phone = P.Phone AND LIV.PID = P.PID
    SELECT I.Name, SUM(T.gain_loss) AS total_gain_loss
    FROM INVESTOR AS I JOIN T ON I.Phone = T.Phone
    GROUP BY I.Name
    HAVING SUM(T.gain_loss) < 0
)
```

	Phone	PID	gain_loss
1	90123456	2	-9950.00
2	90123456	1	27200.00
3	90111876	1	-6500.00
4	89921987	2	12200.00
5	89921987	1	15800.00
6	89912345	1	-6900.00
7	88932098	1	-5350.00
8	88901234	2	31000.00
9	88901234	1	-7000.00
10	87890123	1	28900.00
11	87842109	1	22500.00
12	86789012	2	-5450.00
13	86789012	1	15700.00
14	86743210	1	41800.00
15	85678901	2	26500.00
16	85678901	1	-5850.00
17	85654321	2	-4050.00
18	85654321	1	6650.00
19	84567890	1	26800.00
20	84565432	1	17400.00
21	83456789	2	5000.00
22	83456789	1	-1150.00
23	83456543	2	-9100.00
24	83456543	1	32200.00
25	82347654	1	-6000.00
26	82345678	1	8650.00
27	81239876	1	13800.00
28	81234567	2	3400.00
29	81234567	1	6750.00

And here is the result:

	Name	total_gain_loss
1	Irene Tan	-6900.00
2	Lucas Wong	-6000.00
3	Ryan Tan	-5350.00
4	Timothy Chan	-6500.00

2. Query 2

Find investors who are seeing an annualized return of more than 10% from their portfolios in 2024.

This question is much simpler than the previous one. We only need to check whether the **AnnualizedReturn** of an investor's portfolio is greater than 10% (i.e., > 0.1).

To find the target users, join the **INVESTOR** and **PORTFOLIO** tables.

Note: Make sure that there are no duplicate users in the result—each user should appear only once. So we use **DISTINCT** to satisfy the requirements.

```
SELECT DISTINCT Name
  FROM INVESTOR AS I JOIN PORTFOLIO AS P
    ON I.Phone = P.Phone
   WHERE AnnualizedReturn > 0.1
```

Below is the result:

	Name
1	David Ong
2	Evelyn Goh
3	Francis Teo
4	Gina Chia
5	Harrison Lee
6	Katherine Choo
7	Megan Soh
8	Nathan Ho
9	Olivia Sim
10	Queenie Yeo

3. Query 3

Find the monthly average unrealized gain/loss of portfolios for each month in 2024.

Review on **UNREALIZED_GAIN_LOSS**:

Unrealized gains or losses are recorded monthly for each portfolio. It represents only the gain or loss between two consecutive recording dates, not the total accumulated gain or loss.

To solve the query, we **SUM** all the gain/loss within each month, and use **COUNT** to check whether each portfolio is successfully included in each month's records. Since it is in 2024, we only consider the data in **YEAR(Date) = 2024**. Additionally, we cast the result to **DECIMAL(10,2)** to ensure it is a valid and properly formatted numeric value.

```
SELECT CAST(SUM(Amount)/COUNT(*) AS DECIMAL(10,2)) AS average_unrealized_gain_loss,
       SUM(Amount) AS each_month_sum,
       COUNT(*) AS portfolio_number
  FROM UNREALIZED_GAIN_LOSS
 WHERE YEAR(Date) = 2024
 GROUP BY MONTH(Date)
```

Below is the result:

	average_unrealized_gain_loss	each_month_sum	portfolio_number
1	584.48	16950.00	29
2	627.59	18200.00	29
3	789.66	22900.00	29
4	734.48	21300.00	29
5	817.24	23700.00	29
6	717.24	20800.00	29
7	813.79	23600.00	29
8	677.59	19650.00	29
9	898.28	26050.00	29
10	917.24	26600.00	29
11	994.83	28850.00	29
12	908.62	26350.00	29

4. Query 4

What is the top three most popular first financial goals for investors in 2024?

The solution here is straightforward. We group the **FINANCIAL_GOAL** table by **GOAL**, count the number of occurrences, sort the results in descending order, and select the top 3 as the final answer.

```
WITH goal_number_overview AS
    (SELECT GOAL, COUNT(*) AS number_of_goal
     FROM FINANCIAL_GOAL
     GROUP BY GOAL)
    SELECT TOP 3 *
    FROM goal_number_overview
    ORDER BY number_of_goal DESC
```

Below is the result:

	GOAL	number_of_goal
1	To buy a house	6
2	To fund children's education	6
3	To generate sufficient monthly cash after retir...	5

5. Query 5

Find investors who consistently top up their investment at the beginning of every month (dollar-cost averaging) in 2024 for at least one of their portfolios.

Referring back to Updating **PORTFOLIO**, we again reuse the **Invested_Value_Change** view, as it allows us to track the amounts users top up or withdraw, along with the corresponding transaction dates. On the right is a brief view of the **Invested_Value_Change**.

	Phone	PID	Date	Amount	Prev_Amount	Change
46	83456789	2	2024-12-18	90000.00	\$0000.00	10000.00
47	84565432	1	2024-01-17	60000.00	NULL	NULL
48	84565432	1	2024-11-29	65000.00	60000.00	5000.00
49	84567890	1	2024-01-10	120000.00	NULL	NULL
50	84567890	1	2024-02-14	115000.00	120000.00	-5000.00
51	84567890	1	2024-03-20	125000.00	115000.00	10000.00
52	84567890	1	2024-04-22	135000.00	125000.00	10000.00
53	84567890	1	2024-05-25	140000.00	135000.00	5000.00
54	84567890	1	2024-06-10	138000.00	140000.00	-2000.00
55	84567890	1	2024-07-14	145000.00	138000.00	7000.00
56	84567890	1	2024-08-17	150000.00	145000.00	5000.00
57	84567890	1	2024-09-20	155000.00	150000.00	5000.00
58	84567890	1	2024-10-24	160000.00	155000.00	5000.00
59	84567890	1	2024-11-28	170000.00	160000.00	10000.00
60	84567890	1	2024-12-15	180000.00	170000.00	10000.00

```
-CREATE VIEW Invested_Value_Change AS
SELECT
    Phone,
    PID,
    Date,
    Amount,
    LAG(Amount) OVER (PARTITION BY Phone, PID ORDER BY Date) AS Prev_Amount,
    Amount - LAG(Amount) OVER (PARTITION BY Phone, PID ORDER BY Date) AS Change
FROM INVESTED_VALUE
GO
```

Additionally, since the query requires users to consistently increase their invested value—similar to the concept of Dollar-Cost Averaging (DCA)—we need to track the differences between each top-up to ensure the amounts are stable and regularly scheduled on a monthly basis. Hence, we create the view **Invested_Value_Change_Change**. On the right is a brief view of the **Invested_Value_Change_Change**.

	Phone	PID	Date	Change	Prev_Change	Change_Change
46	83456789	2	2024-12-18	10000.00	3000.00	7000.00
47	84565432	1	2024-01-17	NULL	NULL	NULL
48	84565432	1	2024-11-29	5000.00	NULL	NULL
49	84567890	1	2024-01-10	NULL	NULL	NULL
50	84567890	1	2024-02-14	-5000.00	NULL	NULL
51	84567890	1	2024-03-20	10000.00	-5000.00	15000.00
52	84567890	1	2024-04-22	10000.00	10000.00	0.00
53	84567890	1	2024-05-25	5000.00	10000.00	-5000.00
54	84567890	1	2024-06-10	-2000.00	5000.00	-7000.00
55	84567890	1	2024-07-14	7000.00	-2000.00	9000.00
56	84567890	1	2024-08-17	5000.00	7000.00	-2000.00
57	84567890	1	2024-09-20	5000.00	5000.00	0.00
58	84567890	1	2024-10-24	5000.00	5000.00	0.00
59	84567890	1	2024-11-28	10000.00	5000.00	5000.00
60	84567890	1	2024-12-15	10000.00	10000.00	0.00

```
-CREATE VIEW Invested_Value_Change_Change AS
SELECT
    Phone,
    PID,
    Date,
    Change,
    LAG(Change) OVER (PARTITION BY Phone, PID ORDER BY Date) AS Prev_Change,
    Change - LAG(Change) OVER (PARTITION BY Phone, PID ORDER BY Date) AS Change_Change
FROM Invested_Value_Change
GO
```

Finally, we perform a JOIN between the INVESTOR table and the Invested_Value_Change_Change view using I.Phone = IVCC.Phone. We then filter for users who meet all of the following criteria:

1. Change_Change IS NULL: Indicates the first buy or initial top-up.
2. Change_Change < 6000: Ensures that the difference between consecutive top-ups stays below a threshold, suggesting a stable top-up pattern. Here 6000 is the threshold value
3. Change > 0: Confirms that the transaction is a top-up (not a withdrawal).
4. DAY(Date) <= 5: The top-up date is earlier than the 5th of each month: Suggests regular contributions at the beginning of each month.
5. COUNT(DISTINCT MONTH(Date)) = 12: Ensures there is at least one top-up in every month of the year.

```
SELECT DISTINCT Name
FROM INVESTOR AS I JOIN Invested_Value_Change_Change AS IVCC
ON I.Phone = IVCC.Phone
WHERE IVCC.Phone IN
(
    SELECT Phone
    FROM Invested_Value_Change_Change
    WHERE (Change_Change IS NULL OR ABS(Change_Change) <= 6000)
    AND (Change > 0 OR Change IS NULL)
    AND DAY(Date) <= 5
    GROUP BY Phone
    HAVING COUNT(DISTINCT MONTH(Date)) = 12
)
```

Below is the result of Query5:

	Name
1	Aaron Tan
2	Brandon Lim
3	Evelyn Goh

6. Query 6

Find the most popular financial goals for investors working in the same company and whose age is between 30 to 40 years old.

First, we provide an overview of user distribution across companies. The resulting table shows the total number of users associated with each company.

```
SELECT Company, COUNT(Company) AS number_of_company
FROM INVESTOR
WHERE 2025 - YEAR(DoB) >= 30 AND 2025 - YEAR(DoB) <= 40
GROUP BY Company
GO
```

	Company	number_of_company
1	FinanceCo	4
2	HealthTech	4
3	TechCorp	5

Next, we create a view named **question6** to filter out qualified users whose ages are between 30 and 40 years.

```
CREATE VIEW question6 AS
SELECT Company, Goal, COUNT(*) AS number_of_goal
FROM INVESTOR AS I JOIN FINANCIAL_GOAL AS FG
ON I.Phone = FG.Phone
WHERE 2025 - YEAR(DoB) >= 30 AND 2025 - YEAR(DoB) <= 40
GROUP BY Company, Goal
GO
```

	Company	Goal	number_of_goal
1	FinanceCo	To fund children's education	2
2	FinanceCo	To fund holiday vacations	1
3	FinanceCo	To generate sufficient monthly cash after retir...	1
4	FinanceCo	To launch a startup company	1
5	HealthTech	To buy a car	2
6	HealthTech	To buy a house	1
7	HealthTech	To buy a luxury watch	1
8	HealthTech	To fund holiday vacations	2
9	HealthTech	To generate sufficient monthly cash after retir...	1
10	TechCorp	To afford high-quality medical care	1
11	TechCorp	To buy a house	3
12	TechCorp	To fund children's education	2
13	TechCorp	To fund holiday vacations	1
14	TechCorp	To generate sufficient monthly cash after retir...	1

Below is the filtered table showing users aged between 30 and 40 years old.

Finally, we identify the most popular goals for users within each company. We first create a temporary view, **company_goal**, to extract the maximum number of goals per company. However, this view alone does not include the specific goal details. To address this, we join the temporary view with the relevant table to append the goal descriptions.

```
WITH company_goal AS(
SELECT Company, MAX(number_of_goal) AS number_of_goal
FROM question6
GROUP BY Company)
SELECT Q.Goal, CG.Company, CG.number_of_goal
FROM question6 AS Q, company_goal AS CG
WHERE Q.Company = CG.Company AND Q.number_of_goal = CG.number_of_goal
```

Below are the temporary view and the resulting table:

	Company	number_of_goal
1	FinanceCo	2
2	HealthTech	2
3	TechCorp	3

→

	Goal	Company	number_of_goal
1	To buy a house	TechCorp	3
2	To fund holiday vacations	HealthTech	2
3	To buy a car	HealthTech	2
4	To fund children's education	FinanceCo	2

7. Query 7

Are male investors in their 20s making more money from their investments than their female counterparts in 2024?

We create a temporary view called **phone_amount** to calculate the total gain or loss for each user. Then, we select three columns—Name, total gain/loss, and Gender—and filter out users who are not aged between 20 and 30.

```
=WITH phone_amount AS(
    SELECT I.Phone, SUM(Amount) AS gain_loss
    FROM UNREALIZED_GAIN_LOSS AS GL JOIN INVESTOR AS I
    ON GL.Phone = I.Phone
    GROUP BY I.Phone)
SELECT I.Name, PA.gain_loss, I.Gender
FROM INVESTOR AS I, phone_amount AS PA
WHERE I.Phone = PA.Phone AND 2025-YEAR(I.DoB) >= 20 AND 2025-YEAR(I.DoB) < 30
ORDER BY Gender
GO
```

Below is a preview of the resulting table. It provides the detailed data used for verification and correction.

	Name	gain_loss	Gender
1	Queenie Yeo	22500.00	Female
2	Gina Chia	28900.00	Female
3	Irene Tan	-6900.00	Female
4	Samantha Lau	28000.00	Female
5	Nathan Ho	17400.00	Male
6	David Ong	26800.00	Male
7	Harrison Lee	24000.00	Male
8	Ryan Tan	-5350.00	Male

Next, we reconstruct the temporary view **phone_amount** to calculate the average total gain or loss separately for female and male users.

```
=WITH phone_amount AS(
    SELECT I.Phone, SUM(Amount) AS gain_loss
    FROM UNREALIZED_GAIN_LOSS AS GL JOIN INVESTOR AS I
    ON GL.Phone = I.Phone
    GROUP BY I.Phone)
SELECT I.Gender, CAST(AVG(PA.gain_loss) AS DECIMAL(10,2)) AS average
FROM phone_amount AS PA, INVESTOR AS I
WHERE I.Phone = PA.Phone AND 2025-YEAR(I.DoB) >= 20 AND 2025-YEAR(I.DoB) < 30
GROUP BY I.Gender
```

Below is the final table. Based on the results, the answer to the question is:

No, male investors in their 20s earn less from investments than their female counterparts.

	Gender	average
1	Female	18125.00
2	Male	15712.50

Individual Contribution Form

Full Name	Individual Contribution to Lab 5 Submission	Percentage of Contribution	Signature
Li Yikai	Data Population & Coding & Report Writing	20	Li Yikai
Li Zhenxi	Video Recording & Report Writing	20	Li Zhenxi
Liew Jiawei	Query Solution & Report Writing	20	Liew Jiawei
Liang Jianpeng	Query Solution & Report Writing	20	Liang Jianpeng
Chen Yichen	Query Solution & Report Writing	20	Chen Yichen

Use of AI Tool In Lab Work

Each team member should indicate either A or B:

- A. I affirm that my contribution(s) to the lab work is my own, produced without help from any AI tool(s).
- B. I affirm that my contribution(s) to the lab work has been produced with the use of AI tool(s).

Team member	Signature	Date	A or B
Li Yikai	Li Yikai	2025.3.28	A
Li Zhenxi	Li Zhenxi	2025.3.28	A
Liew Jiawei	Liew Jiawei	2025.3.28	A
Liang Jianpeng	Liang Jianpeng	2025.3.28	A
Chen Yichen	Chen Yichen	2025.3.28	A

By signing this form, you declare that the above affirmation made is true and that you have read and understood NTU's policy on the use of AI tools.