Earthquake Analysis through SQL Queries

Q. How can you combine the separate Date and Time columns into a single “Datetime” column?

```
SELECT *,
PARSE_DATETIME("%Y-%m-%d %H:%M:%S", CONCAT(Date," ", Time)) AS Datetime
FROM db.eqs;
```

Q. How many earthquakes occur annually, and what trends can be observed over the years?

```
SELECT
   EXTRACT(YEAR FROM datetime) AS year,
   COUNT(*) AS no_of_eqs
FROM db.eqs
WHERE mag IS NOT NULL
GROUP BY 1
ORDER BY 1;
```

Q. Which year experienced the highest number of significant earthquakes (magnitude greater than 7)?

```
SELECT
   EXTRACT(YEAR FROM datetime) AS year,
   COUNT(*) AS count_of_earthquakes
FROM db.eqs
WHERE mag > 7
GROUP BY 1
ORDER BY 2 DESC
LIMIT 1;
```

Q. What are the maximum and average magnitudes of earthquakes recorded annually?

```
SELECT EXTRACT( YEAR FROM Datetime ) AS Year,
MAX(Magnitude) AS Max_Magnitude,
```

```
ROUND(AVG(Magnitude), 2) AS Avg_Magnitude
FROM db.eqs
GROUP BY 1
ORDER BY 1;
```

Q. How are earthquakes distributed across different months for the entire data, and which month experiences the most activity?

```
SELECT
EXTRACT(MONTH FROM Datetime) AS Month,
COUNT(ID) AS Earthquake_Count
FROM db.eqs
GROUP BY 1
ORDER BY Earthquake_Count DESC;
```

Q. Which day of the week has the highest frequency of earthquakes across all years, and what patterns emerged over time?

```
SELECT
EXTRACT(DAYOFWEEK FROM Datetime) AS DayOfWeek,
COUNT(ID) AS Earthquake_Count
FROM db.eqs
GROUP BY DayOfWeek
ORDER BY Earthquake_Count DESC;
```

Q. During which hours of the day do earthquakes mostly occur, indicating peak periods of seismic activity?

```
SELECT
EXTRACT(HOUR FROM Datetime) AS Hour,
COUNT(ID) AS Earthquake_Count
FROM db.eqs
GROUP BY Hour
ORDER BY Earthquake_Count DESC;
```

Q. How does the frequency of earthquakes vary across different months of each year?

```
SELECT
FORMAT_DATE('%Y-%m', Datetime) AS YearMonth,
COUNT(ID) AS Earthquake_Count
FROM db.eqs
GROUP BY YearMonth
ORDER BY YearMonth;
```

Q. What is the quarterly pattern of earthquake activity, and are there any significant seasonal trends?

```
SELECT
FORMAT_DATE('%Y-Q%Q', Datetime) AS YearQuarter,
COUNT(ID) AS Earthquake_Count
FROM db.eqs
GROUP BY YearQuarter
ORDER BY YearQuarter;
```

Q. How does the frequency of earthquakes vary across different months of each year.Find using format_date?

```
SELECT
FORMAT_DATE("%B",datetime) as month,
COUNT(*) as earthquake_cnt
FROM db.eqs
GROUP BY 1;
```

%B will give name of the month in format-date function.

Q. How does the frequency of earthquakes vary across different days of a week.Find using format_date?

```
SELECT
FORMAT_DATE("%A",datetime) as month,
```

```
COUNT(*) as earthquake_cnt
FROM db.eqs
GROUP BY 1;
```

Q. How many earthquakes have occurred so far this month?

```
SELECT
COUNT(ID) AS Earthquake_Count
FROM db.eqs
WHERE EXTRACT(YEAR FROM Datetime) = EXTRACT(YEAR FROM CURRENT_DATE())
AND EXTRACT(MONTH FROM Datetime) = EXTRACT(MONTH FROM CURRENT_DATE());
```

Q. How many earthquakes have been recorded in the past 90 days? What was the average depth and magnitude of those earthquakes?

```
SELECT
COUNT(ID) AS Earthquake_Count,
AVG(Depth) AS Avg_Depth,
AVG(Magnitude) AS Avg_Magnitude
FROM db.eqs
WHERE Date >= DATE_SUB(PARSE_DATE('%Y-%m-%d', '2016-12-31'), INTERVAL 90 DAY);
```

Q. What is the average interval of days between significant earthquakes with a magnitude of 7 or higher?

```
SELECT
ROUND(AVG(Days_Between)) AS Avg_Days_Between
FROM
    (SELECT Datetime, DATE_DIFF(Datetime, LAG(Datetime) OVER (ORDER BY Datetime), DAY)
    AS Days_Between
    FROM db.eqs
    WHERE Magnitude >= 7
    )  AS SignificantEarthquakes;
```

Q. How many days have elapsed since the most recent significant earthquake with a magnitude of 7 or higher?

```
-- Considering December 31, 2016, as the current or last recorded date.

SELECT DATE_DIFF(PARSE_DATE('%Y-%m-%d', '2016-12-31'), MAX(Date), DAY) AS
Days_Since_Last_Significant
FROM db.eqs
WHERE Magnitude >= 7;
```

Q. What is the seasonal distribution of earthquake occurrences each year? (Winter, Spring, Summer, Fall)

```
SELECT
EXTRACT(YEAR FROM Datetime) AS Year,
CASE
WHEN EXTRACT(MONTH FROM Datetime) IN (12, 1, 2) THEN 'Winter'
WHEN EXTRACT(MONTH FROM Datetime) IN (3, 4, 5) THEN 'Spring'
WHEN EXTRACT(MONTH FROM Datetime) IN (6, 7, 8) THEN 'Summer'
ELSE 'Fall'
END AS Season,
COUNT(ID) AS Earthquake_Count
FROM db.eqs
GROUP BY 1, 2
ORDER BY1, 2;
```

Q. Based on historical data, how many earthquakes are expected in the upcoming quarter?

```
-- Assuming a predictive model; using past data to forecast

SELECT
ROUND(AVG(Earthquake_Count)) AS Avg_Quarterly_Earthquake_Count
FROM (
SELECT
EXTRACT(YEAR FROM Datetime) AS Year,
```

```
EXTRACT(QUARTER FROM Datetime) AS Quarter,
COUNT(ID) AS Earthquake_Count
FROM db.eqs
GROUP BY Year, Quarter
) AS Past_Quarterly_Counts;
```

Q. What is the frequency of earthquakes and their average magnitude for each quarter over the past five years?

```
SELECT
FORMAT_DATE('%Y-Q%Q', Date) AS YearQuarter,
COUNT(*) AS Earthquake_Count,
ROUND(AVG(Magnitude), 2) AS Avg_Magnitude
FROM db.eqs
WHERE Date >= DATE_SUB(PARSE_DATE('%Y-%m-%d', '2016-12-31'), INTERVAL 5 YEAR)
GROUP BY 1
ORDER BY 1;
```

What would be the impact of our analysis?

- Analyze long-term and seasonal earthquake trends to better anticipate future seismic activity and support preparedness planning.
- Assess changes in earthquake intensity over time to improve risk evaluation and guide safer infrastructure development.
- Detect abnormal patterns in earthquake occurrences that may indicate external influences, helping improve forecasting accuracy.
- Identify periods of increased seismic activity to strengthen early warning systems and enable faster response actions.
- Continuously monitor recent earthquake activity to maintain situational awareness and support timely decision-making.