DBMS Project Deliverable -2

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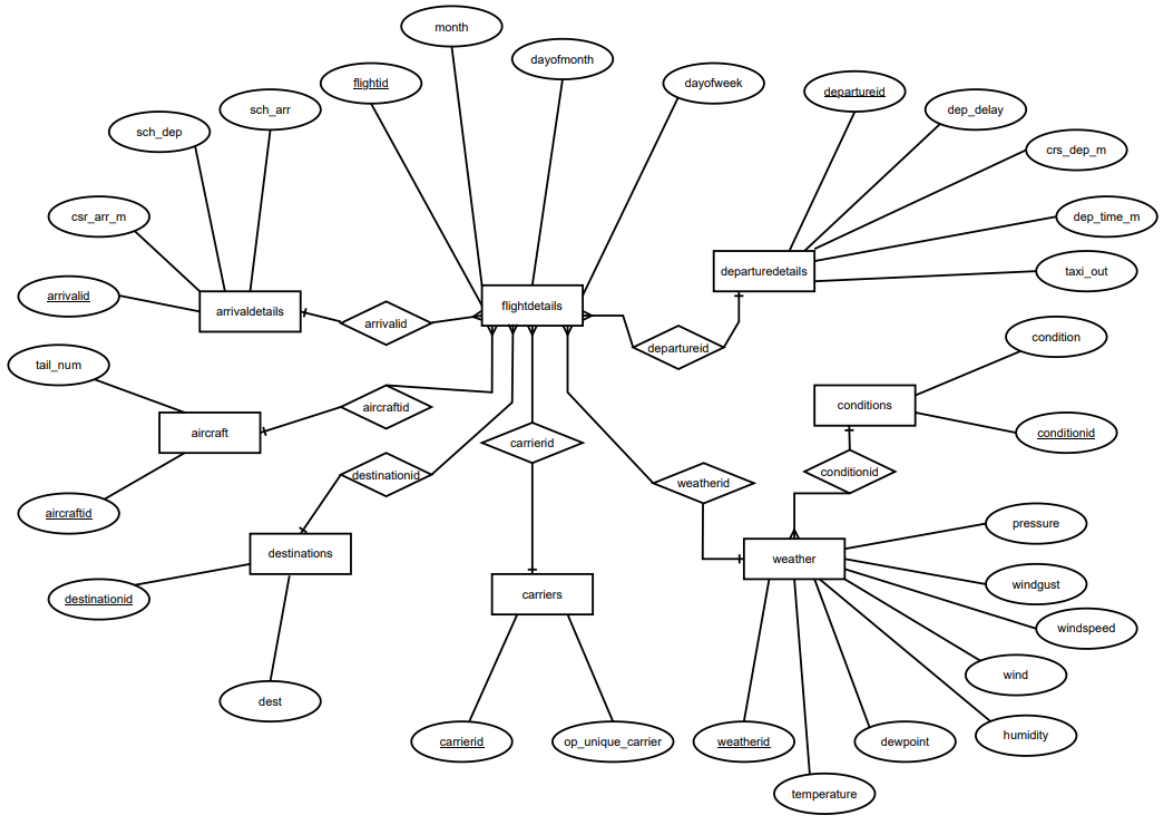
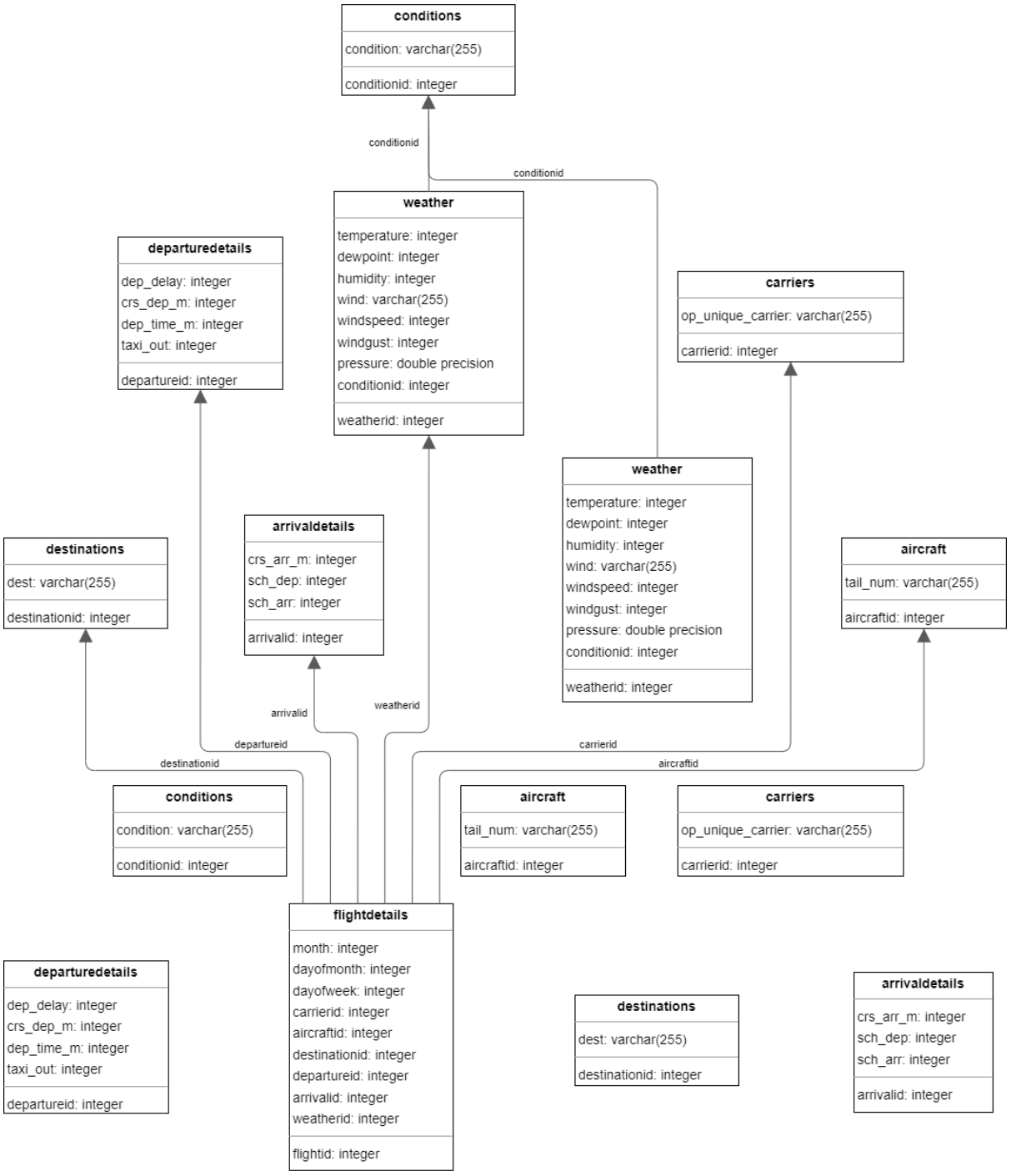
ER Diagram:



Relational Schema:



The relational schema defined above organizes data pertaining to flight operations at JFK Airport, structuring the information to facilitate storage, retrieval, and analysis of flight-related data. Below is a detailed description of each table within the schema, highlighting both primary and foreign keys.

1. **Carriers Table**

- Description: Stores information about flight carriers.

- Fields: `CarrierID` (unique identifier for each carrier), `OP_UNIQUE_CARRIER` (carrier code).

- Primary Key: `CarrierID`

- Foreign Key(s): None.

2. **Aircraft Table**

- Description: Contains details about aircraft.

- Fields: `AircraftID` (unique identifier for each aircraft), `TAIL_NUM` (aircraft tail number).

- Primary Key: `AircraftID`

- Foreign Key(s):None.

3. **Destinations Table**

- Description: Lists destination airports.

- Fields: `DestinationID` (unique identifier for each destination), `DEST` (destination airport code).

- Primary Key:`DestinationID`

- Foreign Key(s): None.

4. **Conditions Table**

- Description: Catalogs weather conditions.

-Fields: `ConditionID` (unique identifier for each condition), `Condition` (description of the weather condition

- Primary Key: `ConditionID`

- Foreign Key(s): None.

5. **Weather Table**

- Description: Records weather data relevant to flights.

- Fields: Include `WeatherID`, `Temperature`, `DewPoint`, `Humidity`, `Wind`, `WindSpeed`, `WindGust`, `Pressure`, and `ConditionID` (links to Conditions Table).

- Primary Key: `WeatherID`

- Foreign Key(s):`ConditionID` (links to `Conditions.ConditionID`).

6. **Departure Details Table**

- Description: Captures details about flight departures.

- Fields: Include `DepartureID`, `DEP_DELAY`, `CRS_DEP_M`, `DEP_TIME_M`, `TAXI_OUT`.

- Primary Key: `DepartureID`

- Foreign Key(s): None.

7. **Arrival Details Table**

- Description: Stores information on flight arrivals.

- Fields: Include `ArrivalID`, `CRS_ARR_M`, `sch_dep`, `sch_arr`.

- Primary Key: `ArrivalID`

- Foreign Key(s): None.

8. **Flight Details Table**

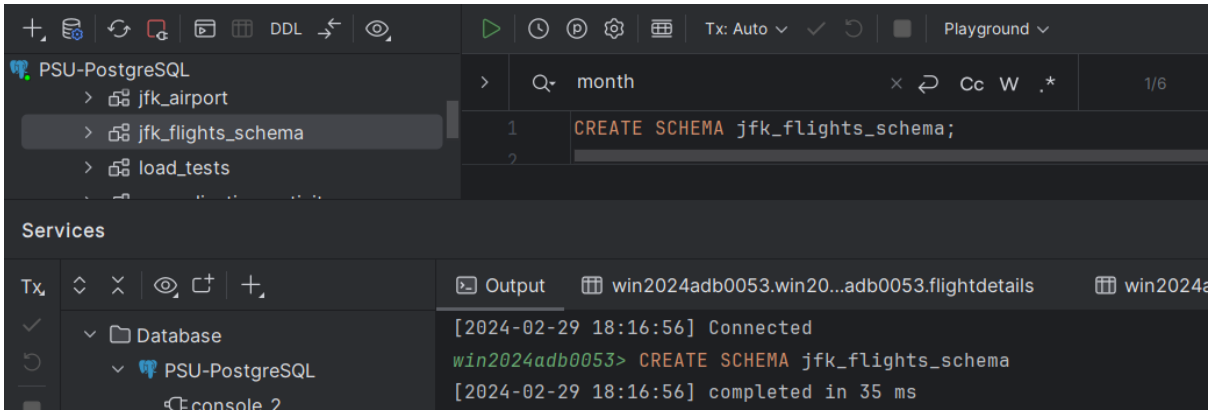
- Description: The central table that aggregates details from all other tables to represent a complete flight record.

- Fields: Include `FlightID`, `Month`, `DayOfMonth`, `DayOfWeek`, `CarrierID`, `AircraftID`, `DestinationID`, `DepartureID`, `ArrivalID`, `WeatherID`.

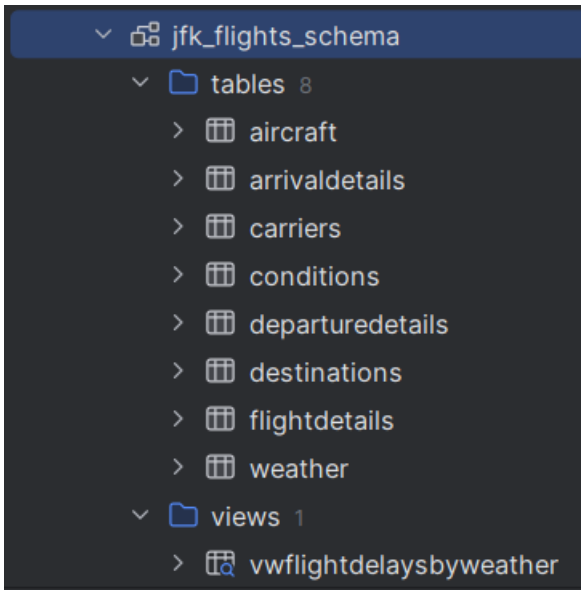
- Primary Key: `FlightID`

- Foreign Key(s): `CarrierID` (links to `Carriers.CarrierID`), `AircraftID` (links to `Aircraft.AircraftID`), `DestinationID` (links to `Destinations.DestinationID`), `DepartureID` (links to `DepartureDetails.DepartureID`), `ArrivalID` (links to `ArrivalDetails.ArrivalID`), `WeatherID` (links to `Weather.WeatherID`).

We created a schema named **jfk_flights_schema** as follows:



We created **8 tables and 1 view** as follows:



SQL script for creating the tables:

```sql
-- Carriers Table
CREATE TABLE jfk_flights_schema.Carriers (
    CarrierID SERIAL PRIMARY KEY,
    OP_UNIQUE_CARRIER VARCHAR(255) UNIQUE
);

-- Aircraft Table
CREATE TABLE jfk_flights_schema.Aircraft (
    AircraftID SERIAL PRIMARY KEY,
    TAIL_NUM VARCHAR(255) UNIQUE
);
```

```sql
-- Destinations Table
CREATE TABLE jfk_flights_schema.Destinations (
    DestinationID SERIAL PRIMARY KEY,
    DEST VARCHAR(255) UNIQUE
);

-- Conditions Table
CREATE TABLE jfk_flights_schema.Conditions (
    ConditionID SERIAL PRIMARY KEY,
    Condition VARCHAR(255) UNIQUE
);
```

```sql
-- Weather Table
CREATE TABLE jfk_flights_schema.Weather (
    WeatherID SERIAL PRIMARY KEY,
    Temperature INT,
    DewPoint INT,
    Humidity INT,
    Wind VARCHAR(255),
    WindSpeed INT,
    WindGust INT,
    Pressure FLOAT,
    ConditionID INT,
    FOREIGN KEY (ConditionID) REFERENCES Conditions(ConditionID)
);
```

```sql
-- Departure Details Table
CREATE TABLE jfk_flights_schema.DepartureDetails (
    DepartureID SERIAL PRIMARY KEY,
    DEP_DELAY INT,
    CRS_DEP_M INT,
    DEP_TIME_M INT,
    TAXI_OUT INT
);

-- Arrival Details Table
CREATE TABLE jfk_flights_schema.ArrivalDetails (
    ArrivalID SERIAL PRIMARY KEY,
    CRS_ARR_M INT,
    sch_dep INT,
    sch_arr INT
);
```

```sql
-- Flight Details Table
CREATE TABLE jfk_flights_schema.FlightDetails (
    FlightID SERIAL PRIMARY KEY,
    Month INT,
    DayOfMonth INT,
    DayOfWeek INT,
    CarrierID INT,
    AircraftID INT,
    DestinationID INT,
    DepartureID INT,
    ArrivalID INT,
    WeatherID INT,
    FOREIGN KEY (CarrierID) REFERENCES Carriers(CarrierID),
    FOREIGN KEY (AircraftID) REFERENCES Aircraft(AircraftID),
    FOREIGN KEY (DestinationID) REFERENCES Destinations(DestinationID),
    FOREIGN KEY (DepartureID) REFERENCES DepartureDetails(DepartureID),
    FOREIGN KEY (ArrivalID) REFERENCES ArrivalDetails(ArrivalID),
    FOREIGN KEY (WeatherID) REFERENCES Weather(WeatherID)
);
```

Then we inserted data into the tables:

Carriers Table:

```
INSERT INTO jfk_flights_schema.Carriers (OP_UNIQUE_CARRIER)
SELECT DISTINCT op_unique_carrier
FROM jfk_airport.m1_final
ON CONFLICT (OP_UNIQUE_CARRIER) DO NOTHING;

SELECT * FROM Carriers;
```

Output | win2024adb0053.win20...adb0053.flightdetails | win2024adb005

9 rows | Tx: Auto | DDL

	carrierid	op_unique_carrier
1	1	AA
2	2	B6
3	3	HA
4	4	9E
5	5	DL
6	6	OO
7	7	AS
8	8	MQ
9	9	YX

```
SELECT count(*) FROM Carriers;
```

Output | win2024adb0053.win20...adb0053.flightdetails | count(*):bigint

1 row

	count
1	9

Destinations Table:

```
145  INSERT INTO jfk_flights_schema.Destinations (DEST)
146  SELECT DISTINCT
147      dest
148  FROM jfk_airport.m1_final;
149
150  SELECT * FROM jfk_flights_schema.Destinations;
```

Output | win2024adb0053.jfk_f...s_schema.destinations

65 rows | Tx: Auto | DDL

	destinationid	dest
1	1	LGB
2	2	PSP
3	3	DEN
4	4	IND
5	5	ORF
6	6	ONT
7	7	BOS
8	8	PIT
9	9	CLE
10	10	JAC

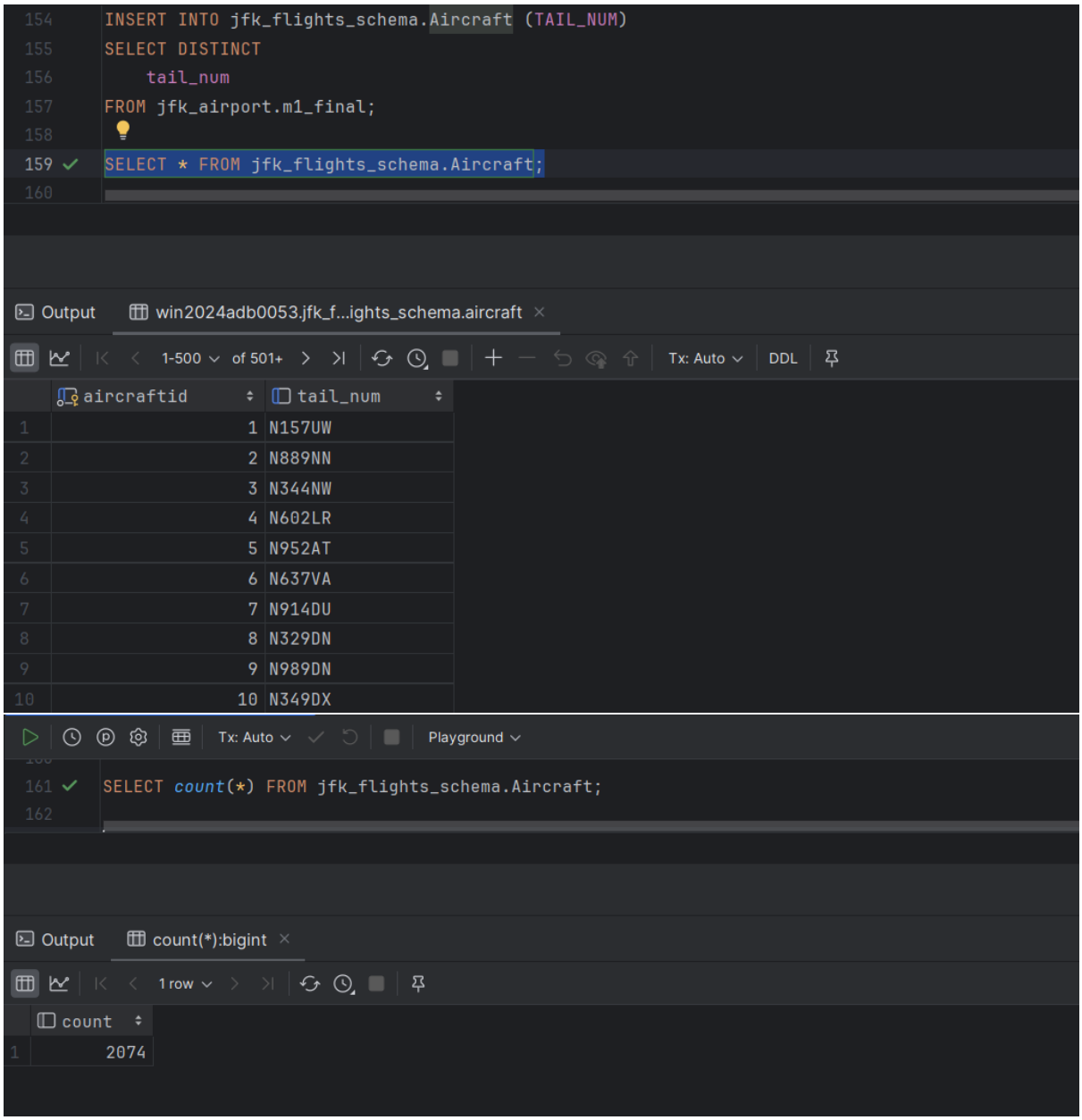
```
152  SELECT count(*) FROM jfk_flights_schema.Destinations;
153
```

Output | count(*):bigint

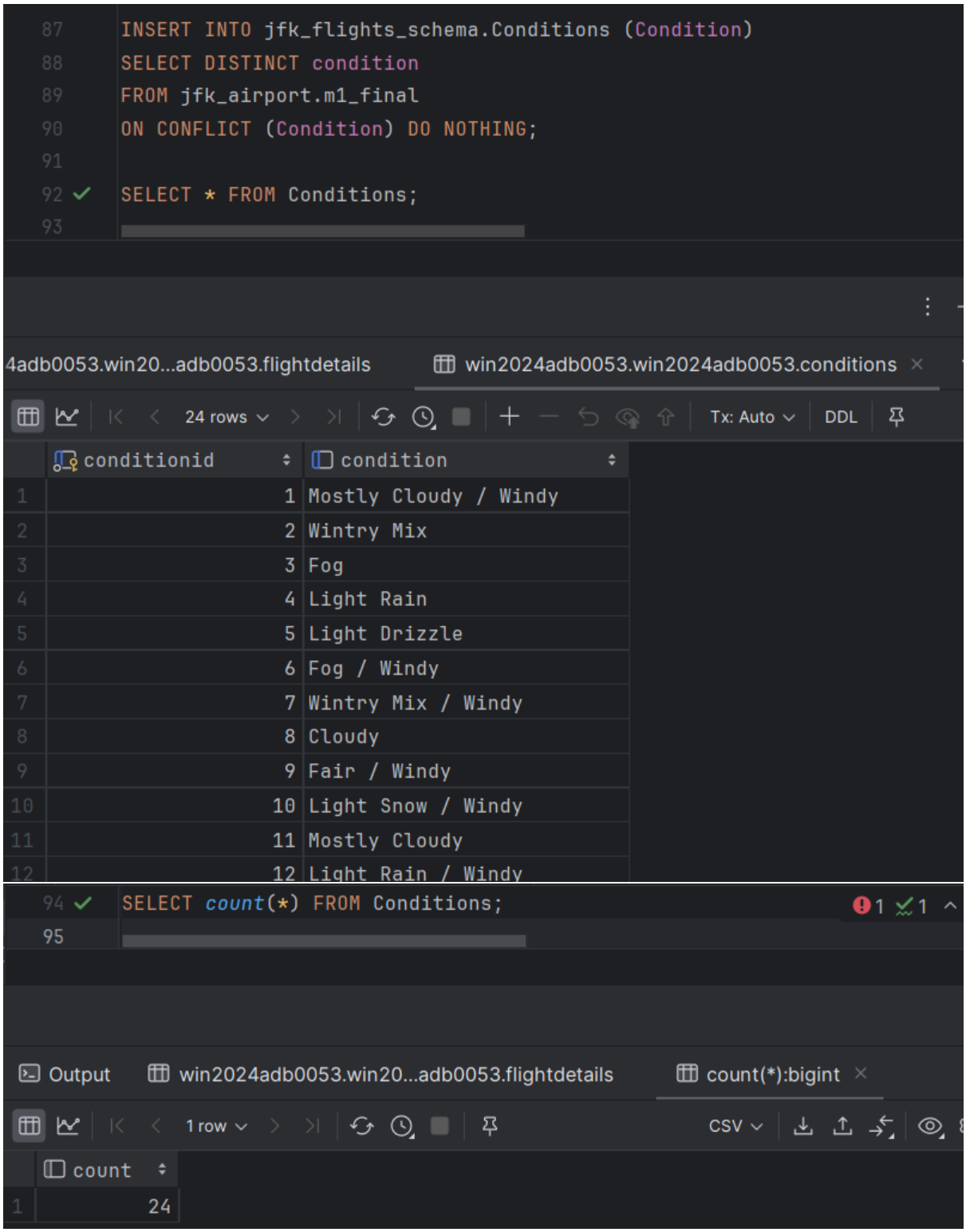
1 row

	count
1	65

Aircraft Table:



Conditions Table:



```
87  INSERT INTO jfk_flights_schema.Conditions (Condition)
88  SELECT DISTINCT condition
89  FROM jfk_airport.m1_final
90  ON CONFLICT (Condition) DO NOTHING;
91
92  SELECT * FROM Conditions;
93
```

4adb0053.win20...adb0053.flightdetails | win2024adb0053.win2024adb0053.conditions

24 rows | Tx: Auto | DDL

	conditionid	condition
1	1	Mostly Cloudy / Windy
2	2	Wintry Mix
3	3	Fog
4	4	Light Rain
5	5	Light Drizzle
6	6	Fog / Windy
7	7	Wintry Mix / Windy
8	8	Cloudy
9	9	Fair / Windy
10	10	Light Snow / Windy
11	11	Mostly Cloudy
12	12	Light Rain / Windy

```
94  SELECT count(*) FROM Conditions;
95
```

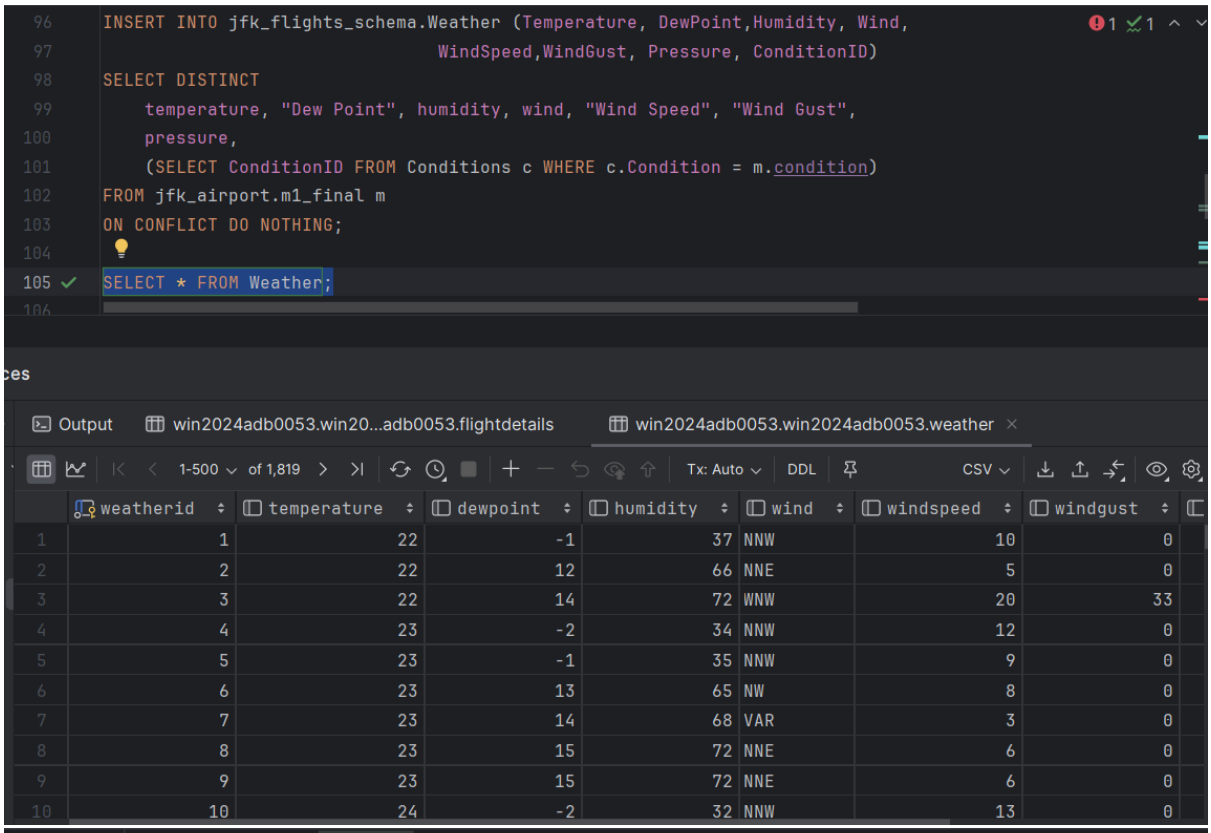
1 1

Output | win2024adb0053.win20...adb0053.flightdetails | count(*):bigint

1 row | CSV

	count
1	24

Weather Table:

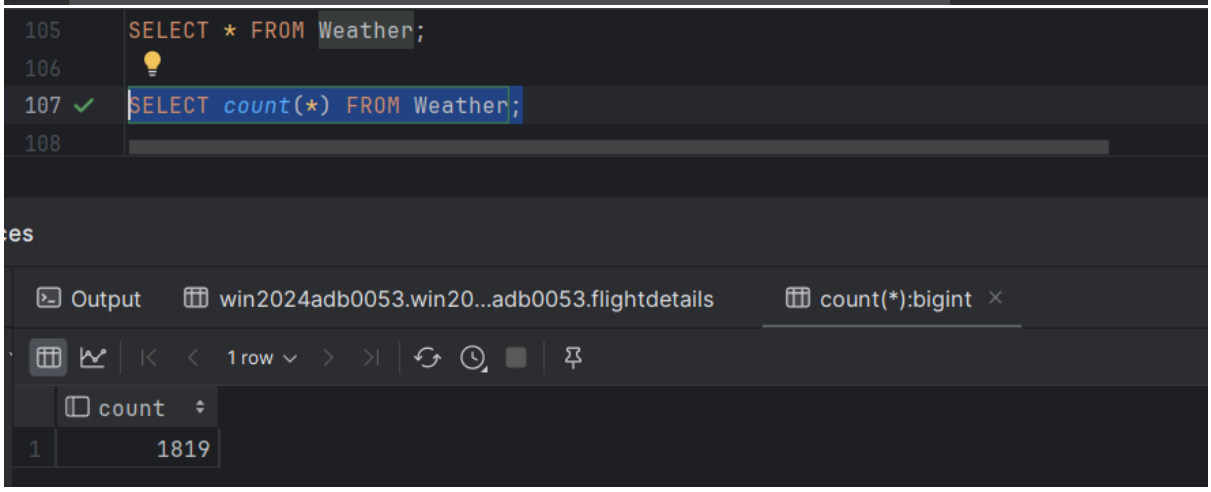


```
INSERT INTO jfk_flights_schema.Weather (Temperature, DewPoint,Humidity, Wind,
                                        WindSpeed,WindGust, Pressure, ConditionID)
SELECT DISTINCT
    temperature, "Dew Point", humidity, wind, "Wind Speed", "Wind Gust",
    pressure,
    (SELECT ConditionID FROM Conditions c WHERE c.Condition = m.condition)
FROM jfk_airport.m1_final m
ON CONFLICT DO NOTHING;

SELECT * FROM Weather;
```

Output | win2024adb0053.win20...adb0053.flightdetails | win2024adb0053.win2024adb0053.weather

1-500 of 1,819 | Tx: Auto | DDL | CSV

	weatherid	temperature	dewpoint	humidity	wind	windspeed	windgust
1	1	22	-1	37	NNW	10	0
2	2	22	12	66	NNE	5	0
3	3	22	14	72	WNW	20	33
4	4	23	-2	34	NNW	12	0
5	5	23	-1	35	NNW	9	0
6	6	23	13	65	NW	8	0
7	7	23	14	68	VAR	3	0
8	8	23	15	72	NNE	6	0
9	9	23	15	72	NNE	6	0
10	10	24	-2	32	NNW	13	0



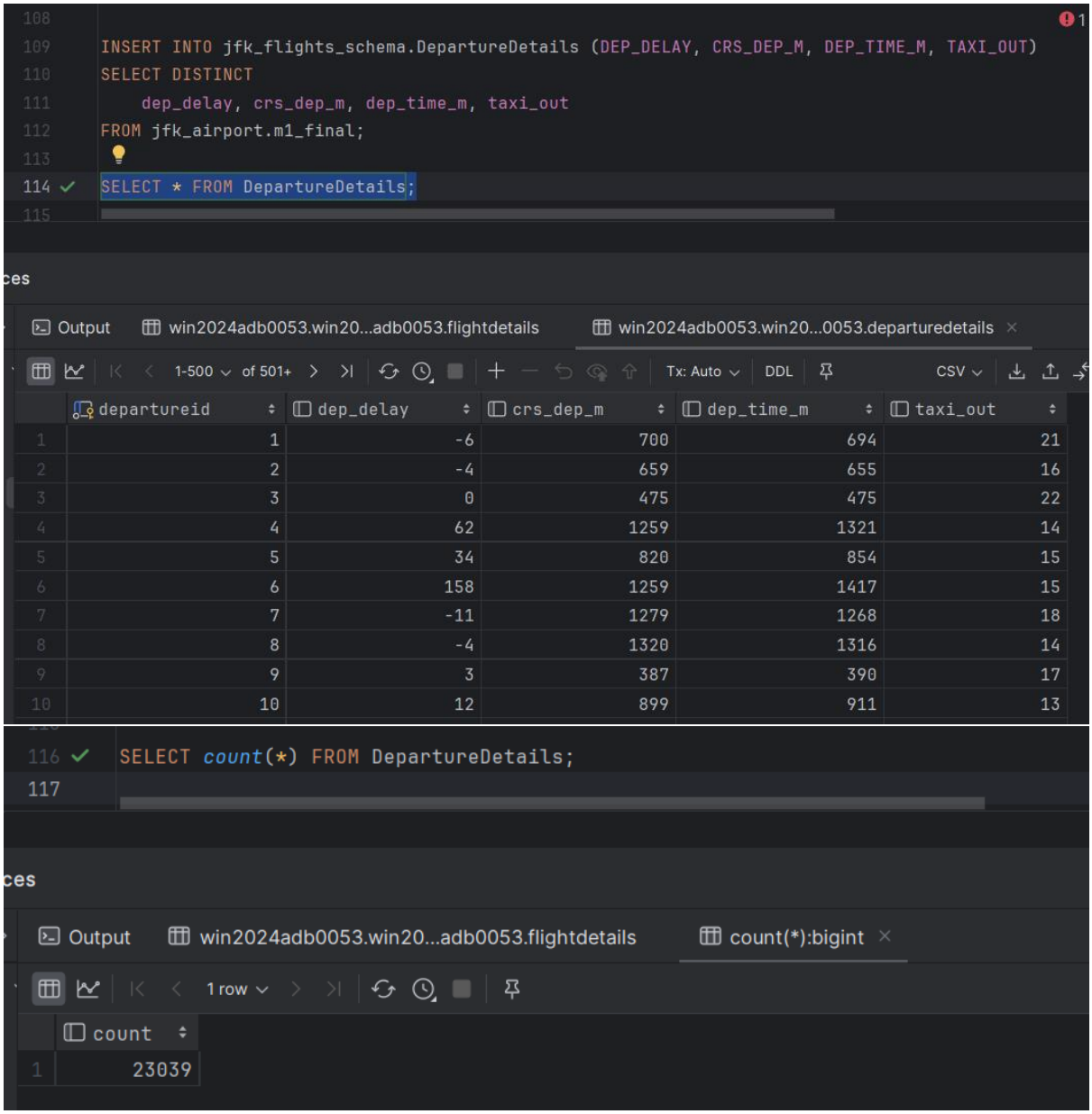
```
SELECT * FROM Weather;

SELECT count(*) FROM Weather;
```

Output | win2024adb0053.win20...adb0053.flightdetails | count(*):bigint

1 row

	count
1	1819

Departure Details Table:



```
INSERT INTO jfk_flights_schema.DepartureDetails (DEP_DELAY, CRS_DEP_M, DEP_TIME_M, TAXI_OUT)
SELECT DISTINCT
    dep_delay, crs_dep_m, dep_time_m, taxi_out
FROM jfk_airport.m1_final;

SELECT * FROM DepartureDetails;
```

Output | win2024adb0053.win20...adb0053.flightdetails | win2024adb0053.win20...0053.departuredetails

1-500 of 501+ | Tx: Auto | DDL | CSV

	departureid	dep_delay	crs_dep_m	dep_time_m	taxi_out
1	1	-6	700	694	21
2	2	-4	659	655	16
3	3	0	475	475	22
4	4	62	1259	1321	14
5	5	34	820	854	15
6	6	158	1259	1417	15
7	7	-11	1279	1268	18
8	8	-4	1320	1316	14
9	9	3	387	390	17
10	10	12	899	911	13

```
SELECT count(*) FROM DepartureDetails;
```

Output | win2024adb0053.win20...adb0053.flightdetails | count(*):bigint

1 row

	count
1	23039

Arrival Details:

```
118 ✓ INSERT INTO jfk_flights_schema.ArrivalDetails (CRS_ARR_M, sch_dep, sch_arr)
119   SELECT DISTINCT
120       crs_arr_m, sch_dep, sch_arr
121   FROM jfk_airport.m1_final;
122
123 ✓ SELECT * FROM ArrivalDetails;
124
```

ces

Output | win2024adb0053.win20...adb0053.flightdetails | win2024adb0053.win20...db0053.arrivaldetails

1-500 of 501+ | Tx: Auto | DDL | CSV

	arrivalid	crs_arr_m	sch_dep	sch_arr
1	1	1314	35	30
2	2	959	25	25
3	3	732	50	19
4	4	588	44	13
5	5	10	22	18
6	6	998	26	37
7	7	824	32	38
8	8	830	27	18
9	9	1336	41	36
10	10	1266	26	26

```
116 ✓ SELECT count(*) FROM DepartureDetails;
117
```

ces

Output | win2024adb0053.win20...adb0053.flightdetails | count(*):bigint

1 row

	count
1	23039

Flight Details Table:

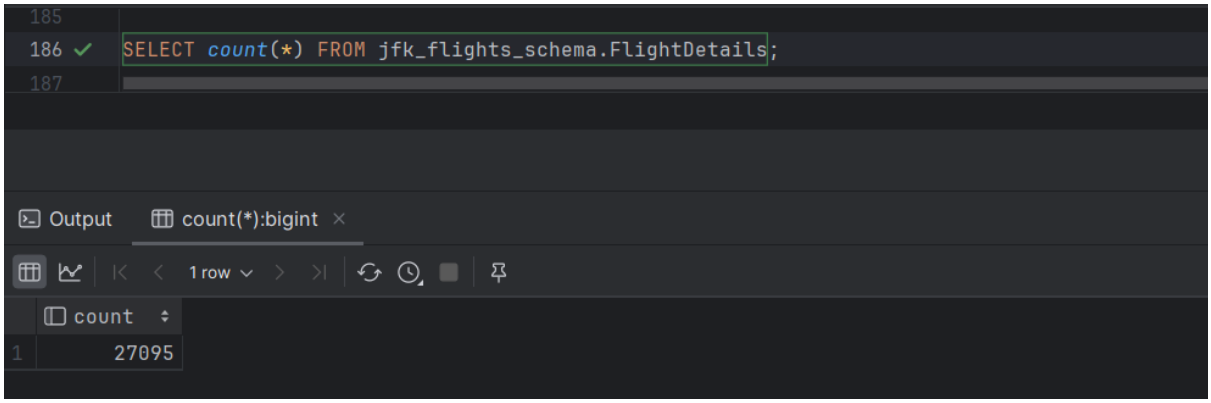
```sql
INSERT INTO jfk_flights_schema.FlightDetails (Month, DayOfMonth, DayOfWeek, CarrierID,
                                              DepartureID, ArrivalID, WeatherID , AircraftID,
                                              DestinationID)
SELECT
    month, day_of_month, day_of_week,
    (SELECT CarrierID FROM Carriers c WHERE c.OP_UNIQUE_CARRIER = m.op_unique_carrier),
    (SELECT DepartureID FROM DepartureDetails d
        WHERE d.DEP_DELAY = m.dep_delay AND d.CRS_DEP_M = m.crs_dep_m
          AND d.DEP_TIME_M = m.dep_time_m
          AND d.TAXI_OUT = m.taxi_out),
    (SELECT ArrivalID FROM ArrivalDetails a
        WHERE a.CRS_ARR_M = m.crs_arr_m AND a.sch_dep = m.sch_dep AND a.sch_arr = m.sch_arr),
    (SELECT WeatherID FROM Weather w
        WHERE w.Temperature = m.temperature AND w.DewPoint = m."Dew Point"
          AND w.Humidity = m.humidity AND w.Wind = m.wind AND w.WindSpeed = m."Wind Speed"
          AND w.WindGust = m."Wind Gust" AND w.Pressure = m.pressure
          AND ConditionID = (SELECT ConditionID FROM Conditions c WHERE c.Condition = m.condition)),
    (SELECT AircraftID FROM Aircraft x WHERE x.TAIL_NUM = m.tail_num),
    (SELECT DestinationID FROM Destinations y WHERE y.DEST = m.dest)
FROM jfk_airport.m1_final m;
```

```sql
SELECT * FROM jfk_flights_schema.FlightDetails;
```

Output | win2024adb0053.jfk_f..._schema.flightdetails 2 | win2024adb0053.jfk_f..._schema.flightdetails

1-500 of 501+ | Tx: Auto | DDL | CSV

	flightid	month	dayofmonth	dayofweek	carrierid	departureid	arrivalid
1	1	11	1	5	2	5603	225
2	2	11	1	5	2	14624	38
3	3	11	1	5	2	16394	1616
4	4	11	1	5	2	4664	1430
5	5	11	1	5	5	2613	137
6	6	11	1	5	1	2122	1151
7	7	11	1	5	1	10411	1322
8	8	11	1	5	2	10520	1857
9	9	11	1	5	2	11597	75
10	10	11	1	5	2	20719	788
11	11	11	1	5	2	10020	1484
12	12	11	1	5	1	5710	867
13	13	11	1	5	1	15376	55
14	14	11	1	5	2	15487	1834
15	15	11	1	5	2	789	1393
16	16	11	1	5	5	5843	170
17	17	11	1	5	5	12878	1807
18	18	11	1	5	5	17234	1128


185
186
SELECT count(*) FROM jfk_flights_schema.FlightDetails;
187
Output
count(*):bigint
1 row
count
1
27095

View:

```sql
CREATE OR REPLACE VIEW jfk_flights_schema.VwFlightDelaysByWeather AS
SELECT
    con.Condition AS WeatherCondition,
    COUNT(fd.FlightID) AS TotalFlights,
    SUM(CASE WHEN dd.DEP_DELAY > 15 THEN 1 ELSE 0 END) AS DelayedFlights,
    AVG(dd.DEP_DELAY) AS AverageDelay
FROM
    jfk_flights_schema.FlightDetails fd
    JOIN jfk_flights_schema.DepartureDetails dd ON fd.DepartureID = dd.DepartureID
    JOIN jfk_flights_schema.Weather w ON fd.WeatherID = w.WeatherID
    JOIN jfk_flights_schema.Conditions con ON w.ConditionID = con.ConditionID
GROUP BY
    con.Condition
ORDER BY
    AverageDelay DESC;
```

```sql
SELECT * FROM jfk_flights_schema.VwFlightDelaysByWeather;
```

rvices

Output | win2024adb0053.jfk_f...flightdelaysbyweather

24 rows | Tx: Auto | DDL | CSV

	weathercondition	totalflights	delayedflights	averagedelay
1	Light Freezing Rain	4	1	70
2	Light Snow / Windy	24	15	63.625
3	Wintry Mix / Windy	4	2	54.75
4	Heavy Rain	54	21	35.6111111111111111
5	Fog / Windy	28	9	25.8928571428571429
6	Cloudy / Windy	341	73	18.6950146627565982
7	Fair / Windy	479	91	15.3695198329853862
8	Light Snow	76	17	15.1447368421052632
9	Partly Cloudy / Windy	558	110	14.7867383512544803
10	Rain	351	97	14.4957264957264957
11	Wintry Mix	83	21	12.3373493975903614
12	Light Rain	1865	324	9.5957104557640751
13	Light Rain / Windy	288	43	6.2361111111111111
14	Mostly Cloudy / Windy	1442	211	5.855755894590846
15	Fair	4408	572	5.8044464609800363
16	Partly Cloudy	2974	393	5.261600537995965
17	Cloudy	4902	574	5.233578131374949
18	Mostly Cloudy	8820	1037	4.8478458049886621
19	Light Drizzle	194	19	3.9587628865979381
20	Rain / Windy	25	4	3.8