LOOKING THROUGH THE WINDOW

Jed Rembold

Monday, October 21, 2024

ANNOUNCEMENTS

- HW7 due on Thursday night!
  - Last of the “testable” content for the next exam
  - The last part of the last question does involve some content from today
- Exam 2 is 1 week from Wednesday
  - Review and study materials will be posted on Wednesday
- Polling today: **polling.jedrembold.prof**

REVIEW QUESTION!

Assuming that your server has its timezone set to `'American/Los_Angeles'`, what is the output of the below query?

```
SELECT make_time(
  date_part('dow', current_date)::INT,
  date_part('day', now())::INT,
  date_part('hour', localtime)::INT
  ) AT TIME ZONE 'PDT';
```

A) 01:21:14-07

B) 01:21:13

C) 00:22:12-07

D) 08:21:14

INTRO TO WINDOW FUNCTIONS

WINDOW FUNCTIONS

- One useful piece of kit that is only partially included in the text (in Chapter 11) is that of *window functions*
- A window function is like a mix between a normal column value and an aggregate function
  - Unlike aggregate functions, a window function returns a value for each row
  - Unlike normal column values, a window function can utilize other rows included within its "window" in making an aggregation
- Any normal aggregate function can be used as a window function, though there are specific window functions as well
- Window functions can only be used inside `SELECT` or `ORDER BY` statements
  - They are evaluated *after* any filtering, grouping, or normal aggregations

OVER THE HILL

- The defining characteristic of any window function is the `OVER ()` keyword, which comes after the aggregating window function
- Content inside the `()` determines the "window" of the window function
- By default, if nothing is provided, the entire column is the window
- The below would output the average of the column in every row
  - There will be other ways to do something similar with subqueries, but this is perhaps the most straightforward method

```
SELECT AVG(column) OVER()
FROM table;
```

SPECIAL WINDOW FUNCTIONS

DEDICATED WINDOW FUNCTIONS

- You can use any existing aggregate function as a window function, but there are also more specific window functions

Function	Description
`row_number()`	Assigns an ascending row number to each row in a window
`rank()`	Assigns an ascending rank to each row, with possible ties skipping the next value
`dense_rank()`	Assigns an ascending rank to each row, with possible ties not skipping the next value
`first_value(`col`)`	Returns the first value in the window of column col
`last_value(`col`)`	Returns the last value in the window of column col
`lag(`col`, `amt`)`	Returns the previous (or shifted by amt) row of column col
`lead(`col`, `amt`)`	Returns the next (or shifted by amt) row of column col
`nth_value(`col`, `n`)`	Returns the n th row of column col (`NULL` if doesn't exist)

CHANGING THE WINDOW

DETERMINING ORDER

- Often, to be useful, you may want to define an ordering inside the `OVER()` statement
- As soon as you specify an ordering, the default window changes
  - By default, each window now encompasses everything from the start, up to (and including) that current row
    - Easiest to see with classic aggregate functions

```
SELECT COUNT(*) OVER( ORDER BY column )
FROM table;
```

TWEAKING THE WINDOW

- You can tweak this window by specifying the starting and stopping point, using the syntax:

```
...type BETWEEN offset PRECEDING AND offset FOLLOWING
```

  which appears in the `OVER` clause, after any provided ordering

  - *type* can be either `ROWS`, `RANGE`, or `GROUP`
  - *offset* can be
    - an non-null, non-negative integer or `UNBOUNDED` if the type is `ROWS` or `GROUP`
    - an value that makes sense to add or subtract from the ordered column if the type is `RANGE`

EXCLUDING THE WINDOW

- Can also exclude the current row or group from the window:

```
... EXCLUDE type
```

- *type* here can be:
  - `CURRENT ROW`, which excludes the current row from the window
  - `GROUP` which excludes the current row and all other rows currently tied with it
  - `TIES` which just excludes the tied rows, but keeps the current row

PARTITIONING

- Additionally, you can specify a partition for the window
- The default partition is the entire column
- Partitioning here is determined *before* the rows comprising the window are computed
  - This has a similar feel to `GROUP BY`, but *every* row will get a value here
- Window functions evaluated within each window within each partition

```
SELECT AVG(column) OVER (
    PARTITION BY column
  )
FROM table;
```

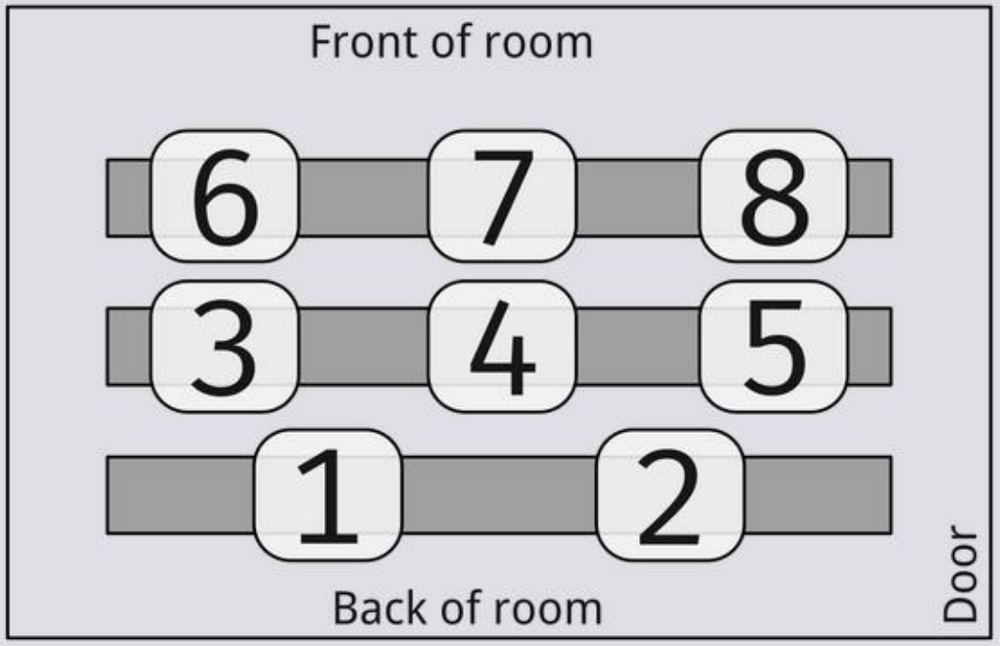
ACTIVITY!

A SWEET DATASET

- Contained here is an SQL file to generate a table of Halloween trick-or-treater data, which contains two columns:
  - The timestamp when a trick-or-treater visited and was given a piece of candy
  - What candy was given to the trick-or-treater
- You started out with a supply of 50 of each type of candy
- You will have several questions you are trying to answer.

TODAY'S GROUPS

- Group 1: Tippy, Dayton, Sam J
- Group 2: AJ, Myles, Matthew, Nick
- Group 3: Hannah, Grace, Michael
- Group 4: Aurora, Mallory, Greg
- Group 5: Jordan, Marcus, Evan
- Group 6: Harleen, Jerrick, Jack
- Group 7: Finn, Connor, Sam H
- Group 8: Haley, Tiffany, Sergio



Group Areas

QUESTIONS

- Reminder: You started out with a supply of 50 of each type of candy
- Using the dataset, answer the following questions:
  - Between the 20th and 30th minutes, what were the three most popular candies given?
  - What candies did you never run out of?
  - At what time did you run out of Skittles?
  - What times did you run out of the three most popular candies?
  - Construct a 5-minute rolling average of the number of trick-or-treaters you saw each minute of the evening. According to this, about when were things busiest?