資料庫系統概論作業 HW 1 報告

A. Create Tables (20%)

```
DROP DATABASE IF EXISTS sql_LoL;
CREATE DATABASE sql_LoL;
USE sql_LoL;
SHOW DATABASES;

DROP TABLE IF EXISTS champ;
-- champ_table
CREATE TABLE IF NOT EXISTS champ  (
    champion_name     VARCHAR(15) NOT NULL,
    champion_id       INT PRIMARY KEY NOT NULL
);

-- secure_file_priv = '';
-- SHOW VARIABLES LIKE "local_infile";
-- SHOW GLOBAL VARIABLES LIKE "secure_file_prev";
-- USE `champ`;
-- LOAD DATA INFILE '/Users/origamyee/Desktop/dataset/champs.csv'
-- INTO TABLE `champ`
-- LOAD DATA LOCAL INFILE '/Users/origamyee/Desktop/dataset/champs.csv'
-- INTO TABLE champ
-- FIELDS TERMINATED BY ','
-- ENCLOSED BY '"'
-- LINES TERMINATED BY '\n'
-- IGNORE 1 LINES;

DROP TABLE IF EXISTS match_info;
-- match_info_table
CREATE TABLE IF NOT EXISTS match_info (
    match_id   INT PRIMARY KEY NOT NULL,
    duration   INT,
    version    VARCHAR(15)
);
-- LOAD DATA LOCAL INFILE '/Users/origamyee/Desktop/dataset/matches.csv'
-- INTO TABLE match_info
-- FIELDS TERMINATED BY ','
-- ENCLOSED BY '"'
-- LINES TERMINATED BY '\n'
-- IGNORE 1 LINES;

-- participant_table
DROP TABLE IF EXISTS participant;
CREATE TABLE IF NOT EXISTS participant (
    player_id         INT PRIMARY KEY NOT NULL,
    match_id          INT NOT NULL,
    player            TINYINT,
    champion_id       INT NOT NULL,
    ss1                      VARCHAR(15),
    ss2                      VARCHAR(15),
    position          VARCHAR(15) NOT NULL,
    FOREIGN KEY (match_id) REFERENCES match_info (match_id)
);
-- LOAD DATA LOCAL INFILE '/Users/origamyee/Desktop/dataset/participants.
-- INTO TABLE participant
-- FIELDS TERMINATED BY ','
-- ENCLOSED BY '"'
-- LINES TERMINATED BY '\n'
-- IGNORE 1 LINES;

-- participant_table
CREATE TABLE IF NOT EXISTS teamban (
    match_id      INT NOT NULL,
    team          CHAR(1) NOT NULL,
    champion_id   INT NOT NULL,
```

```
    banturn       TINYINT NOT NULL,
    PRIMARY KEY (match_id, banturn)
);
-- LOAD DATA LOCAL INFILE '/Users/origamyee/Desktop/dataset/teambans.csv
-- INTO TABLE teamban
-- FIELDS TERMINATED BY ','
-- ENCLOSED BY '"'
-- LINES TERMINATED BY '\n'
-- IGNORE 1 LINES;

-- stat_table
DROP TABLE IF EXISTS stat;
CREATE TABLE IF NOT EXISTS stat (
    player_id         INT PRIMARY KEY NOT NULL,
    win                       BOOLEAN,
    item1             SMALLINT,
    item2             SMALLINT,
    item3             SMALLINT,
    item4             SMALLINT,
    item5             SMALLINT,
    item6             SMALLINT,
    kills             TINYINT,
    deaths            TINYINT,
    assists           TINYINT,
    longesttimespentliving    SMALLINT,
    doublekills               TINYINT,
    triplekills               TINYINT,
    quadrakills               TINYINT,
    pentakills        TINYINT,
    legendarykills            TINYINT,
    goldearned        MEDIUMINT,
    firstblood        BOOLEAN
);
USE sql_LoL;
-- DESCRIBE stat;

-- LOAD DATA LOCAL INFILE '/Users/origamyee/Desktop/dataset/stats.csv'
-- INTO TABLE stat
-- FIELDS TERMINATED BY ','
-- ENCLOSED BY '"'
-- LINES TERMINATED BY '\n'
-- IGNORE 1 LINES;
```

champ

```
mysql> DESCRIBE champ;
+---------------+-------------+------+-----+---------+-------+
| Field         | Type        | Null | Key | Default | Extra |
+---------------+-------------+------+-----+---------+-------+
| champion_name | varchar(15) | NO   |     | NULL    |       |
| champion_id   | int         | NO   | PRI | NULL    |       |
+---------------+-------------+------+-----+---------+-------+
2 rows in set (0.00 sec)
```

match_info

```
mysql> DESCRIBE match_info;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| match_id | int         | NO   | PRI | NULL    |       |
| duration | int         | YES  |     | NULL    |       |
| version  | varchar(15) | YES  |     | NULL    |       |
+----------+-------------+------+-----+---------+-------+
3 rows in set (0.00 sec)
```

participant

```
mysql> describe participant;
+-------------+-------------+------+-----+---------+-------+
| Field       | Type        | Null | Key | Default | Extra |
+-------------+-------------+------+-----+---------+-------+
| player_id   | int         | NO   | PRI | NULL    |       |
| match_id    | int         | NO   | MUL | NULL    |       |
| player      | tinyint     | YES  |     | NULL    |       |
| champion_id | int         | NO   |     | NULL    |       |
| ss1         | varchar(15) | YES  |     | NULL    |       |
| ss2         | varchar(15) | YES  |     | NULL    |       |
| position    | varchar(15) | NO   |     | NULL    |       |
+-------------+-------------+------+-----+---------+-------+
7 rows in set (0.01 sec)
```

teamban

```
mysql> DESCRIBE teamban;
+-------------+---------+------+-----+---------+-------+
| Field       | Type    | Null | Key | Default | Extra |
+-------------+---------+------+-----+---------+-------+
| match_id    | int     | NO   | PRI | NULL    |       |
| team        | char(1) | NO   |     | NULL    |       |
| champion_id | int     | NO   |     | NULL    |       |
| banturn     | tinyint | NO   | PRI | NULL    |       |
+-------------+---------+------+-----+---------+-------+
4 rows in set (0.00 sec)
```

stat

```
mysql> describe stat;
+----------------------+------------+------+-----+---------+-------+
| Field                | Type       | Null | Key | Default | Extra |
+----------------------+------------+------+-----+---------+-------+
| player_id            | int        | NO   | PRI | NULL    |       |
| win                  | tinyint(1) | YES  |     | NULL    |       |
| item1                | smallint   | YES  |     | NULL    |       |
| item2                | smallint   | YES  |     | NULL    |       |
| item3                | smallint   | YES  |     | NULL    |       |
| item4                | smallint   | YES  |     | NULL    |       |
| item5                | smallint   | YES  |     | NULL    |       |
| item6                | smallint   | YES  |     | NULL    |       |
| kills                | tinyint    | YES  |     | NULL    |       |
| deaths               | tinyint    | YES  |     | NULL    |       |
| assists              | tinyint    | YES  |     | NULL    |       |
| longesttimespentliving | smallint | YES  |     | NULL    |       |
| doublekills          | tinyint    | YES  |     | NULL    |       |
| triplekills          | tinyint    | YES  |     | NULL    |       |
| quadrakills          | tinyint    | YES  |     | NULL    |       |
| pentakills           | tinyint    | YES  |     | NULL    |       |
| legendarykills       | tinyint    | YES  |     | NULL    |       |
| goldearned           | mediumint  | YES  |     | NULL    |       |
| firstblood           | tinyint(1) | YES  |     | NULL    |       |
+----------------------+------------+------+-----+---------+-------+
19 rows in set (0.01 sec)
```

Problem 1

- (3%) What the difference between type “char” and type “varchar”?

- char 長度固定 (不足補空白), 儲存空間固定
- varchar 長度不固定, 儲存空間不固定

Problem 2

- (3%) Type “boolean” would be stored as which type in MySQL?
- TINYINT(1)

Problem 3

- (4%) How many bytes it should take for “tinyint”, “smallint”, “mediumint”, “int”? (e.g. 8 bytes for “bigint”) And what’s the range they can express? (e.g. from -1000 to 1000)
- 下面的區間都是閉區間

整數型態	幾位元組	範圍
tinyint	1 位元組	2^0-1 to 2^8-1
smallint	2 位元組	-2^15 to 2^15-1
mediumint	3 位元組	-8388608到8388607
int	4 位元組	-2^31 to 2^31-1

Problem 4

- (5%) What do you think about this table schema? If you can change this table architecture, how would you modify it and why?
- 我覺得這表格紀錄了大部分刀塔遊戲都會有的資訊, 但沒有記錄到更多細節
- 像是我們可以加入會影響勝負機率的資訊, 以利於我們評估這些資訊對於勝負機率的影響程度
- 如打倒巴龍, 遠古巨龍的次數
- 選角是什麼職業的: 法師, 刺客, 戰士, 射手, 坦克...

C. Query Tasks (80%)

Problem 1

```
SELECT COUNT(*) AS cnt FROM champ;
```

```
mysql> SELECT COUNT(*) AS cnt FROM champ;
+-----+
| cnt |
+-----+
| 138 |
+-----+
1 row in set (0.01 sec)
```

Problem 2

```
SELECT COUNT(DISTINCT SUBSTRING_INDEX(version, '.', 2))
    AS cnt FROM match_info;
```

```
mysql> SELECT COUNT(DISTINCT SUBSTRING_INDEX(version, '.', 2)) AS cnt FROM match
_info;
+-----+
| cnt |
+-----+
|  74 |
+-----+
1 row in set (0.09 sec)
```

Problem 3

```
SELECT c.champion_name, COUNT(*) AS cnt
FROM participant p
JOIN champ c ON p.champion_id = c.champion_id
WHERE p.position = 'JUNGLE'
GROUP BY c.champion_name
ORDER BY cnt DESC
LIMIT 3;
```

```
mysql> SELECT c.champion_name, COUNT(*) AS cnt
    -> FROM participant p
    -> JOIN champ c ON p.champion_id = c.champion_id
    -> WHERE p.position = 'JUNGLE'
    -> GROUP BY c.champion_name
    -> ORDER BY cnt DESC
    -> LIMIT 3;
+---------------+-------+
| champion_name | cnt   |
+---------------+-------+
| Lee Sin       | 56598 |
| Master Yi     | 23385 |
| Graves        | 19767 |
+---------------+-------+
3 rows in set (0.53 sec)
```

Problem 4

```
SELECT
    match_id,
    SEC_TO_TIME(duration) AS time
FROM
    match_info
ORDER BY
    duration DESC
LIMIT 5;
```

```
mysql> SELECT
    ->     match_id,
    ->     SEC_TO_TIME(duration) AS time
    -> FROM
    ->     match_info
    -> ORDER BY
    ->     duration DESC
    -> LIMIT 5;
+----------+----------+
| match_id | time     |
+----------+----------+
|   146486 | 01:23:11 |
|    69303 | 01:20:14 |
|      581 | 01:16:59 |
|    70361 | 01:15:06 |
|   176628 | 01:13:34 |
+----------+----------+
5 rows in set (0.07 sec)
```

Problem 5

```
SELECT
    CASE WHEN win = 1 THEN 'win' ELSE 'lose' END AS win_lose,
    COUNT(*) AS cnt
FROM (
    SELECT
        p.match_id,
        s.win,
        AVG(s.longesttimespentliving) AS average_longesttimespentliving
    FROM
        stat AS s
    JOIN
        participant AS p
        ON p.player_id = s.player_id
    GROUP BY
        p.match_id, s.win
    HAVING
        AVG(s.longesttimespentliving) >= 1200
) AS subquery
GROUP BY win_lose;
```

```
mysql> SELECT
    ->     CASE WHEN win = 1 THEN 'win' ELSE 'lose' END AS win_lose,
    ->     COUNT(*) AS cnt
    -> FROM (
    ->     SELECT
    ->         p.match_id,
    ->         s.win,
    ->         AVG(s.longesttimespentliving) AS average_longesttimespentliving
    ->     FROM
    ->         stat AS s
    ->     JOIN
    ->         participant AS p
    ->         ON p.player_id = s.player_id
    ->     GROUP BY
    ->         p.match_id, s.win
    ->     HAVING
    ->         AVG(s.longesttimespentliving) >= 1200
    -> ) AS subquery
[    -> GROUP BY win_lose;
+----------+-----+
| win_lose | cnt |
+----------+-----+
| win      | 807 |
| lose     | 338 |
+----------+-----+
2 rows in set (4.82 sec)
```

Problem 6

```sql
WITH PositionWins AS (
  SELECT
    p.champion_id,
    p.position,
    SUM(s.win) AS total_win,
    RANK() OVER (PARTITION BY p.position ORDER BY SUM(s.win) DESC) AS pos
  FROM match_info AS m
  JOIN participant AS p ON m.match_id = p.match_id AND (m.duration BETWEE
  JOIN stat AS s ON p.player_id = s.player_id
  WHERE p.position IN ('TOP', 'MID', 'JUNGLE', 'DUO_CARRY', 'DUO_SUPPORT'
  GROUP BY p.champion_id, p.position
)
SELECT pw.position, c.champion_name
FROM PositionWins AS pw
JOIN champ AS c ON pw.champion_id = c.champion_id
WHERE position_rank = 1;
```

```
mysql> WITH PositionWins AS (
    ->   SELECT
    ->     p.champion_id,
    ->     p.position,
    ->     SUM(s.win) AS total_win,
    ->     RANK() OVER (PARTITION BY p.position ORDER BY SUM(s.win) DESC) AS position_rank
    ->   FROM match_info AS m
    ->   JOIN participant AS p ON m.match_id = p.match_id AND (m.duration BETWEEN 40*60 AND 50*60)
    ->   JOIN stat AS s ON p.player_id = s.player_id
    ->   WHERE p.position IN ('TOP', 'MID', 'JUNGLE', 'DUO_CARRY', 'DUO_SUPPORT')
    ->   GROUP BY p.champion_id, p.position
    -> )
    -> SELECT pw.position, c.champion_name
    -> FROM PositionWins AS pw
    -> JOIN champ AS c ON pw.champion_id = c.champion_id
[    -> WHERE position_rank = 1;
+-------------+---------------+
| position    | champion_name |
+-------------+---------------+
| DUO_CARRY   | Caitlyn       |
| DUO_SUPPORT | Thresh        |
| JUNGLE      | Lee Sin       |
| MID         | Ahri          |
| TOP         | Riven         |
+-------------+---------------+
5 rows in set (2.79 sec)
```

Problem 7

```sql
WITH PositionKDA AS (
    SELECT p.champion_id, p.position, SUM(s.kills + s.assists) / NULLIF(S
    RANK() OVER (PARTITION BY p.position ORDER BY SUM(s.kills + s.assists
    FROM stat AS s
    JOIN participant AS p ON p.player_id = s.player_id
    WHERE p.position IN ('TOP', 'MID', 'JUNGLE', 'DUO_CARRY', 'DUO_SUPPOR
    GROUP BY p.champion_id, p.position
    HAVING KDA IS NOT NULL
)
SELECT pk.position, c.champion_name, pk.kda
FROM PositionKDA AS pk
JOIN champ AS c ON c.champion_id = pk.champion_id
WHERE KDA_rank = 1;
```

```
mysql> WITH PositionKDA AS (
    ->     SELECT p.champion_id, p.position, SUM(s.kills + s.assists) / NULLIF(SUM(s.deaths), 0) AS kda,
    ->     RANK() OVER (PARTITION BY p.position ORDER BY SUM(s.kills + s.assists) / NULLIF(SUM(s.deaths), 0) DESC) AS KDA_rank
    ->     FROM stat AS s
    ->     JOIN participant AS p ON p.player_id = s.player_id
    ->     WHERE p.position IN ('TOP', 'MID', 'JUNGLE', 'DUO_CARRY', 'DUO_SUPPORT')
    ->     GROUP BY p.champion_id, p.position
    ->     HAVING KDA IS NOT NULL
    -> )
    -> SELECT pk.position, c.champion_name, pk.kda
    -> FROM PositionKDA AS pk
    -> JOIN champ AS c ON c.champion_id = pk.champion_id
    -> WHERE KDA_rank = 1;
+-------------+---------------+---------+
| position    | champion_name | kda     |
+-------------+---------------+---------+
| DUO_CARRY   | Shaco         | 19.0000 |
| DUO_SUPPORT | Janna         |  3.8330 |
| JUNGLE      | Ivern         |  3.8764 |
| MID         | Ivern         |  3.7015 |
| TOP         | Sona          |  3.1538 |
+-------------+---------------+---------+
5 rows in set (3.33 sec)
```

Problem 8

```sql
SELECT champion_name
FROM champ
WHERE champion_id NOT IN (
    SELECT champion_id
    FROM teamban
    WHERE teamban.match_id IN (
        SELECT match_id
        FROM match_info
        WHERE match_info.version LIKE '7.7.%'
    )
);
```

```
mysql> SELECT champion_name
    -> FROM champ
    -> WHERE champion_id NOT IN (
    ->     SELECT champion_id
    ->     FROM teamban
    ->     WHERE teamban.match_id IN (
    ->         SELECT match_id
    ->         FROM match_info
    ->         WHERE match_info.version LIKE '7.7.%'
    ->     )
    -> );
+---------------+
| champion_name |
+---------------+
| Sion          |
| Kayn          |
| RekSai        |
| Rakan         |
| Xayah         |
| Ornn          |
+---------------+
6 rows in set (0.14 sec)
```

Problem 9

```sql
SELECT
    version,
    SUM(win) AS win_cnt,
    SUM(1 - win) AS lose_cnt,
    SUM(win) / (SUM(win) + SUM(1 - win)) AS win_ratio
FROM (
    SELECT
        c.win,
        SUBSTRING_INDEX(m.version, '.', 2) AS version
    FROM (
        SELECT
            participant.match_id,
            stat.win,
            GROUP_CONCAT(participant.champion_id ORDER BY participant.cha
        FROM participant
        JOIN stat ON participant.player_id = stat.player_id
        GROUP BY participant.match_id, stat.win
    ) c
    JOIN match_info m ON c.match_id = m.match_id
    WHERE FIND_IN_SET('17', c.top_5_champion_ids) > 0
      AND FIND_IN_SET('64', c.top_5_champion_ids) > 0
) subquery
GROUP BY version
ORDER BY version;
```

```
mysql> SELECT
    ->     version,
    ->     SUM(win) AS win_cnt,
    ->     SUM(1 - win) AS lose_cnt,
    ->     SUM(win) / (SUM(win) + SUM(1 - win)) AS win_ratio
    -> FROM (
    ->     SELECT
    ->         c.win,
    ->         SUBSTRING_INDEX(m.version, '.', 2) AS version
    ->     FROM (
    ->         SELECT
    ->             participant.match_id,
    ->             stat.win,
    ->             GROUP_CONCAT(participant.champion_id ORDER BY participant.champion_id ASC) AS top_5_champion_ids
    ->         FROM participant
    ->         JOIN stat ON participant.player_id = stat.player_id
    ->         GROUP BY participant.match_id, stat.win
    ->     ) c
    ->     JOIN match_info m ON c.match_id = m.match_id
    ->     WHERE FIND_IN_SET('17', c.top_5_champion_ids) > 0
    ->       AND FIND_IN_SET('64', c.top_5_champion_ids) > 0
    -> ) subquery
    -> GROUP BY version
    -> ORDER BY version;
+---------+---------+----------+-----------+
| version | win_cnt | lose_cnt | win_ratio |
+---------+---------+----------+-----------+
| 4.10    |       2 |        1 |    0.6667 |
| 4.12    |       0 |        1 |    0.0000 |
| 4.15    |       1 |        1 |    0.5000 |
| 4.17    |       0 |        1 |    0.0000 |
| 4.18    |       0 |        1 |    0.0000 |
| 4.19    |       0 |        1 |    0.0000 |
| 4.21    |       1 |        1 |    0.5000 |
| 4.9     |       1 |        0 |    1.0000 |
| 5.1     |       1 |        2 |    0.3333 |
| 5.12    |       1 |        0 |    1.0000 |
| 5.13    |       0 |        1 |    0.0000 |
| 5.15    |       0 |        1 |    0.0000 |
| 5.19    |       1 |        0 |    1.0000 |
| 5.20    |       2 |        0 |    1.0000 |
| 5.21    |       0 |        2 |    0.0000 |
| 5.24    |       1 |        1 |    0.5000 |
| 5.5     |       1 |        0 |    1.0000 |
| 5.6     |       0 |        1 |    0.0000 |
| 5.7     |       1 |        0 |    1.0000 |
| 6.1     |       0 |        1 |    0.0000 |
| 6.13    |       1 |        0 |    1.0000 |
| 6.14    |       1 |        0 |    1.0000 |
| 6.18    |       1 |        1 |    0.5000 |
| 6.19    |       1 |        0 |    1.0000 |
| 6.2     |       1 |        1 |    0.5000 |
| 6.20    |       3 |        2 |    0.6000 |
| 6.21    |       0 |        2 |    0.0000 |
| 6.22    |       2 |        1 |    0.6667 |
| 6.23    |       3 |        2 |    0.6000 |
| 6.24    |       4 |        3 |    0.5714 |
| 6.5     |       1 |        0 |    1.0000 |
| 6.6     |       0 |        1 |    0.0000 |
| 6.8     |       1 |        0 |    1.0000 |
| 6.9     |       1 |        1 |    0.5000 |
| 7.10    |     282 |      304 |    0.4812 |
| 7.2     |       2 |        1 |    0.6667 |
| 7.3     |       0 |        1 |    0.0000 |
| 7.4     |       1 |        1 |    0.5000 |
| 7.5     |       2 |        2 |    0.5000 |
| 7.6     |       2 |        5 |    0.2857 |
| 7.7     |      32 |       29 |    0.5246 |
| 7.8     |     210 |      237 |    0.4698 |
| 7.9     |     527 |      464 |    0.5318 |
+---------+---------+----------+-----------+
43 rows in set (3.05 sec)
```

Problem 10

```sql
WITH top_player_stats AS (
    SELECT
        s.win, s.kills, s.deaths, s.assists, s.goldearned,
        p.match_id, p.champion_id
    FROM participant AS p
    JOIN stat AS s ON s.player_id = p.player_id AND p.position = 'TOP'
)

, top_player_comparison AS (
    SELECT DISTINCT p1.match_id,
        p1.win, p1.kills, p1.deaths, p1.assists, p1.goldearned,
        p2.win AS win2, p2.kills AS kills2, p2.deaths AS deaths2, p2.assi
        p2.match_id AS match_id2, p2.champion_id AS champion_id2
    FROM top_player_stats AS p1
    JOIN top_player_stats AS p2
    WHERE p1.match_id = p2.match_id AND p1.win <> p2.win
    AND p1.champion_id = '79'
)

SELECT
    c.champion_name AS self_champ_name,
    (SUM(CASE WHEN win2 = 1 THEN 1 ELSE 0 END) / SUM(CASE WHEN win = 1 OR
    (SUM(kills2 + assists2) / SUM(deaths2)) AS self_kda,
    AVG(goldearned2) AS self_avg_gold,
    'Gragas' AS enemy_champ_name,
    (SUM(kills + assists) / SUM(deaths)) AS enemy_kda,
    AVG(goldearned) AS enemy_avg_gold,
    (SUM(CASE WHEN win = 1 OR win2 = 1 THEN 1 ELSE 0 END)) AS battle_reco
FROM top_player_comparison AS t
JOIN champ AS c ON t.champion_id2 = c.champion_id
GROUP BY self_champ_name
HAVING battle_record > 100 AND enemy_champ_name = 'Gragas'
ORDER BY win_ratio DESC
LIMIT 5;
```

```
Database changed
mysql> WITH top_player_stats AS (
    ->     SELECT
    ->         s.win, s.kills, s.deaths, s.assists, s.goldearned,
    ->         p.match_id, p.champion_id
    ->     FROM participant AS p
    ->     JOIN stat AS s ON s.player_id = p.player_id AND p.position = 'TOP'
    -> )
    ->
    -> , top_player_comparison AS (
    ->     SELECT DISTINCT p1.match_id,
    ->         p1.win, p1.kills, p1.deaths, p1.assists, p1.goldearned,
    ->         p2.win AS win2, p2.kills AS kills2, p2.deaths AS deaths2, p2.assists AS assists2, p2.goldearned AS goldearned2,
    ->         p2.match_id AS match_id2, p2.champion_id AS champion_id2
    ->     FROM top_player_stats AS p1
    ->     JOIN top_player_stats AS p2
    ->     WHERE p1.match_id = p2.match_id AND p1.win <> p2.win
    ->     AND p1.champion_id = '79'
    -> )
    ->
    -> SELECT
    ->     c.champion_name AS self_champ_name,
    ->     (SUM(CASE WHEN win2 = 1 THEN 1 ELSE 0 END) / SUM(CASE WHEN win = 1 OR win2 = 1 THEN 1 ELSE 0 END)) AS win_ratio,
    ->     (SUM(kills2 + assists2) / SUM(deaths2)) AS self_kda,
    ->     AVG(goldearned2) AS self_avg_gold,
    ->     'Gragas' AS enemy_champ_name,
    ->     (SUM(kills + assists) / SUM(deaths)) AS enemy_kda,
    ->     AVG(goldearned) AS enemy_avg_gold,
    ->     (SUM(CASE WHEN win = 1 OR win2 = 1 THEN 1 ELSE 0 END)) AS battle_record
    -> FROM top_player_comparison AS t
    -> JOIN champ AS c ON t.champion_id2 = c.champion_id
    -> GROUP BY self_champ_name
    -> HAVING battle_record > 100 AND enemy_champ_name = 'Gragas'
    -> ORDER BY win_ratio DESC
    -> LIMIT 5;
+----------------+-----------+---------+--------------+-----------------+-----------+---------------+---------------+
| self_champ_name | win_ratio | self_kda | self_avg_gold | enemy_champ_name | enemy_kda | enemy_avg_gold | battle_record |
+----------------+-----------+---------+--------------+-----------------+-----------+---------------+---------------+
| Yasuo          |    0.6042 |   1.7255 |    12501.5833 | Gragas          |    2.4916 |     10755.1042 |           288 |
| Darius         |    0.5897 |   2.1526 |    12049.7920 | Gragas          |    2.2283 |     10709.1567 |           351 |
| Jax            |    0.5805 |   1.7122 |    12111.4634 | Gragas          |    2.3960 |     10978.0780 |           205 |
| Teemo          |    0.5798 |   1.8163 |    12361.1968 | Gragas          |    2.4122 |     11212.8511 |           188 |
| Pantheon       |    0.5515 |   2.2233 |    11616.3015 | Gragas          |    2.1137 |     10785.1176 |           136 |
+----------------+-----------+---------+--------------+-----------------+-----------+---------------+---------------+
5 rows in set (0.65 sec)

mysql>
```

Problem 11

- 我們列所有上路的召喚師技能組合, 算出他們的勝率
- 並且要求同一組召喚師技能前後交換不影響計算

- 按照算出的勝率排序, 並且去除極端值 (樣本太少的數據)
- 按照下面的結果, 他應選擇 Haste, Ignite 這組召喚師技能

```
SELECT
  CASE
    WHEN p.ss1 > p.ss2 THEN p.ss2
    ELSE p.ss1
  END AS new_ss1,
  CASE
    WHEN p.ss1 > p.ss2 THEN p.ss1
    ELSE p.ss2
  END AS new_ss2,
  SUM(win) / (SUM(1 - win) + SUM(win)) AS win_ratio,
  (SUM(1 - win) + SUM(win)) AS total_times
FROM stat AS s
JOIN participant AS p ON s.player_id = p.player_id
  AND p.position='TOP'
GROUP BY new_ss1, new_ss2
HAVING total_times>100
ORDER BY win_ratio DESC;
```

```
mysql> SELECT
    ->   CASE
    ->     WHEN p.ss1 > p.ss2 THEN p.ss2
    ->     ELSE p.ss1
    ->   END AS new_ss1,
    ->   CASE
    ->     WHEN p.ss1 > p.ss2 THEN p.ss1
    ->     ELSE p.ss2
    ->   END AS new_ss2,
    ->   SUM(win) / (SUM(1 - win) + SUM(win)) AS win_ratio,
    ->   (SUM(1 - win) + SUM(win)) AS total_times
    -> FROM stat AS s
    -> JOIN participant AS p ON s.player_id = p.player_id
    ->   AND p.position='TOP'
    -> GROUP BY new_ss1, new_ss2
    -> HAVING total_times>100
    -> ORDER BY win_ratio DESC;
+---------+----------+-----------+-------------+
| new_ss1 | new_ss2  | win_ratio | total_times |
+---------+----------+-----------+-------------+
| Haste   | Ignite   |    0.5221 |        1630 |
| Flash   | Ignite   |    0.5200 |       42622 |
| Flash   | Haste    |    0.5126 |        2696 |
| Exhaust | Ignite   |    0.5053 |         190 |
| Ignite  | Teleport |    0.5000 |        5934 |
| Flash   | Teleport |    0.4998 |      290510 |
| Smite   | Teleport |    0.4950 |         101 |
| Haste   | Teleport |    0.4919 |        7433 |
| Exhaust | Flash    |    0.4886 |        7444 |
| Barrier | Flash    |    0.4872 |         702 |
| Exhaust | Teleport |    0.4744 |         156 |
| Exhaust | Haste    |    0.4677 |         124 |
| Flash   | Smite    |    0.4665 |        1044 |
| Flash   | Heal     |    0.4577 |        1785 |
| Haste   | Smite    |    0.4486 |         107 |
+---------+----------+-----------+-------------+
15 rows in set (2.12 sec)
```

Problem 12

- 我猜想勝率跟經濟量會有正相關, 那麼有沒有可能會有相關性不大的的英雄呢
- 定義 rate = 勝率 / 每分鐘經濟量
- 如果勝率越高彈每分鐘經濟量越大, 那麼 rate 會越大
- 所以這個值越大越可能是我們要的結果, 結果發現真的這些英雄存在
- 發現這些大多是輔助類型的角色
- 可以大略推算出輔助的經濟量對於勝率影響不大, 符合直覺

```
SELECT champion_name,
       SUM(win)/(SUM(win)+SUM(1-win)) AS win_ratio,
       SUM(goldearned)/(SUM(duration/60)) AS ave_goldearned,
       (SUM(win)/(SUM(win)+SUM(1-win)))/(SUM(goldearned)/(SUM(duration/60
FROM stat AS s
JOIN participant AS p ON p.player_id = s.player_id
JOIN match_info AS m ON m.match_id = p.match_id
JOIN champ AS c ON c.champion_id=p.champion_id
GROUP BY champion_i
ORDER BY rate DESC
LIMIT 30;
```

```
mysql> SELECT champion_name,
    ->        SUM(win)/(SUM(win)+SUM(1-win)) AS win_ratio,
    ->        SUM(goldearned)/(SUM(duration/60)) AS ave_goldearned,
    ->        (SUM(win)/(SUM(win)+SUM(1-win)))/(SUM(goldearned)/(SUM(duration/60))) AS rate
    -> FROM stat AS s
    -> JOIN participant AS p ON p.player_id = s.player_id
    -> JOIN match_info AS m ON m.match_id = p.match_id
    -> JOIN champ AS c ON c.champion_id=p.champion_id
    -> GROUP BY champion_name
    -> ORDER BY rate DESC
[   -> LIMIT 30;
+---------------+-----------+----------------+------------+
| champion_name | win_ratio | ave_goldearned | rate       |
+---------------+-----------+----------------+------------+
| Janna         |    0.5292 |       299.4826 | 0.00176714 |
| Soraka        |    0.5165 |       299.7896 | 0.00172281 |
| Thresh        |    0.5032 |       296.2243 | 0.00169879 |
| Taric         |    0.5076 |       300.2349 | 0.00169059 |
| Leona         |    0.5142 |       305.2803 | 0.00168451 |
| Blitzcrank    |    0.5164 |       307.0880 | 0.00168152 |
| Braum         |    0.4975 |       298.9306 | 0.00166411 |
| Nami          |    0.5058 |       304.3279 | 0.00166215 |
| Sona          |    0.5345 |       321.7465 | 0.00166120 |
| Alistar       |    0.4926 |       299.1393 | 0.00164687 |
| Lulu          |    0.5065 |       309.6152 | 0.00163593 |
| Ivern         |    0.5589 |       342.6498 | 0.00163111 |
| Zilean        |    0.5216 |       336.3481 | 0.00155086 |
| Bard          |    0.5058 |       327.1701 | 0.00154592 |
| Tahm Kench    |    0.4768 |       313.0690 | 0.00152306 |
| Rakan         |    0.4603 |       302.7738 | 0.00152014 |
| Karma         |    0.4855 |       321.9963 | 0.00150783 |
| Morgana       |    0.5027 |       333.7479 | 0.00150618 |
| Nautilus      |    0.4812 |       324.4570 | 0.00148298 |
| Amumu         |    0.5239 |       354.1687 | 0.00147917 |
| Zyra          |    0.4965 |       337.8405 | 0.00146968 |
| Maokai        |    0.4854 |       330.2970 | 0.00146963 |
| Brand         |    0.5107 |       353.7593 | 0.00144360 |
| Skarner       |    0.5265 |       365.3923 | 0.00144090 |
| Sejuani       |    0.5095 |       353.6547 | 0.00144071 |
| Nunu          |    0.5085 |       353.1058 | 0.00144001 |
| Rammus        |    0.4955 |       346.4036 | 0.00143039 |
| Malphite      |    0.5015 |       351.3193 | 0.00142758 |
| Sion          |    0.5026 |       352.9683 | 0.00142398 |
| Annie         |    0.5208 |       368.7421 | 0.00141243 |
+---------------+-----------+----------------+------------+
30 rows in set (4.95 sec)
```