Group Project: Online Casino

Group 4
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Disclaimer: An interview was conducted with a friend of ours that works in a casino in Lebanon to aid in getting all these details and this comprehensive model. In addition, the following link was used a reference to online game ERD's https://www.geeksforgeeks.org/sql/how-to-design-er-diagrams-for-online-gaming-platforms/

The work was developed on a Notion page shared by the whole group.

▼ Sub-Models

1. **Game Management Sub-model**
2. **Geography & Location Sub-model**
3. **User & Account Sub-model**
4. **Payments & Transactions Sub-model**
5. **Bets & Sessions Sub-model**
6. **Online Behaviour & Platform Sub-model**
7. **Tournaments Sub-model**

▼ Summary of the ERD

1. Game Management Sub-model

Purpose

To manage all information about casino games, their categories, providers, and levels of difficulty. It keeps track of game properties and game profitability / popularity.

Entities

Entity	Purpose	Attributes
Game	Stores each game's details like name, RTP (Return to Player), min/max bets, and status.	Game_ID (PK), Name, Description, Release_Date, RTP, Min_Bet, Max_Bet, Active_Flag
Game_Category	Defines categories (Slots, Roulette, Poker, etc.) as a lookup table.	Category_ID (PK), Name (Slots, Roulette, Poker), Description
Game_Provider	Stores details of third-party developers supplying the games.	Provider_ID (PK), Name, Website_URL, Contact_Info
Game_Level	Defines difficulty levels or classifications for games.	Level_ID (PK), Name (Easy, Medium, Hard), Win_Threshold, Description

Internal Relationships

- Game - Game_Category (M:1): Many games can belong to one category.
- Game - Game_Provider (M:1): Many games can be supplied by one provider.
- Game - Game_Level (M:1): Many games can share a difficulty level.

External Relationships (Other Sub-models)

- Linked to Bets Sub-model: Bets are placed on Games.
- Linked to Tournaments Sub-model: Games may participate in tournaments via Game_Tournament.

2. Geography & Location Sub-model

Purpose

To handle geographical and location data for users and currencies which ensures proper international operations and regional drill down.

Entities

Entity	Purpose	Attributes
Country	Stores country details, links users to their location.	Country_ID (PK), Name, ISO_Code, Currency_ID (FK)
City	Optional: For finer-grained location within countries.	City_ID (PK), Name, Country_ID (FK)
Language	Lookup table for user-preferred languages.	Language_ID (PK), Name, ISO_Code
Currency	Lookup for currencies used in countries and payments.	Currency_ID (PK), Name, Symbol, ISO_Code

Internal Relationships

- Country - City (1:M): A country has multiple cities.
- Country - Currency (M:1): Many countries may use the same currency.

External Relationships (Other Sub-models)

- Linked to User_Profile: Users are tied to countries and languages.
- Linked to Payments Sub-model: Currencies impact payment processing.

3. User & Account Sub-model

Purpose

To store detailed information about users, their profiles, devices, and account statuses. Helps in user management, device tracking, and account security / verification.

Entities

Entity	Purpose	Attributes
User	Core entity for registered players with login credentials.	User_ID (PK), Username, Email, Password_Hash, Registration_Date, Country_ID (FK)
User_Profile	Stores personal details like name, DOB, language, and country.	Profile_ID (PK), User_ID (FK), First_Name, Last_Name, DOB, Gender, Language_ID (FK), Country_ID (FK)
User_Device	Tracks devices used to access the casino (Mobile, Desktop).	Device_ID (PK), User_ID (FK), Device_Type (Mobile/Desktop), OS, Browser, Last_Login
User_Status	Lookup for account status (Active, Suspended, etc.).	Status_ID (PK), Name (Active, Suspended, Banned), Reason

Internal Relationships

- User - User_Profile (1:1): One user has one profile.
- User - User_Device (1:M): One user may use multiple devices.
- User - User_Status (M:1): Many users share the same status.

External Relationships (Other Sub-models)

- Linked to Payments Sub-model: Users make payments.
- Linked to Bets Sub-model: Users place bets.
- Linked to Tournaments Sub-model: Users participate in tournaments via User_Tournament.
- Linked to Online Behaviour Sub-model: Users generate action logs.
- Linked to Geography and Location Sub-Model: user_profile linked to country

4. Payments & Transactions Sub-model

Purpose

To manage all financial transactions including deposits, withdrawals, and payment methods. Essential for revenue tracking and fraud prevention.

Entities

Entity	Purpose	Attributes
Payment	Records each user transaction, including amount and method.	Payment_ID (PK), User_ID (FK), Amount, Payment_Date, Status_ID (FK), Method_ID (FK)
Payment_Method	Lookup for methods (Visa, PayPal, Crypto, etc.).	Method_ID (PK), Name (Visa, MasterCard, PayPal, Crypto), Type (Card, Wallet)
Payment_Status	Lookup for payment states (Pending, Completed, Failed).	Status_ID (PK), Name (Pending, Completed, Failed, Refunded)

Internal Relationships

- Payment - Payment_Method (M:1): Each payment uses one method.
- Payment - Payment_Status (M:1): Tracks status of each transaction.

External Relationships (Other Sub-models)

- Linked to User Sub-model: Each payment belongs to a user.

5. Bets & Sessions Sub-model

Purpose

To track user betting activity, session details, and outcomes. Enables analysis of user behaviour and revenue per session.

Entities

Entity	Purpose	Attributes
Bet	Stores details of bets, amounts, outcomes, and winnings.	Bet_ID (PK), User_ID (FK), Game_ID (FK), Bet_Amount, Bet_Date, Outcome, Win_Amount
Session	Tracks user sessions (start/end times, device, IP address).	Session_ID (PK), User_ID (FK), Start_Time, End_Time, Device_ID (FK), IP_Address
Bet_Status	Lookup for bet states (Placed, Won, Lost, Cancelled).	Status_ID (PK), Name (Placed, Won, Lost, Cancelled)

Internal Relationships

- Bet - Session (M:1): A session may contain many bets.
- Bet - Bet_Status (M:1): Each bet has a status.

External Relationships (Other Sub-models)

- Linked to User Sub-model: Bets are placed by users.
- Linked to Game Sub-model: Bets are placed on games.

6. Online Behaviour & Platform Sub-model

Purpose

To track user actions on the platform for auditing, personalisation, and fraud detection.

Entities

Entity	Purpose	Attributes
User_Action_Log	Stores individual user actions with timestamps and details.	Log_ID (PK), User_ID (FK), Action_Type_ID (FK), Timestamp, Details
Action_Type	Lookup for types of actions (Login, Logout, Bet Placed).	Action_Type_ID (PK), Name (Login, Logout, Bet_Placed, Payment)

Internal Relationships

- User_Action_Log - Action_Type (M:1): Many logs per action type.

External Relationships (Other Sub-models)

- Linked to User Sub-model: Logs belong to users.

7. Tournaments Sub-model

Purpose

To manage tournaments, user participation, game involvement, leaderboards, and prize structures.

Entities

Entity	Purpose	Attributes
Tournament	Core tournament details including dates and prize pool.	Tournament_ID (PK), Name, Description, Start_Date, End_Date, Entry_Fee, Prize_Pool, Status_ID (FK)
Tournament_Status	Lookup for tournament lifecycle stages.	Status_ID (PK), Name (Scheduled, Active, Completed, Cancelled)
User_Tournament	Junction table for users participating in tournaments.	User_Tournament_ID (PK), User_ID (FK), Tournament_ID (FK), Join_Date
Game_Tournament	Junction table for games included in tournaments.	Game_Tournament_ID (PK), Game_ID (FK), Tournament_ID (FK)
Leaderboard	Tracks user scores and ranks in tournaments.	Leaderboard_ID (PK), Tournament_ID (FK), User_ID (FK), Score, Rank
Tournament_Prize	Defines prize structure per tournament (e.g., 1st place).	Prize_ID (PK), Tournament_ID (FK), Position, Amount

Internal Relationships

- Tournament - Tournament_Status (M:1)
- User - Tournament (M:N via User_Tournament)
- Game - Tournament (M:N via Game_Tournament)
- Leaderboard - Tournament (M:1)
- Leaderboard - User (M:1)
- Tournament - Tournament_Prize (1:M)

External Relationships (Other Sub-models)

- Linked to User Sub-model: Players participate in tournaments.
- Linked to Game Sub-model: Tournaments may involve multiple games.

▼ Assumptions

1. Game Management

- Each game is unique by its name and provider combination (Game.Name + Game_Provider_ID is unique)
- A game belongs to exactly one category, provider, and level (1:1 relationships from Game to Lookup)
- RTP values are stored as percentages (0–100)
- A provider can supply multiple games (1:M), but a game only has one provider
- No two games in the same provider can have the same name

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2. User & Account

- A user is uniquely identified by their **email address**
- One person may have multiple accounts using different emails
- A user has exactly one profile (1:1) but can use multiple devices (1:M)
- Devices are linked to users; device reuse across users is allowed
- Account status (Active, Suspended, Banned) is stored in a lookup table and is a mandatory field

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3. Geography & Location

- Each country has exactly one currency, but multiple countries may share the same currency (M:1)
- A city belongs to one country; duplicate city names are allowed across countries but not within a country
- Users are tied to countries via User_Profile, which ensures an accurate location of the user
- All currencies are identified by ISO codes (e.g., USD, EUR)

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4. Payments & Transactions

- All payments are tied to a user; orphan transactions are not allowed
- Only valid Payment_Method_ID and Payment_Status_ID values are accepted
- A user can make multiple payments; each payment uses exactly one payment method and status (1:M from User → Payment)
- Multi-currency support is enabled; each payment has a mandatory currency field
- Only payments with Status_ID = Completed contribute to revenue calculations

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5. Bets & Sessions

- A bet is always tied to one session and one game; no cross-session or cross-game bets
- Each session is tied to one user and optionally one device
- Users can have multiple sessions (1:M), and sessions can span multiple devices and IP addresses
- Bet statuses (Placed, Won, Lost, Cancelled) are stored in a lookup table
- A user may place multiple bets within a single session

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6. Online Behaviour

- All user actions (Login, Logout, Place Bet, Make Payment) are logged
- There is no concept of anonymous actions; every action log is tied to a user
- Action types are stored in a lookup table to avoid duplication
- One user may have multiple action logs (1:M)

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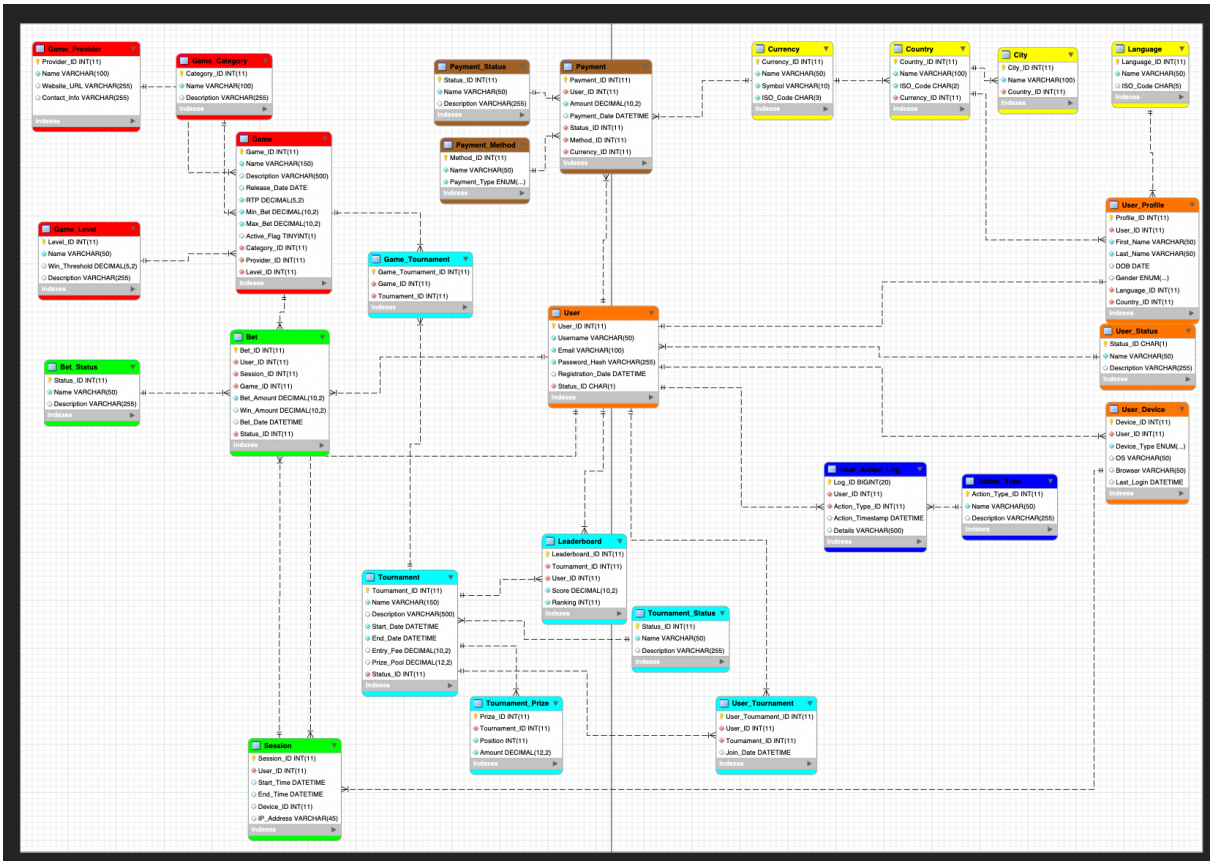
7. Tournaments

- A user cannot join the same tournament more than once (unique User_ID + Tournament_ID pair)

- A game cannot be added to the same tournament more than once (unique Game_ID + Tournament_ID pair)
- Each tournament has a status (Scheduled, Active, Completed) and prize pool defined
- Leaderboards tie users to tournaments and store their rank and score
- Each tournament prize position is unique (e.g., only one 1st place per tournament)

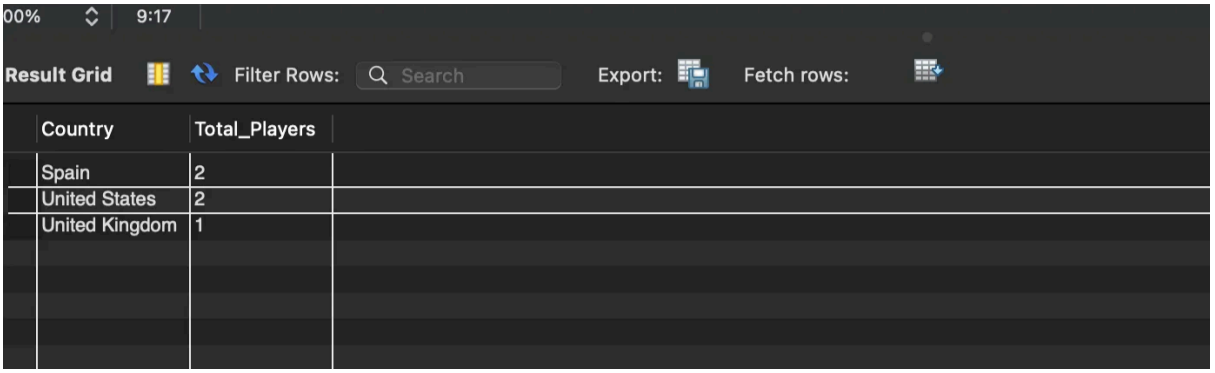
ERD



SQL Questions, Queries, and Output

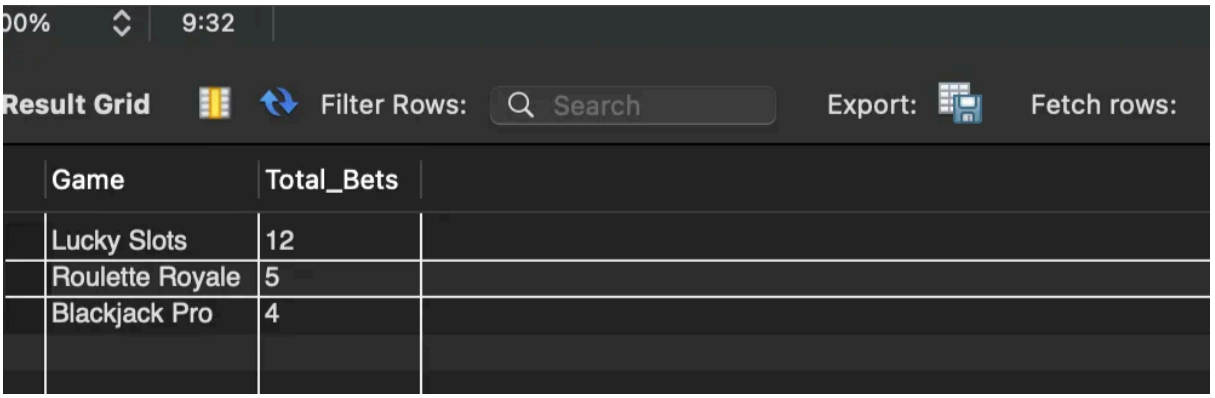
Q1: Which are the top 3 countries with the greatest number of players?

```
SELECT c.Name AS Country, COUNT(u.User_ID) AS Total_Players
FROM User u
INNER JOIN User_Profile up ON (u.User_ID = up.User_ID)
INNER JOIN Country c ON up.Country_ID = c.Country_ID
GROUP BY c.Name
ORDER BY Total_Players DESC
LIMIT 3;
```



Q2: Which are the top 3 demanding casino games?

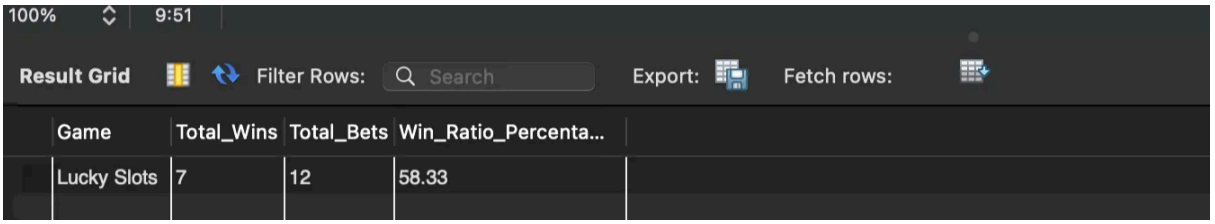
```
SELECT g.Name AS Game, COUNT(b.Bet_ID) AS Total_Bets
FROM Bet b
INNER JOIN Game g ON b.Game_ID = g.Game_ID
GROUP BY g.Name
ORDER BY Total_Bets DESC
LIMIT 3;
```



Game	Total_Bets
Lucky Slots	12
Roulette Royale	5
Blackjack Pro	4

Q3: Which is the easiest game to win, by number of bets won by players?

```
SELECT g.Name AS Game,
        SUM(CASE WHEN bs.Name = 'Won' THEN 1 ELSE 0 END) AS Total_Win
        COUNT(b.Bet_ID) AS Total_Bets,
        ROUND((SUM(CASE WHEN bs.Name = 'Won' THEN 1 ELSE 0 END) / CC
FROM Bet b
INNER JOIN Game g ON b.Game_ID = g.Game_ID
INNER JOIN Bet_Status bs ON b.Status_ID = bs.Status_ID
GROUP BY g.Name
ORDER BY Win_Ratio_Percentage DESC
LIMIT 1;
```



Q4: Show a linear graph of revenue for the last 12 months

```
SELECT YEAR(Payment_Date) AS Year,
        MONTH(Payment_Date) AS Month,
        SUM(Amount) AS Total_Revenue
FROM Payment
WHERE Status_ID = 2 -- ID for completed payments
   AND (
        (YEAR(Payment_Date) = YEAR(CURDATE()) AND MONTH(Payment_Da
      OR (YEAR(Payment_Date) = YEAR(CURDATE()) - 1 AND MONTH(Payment
        )
GROUP BY YEAR(Payment_Date), MONTH(Payment_Date)
ORDER BY Year, Month;
```

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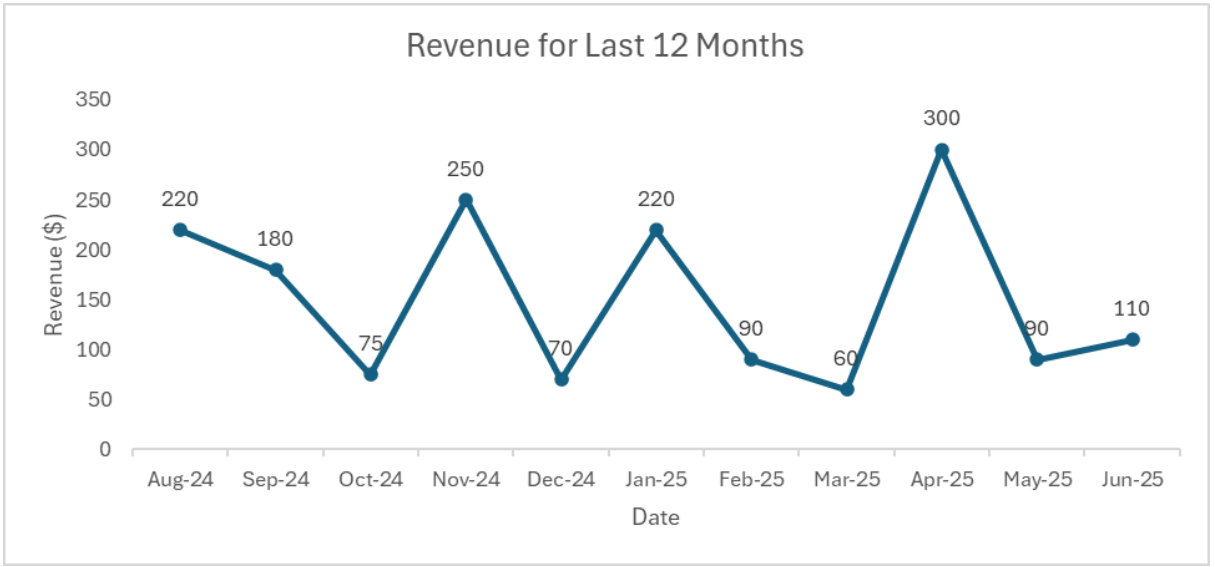
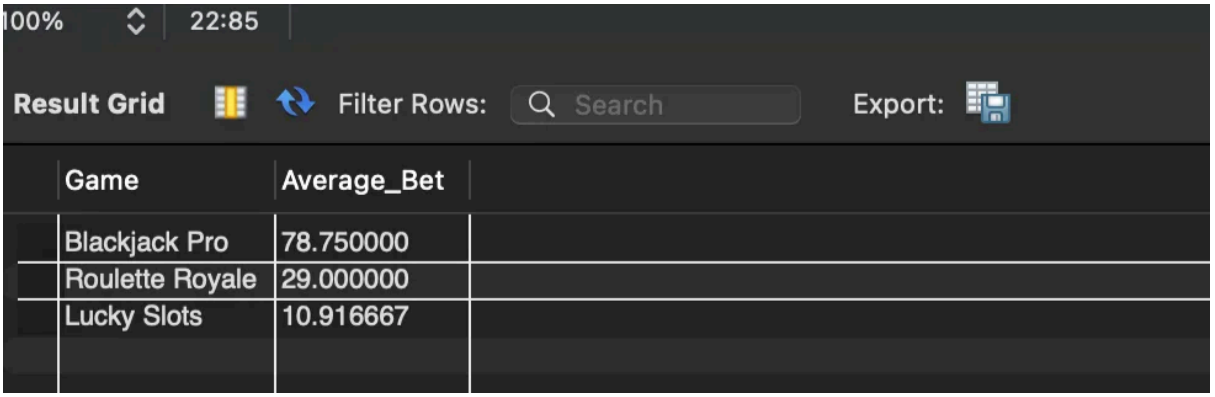
Result Grid Filter Rows: Search Export:

Year	Month	Total_Revenue
2024	8	220.00
2024	9	180.00
2024	10	75.00
2024	11	250.00
2024	12	70.00
2025	1	220.00
2025	2	90.00
2025	3	60.00
2025	4	300.00
2025	5	90.00
2025	6	110.00



Q5: What is the average bet amount by game?

```
SELECT g.Name AS Game, AVG(b.Bet_Amount) AS Average_Bet
FROM Bet b
INNER JOIN Game g ON b.Game_ID = g.Game_ID
GROUP BY g.Name
ORDER BY Average_Bet DESC;
```



Game	Average_Bet
Blackjack Pro	78.750000
Roulette Royale	29.000000
Lucky Slots	10.916667