# Date and time functions

CALCULATIONS IN TABLEAU

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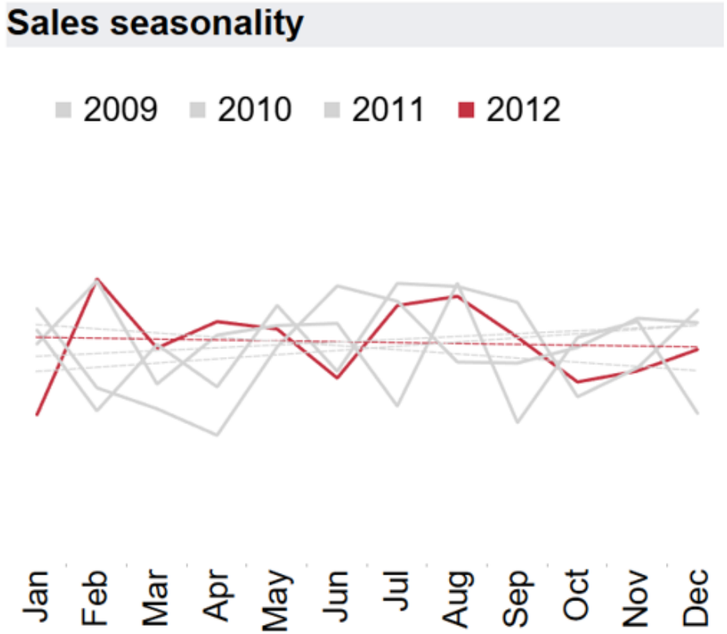
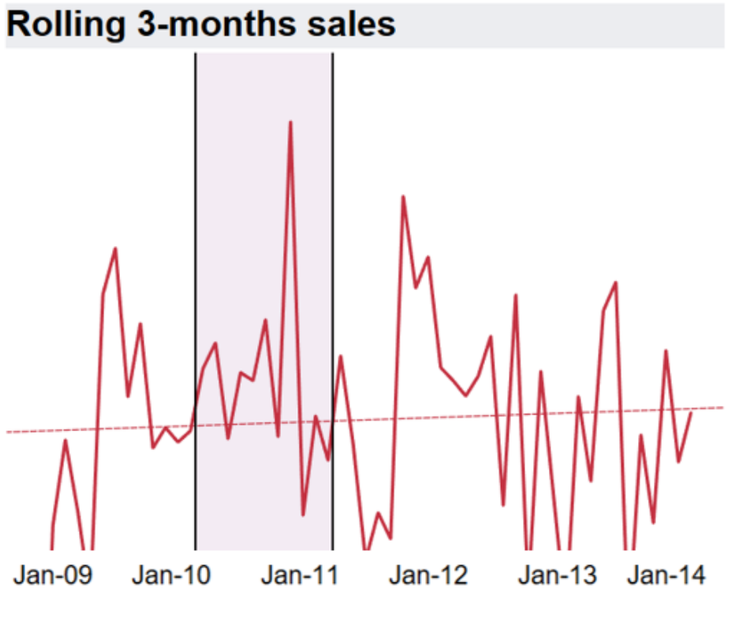
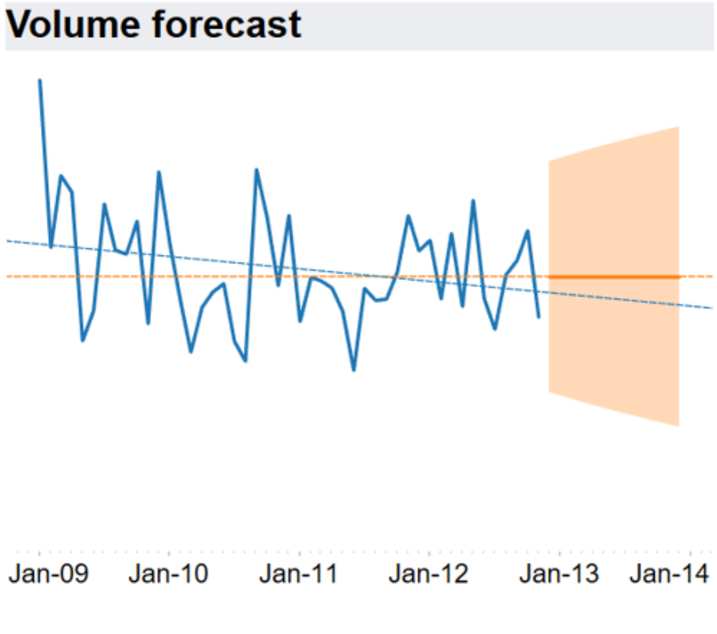
# What is time series analysis?

> **Time series analysis** - study of data in particular periods or intervals, which often includes trend analysis, seasonal comparisons of data and study of rolling time-periods

- Examples of time series analysis:



# Date and time as data types

**Date** or **DateTime** data types:

- Data type storing calendar date/time
- May be auto-recognized by Tableau
- Dependent on data locale (1)
- Represented in Tableau with calendar symbol:


**Date can have various *output* formats:**

- 21-Jan-2020
- Monday, 31. December 19
- 31/10/12
- 10/31/12
- jan.22
- 2022-W05
- ...

[1] Data locale: set of parameters describing the user's language & region settings.

# Deriving Date(Time) from other columns

Example:

| Year | Month | Day |
|---|---|---|
| 2022 | 3 | 1 |
| 2019 | 5 | 28 |
| 2023 | 2 | 6 |

```
MakeDate ([Year], [Month], [Day])
```


| Hour | Minute | Second |
|---|---|---|
| 5 | 2 | 0 |
| 6 | 59 | 59 |
| 8 | 12 | 10 |

```
MakeTime ([Hour], [Minute], [Second])
```


| Year | Month | Day | Hour | Minute | Second |
|---|---|---|---|---|---|
| 2022 | 3 | 1 | 5 | 2 | 0 |

```
MakeDateTime ([Date], [Time])
```

# Parsing dates

> **Parsing:** analyzing a string into logical syntactic components

Example:

| Transaction_date |
| --- |
| 2022-03-29 07:23:02 AM |

```
DateParse ( format, string )
```

```
DATEPARSE('YYYY-MM-dd HH:mm:ss aa',[Transaction date])
```


# Extracting date parts

Extracting a discrete year, but also possible with *quarter*, *month*, *day*, *dayofyear*, *weekday*, *hour*, *minute*, etc.

Example:

```
DATEPART ( 'year', [Order Date] )
```

```
DATEPART ( 'quarter', [Order Date] )
```


| Year of Order Date |
| --- |
| 2009 |
| 2010 |

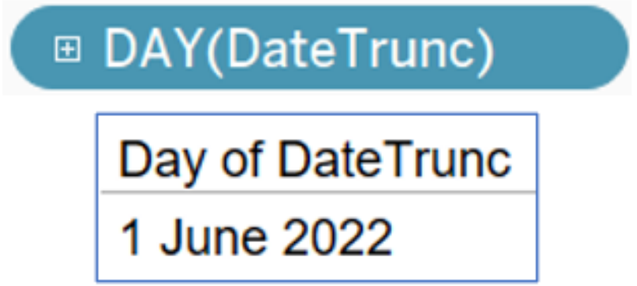

| Quarter of Order Date |
| --- |
| Q1 |
| Q2 |

# Truncating dates

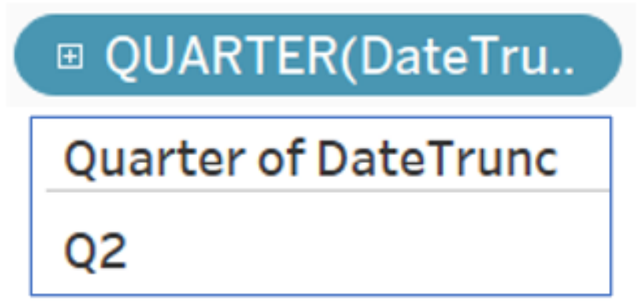
> **Truncating**: shortening, cutting

Truncating the specified date to the accuracy specified by the date part.

```
DATETRUNC ( 'month', #2022-06-15# )
```




```
DATETRUNC ( 'quarter', #2022-06-15# )
```



# Calculating with dates

**Adding intervals to dates:**

```
DATEADD (date_part, interval, [Date])
```

- Adds specified amount of intervals (e.g., 3 months, 2 days, 10 weeks, etc.) to the date

E.g.

- `DATEADD ('month', 3, [Date])`
- `DATEADD ('week', 10, [Date])`
- Returns a **date**

**Subtracting intervals from dates:**

```
DATEDIFF ( date_part, date1, date2 )
```

- Returns the difference between two dates, expressed in requested date part intervals

E.g.

- `DATEDIFF ('month', [Start], [End])`
- `DATEDIFF ('day', [Start], [End])`
- Returns a **number**

# Referring to a date in a calculation

**Using hard-coded dates in calculations:**

Enclose the date value between `# #`

E.g. `#2010-12-31#`

```
IF [Order Date]> #2010-12-31# then [Sales] END
```

| Year of Order Date | Sales |
|---|---|
| 2009 | € 4,209K |
| 2010 | € 3,550K |
| 2011 | € 3,437K |
| 2012 | € 3,720K |

| Year of Order Date | Sales | Sales as of 2011 |
|---|---|---|
| 2009 | € 4,209K | |
| 2010 | € 3,550K | |
| 2011 | € 3,437K | € 3,437K |
| 2012 | € 3,720K | € 3,720K |

# Let's practice!

CALCULATIONS IN TABLEAU

# Date and time in practice

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# Let's practice!

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# Time series analysis

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# Seasonality and year-over-year analysis

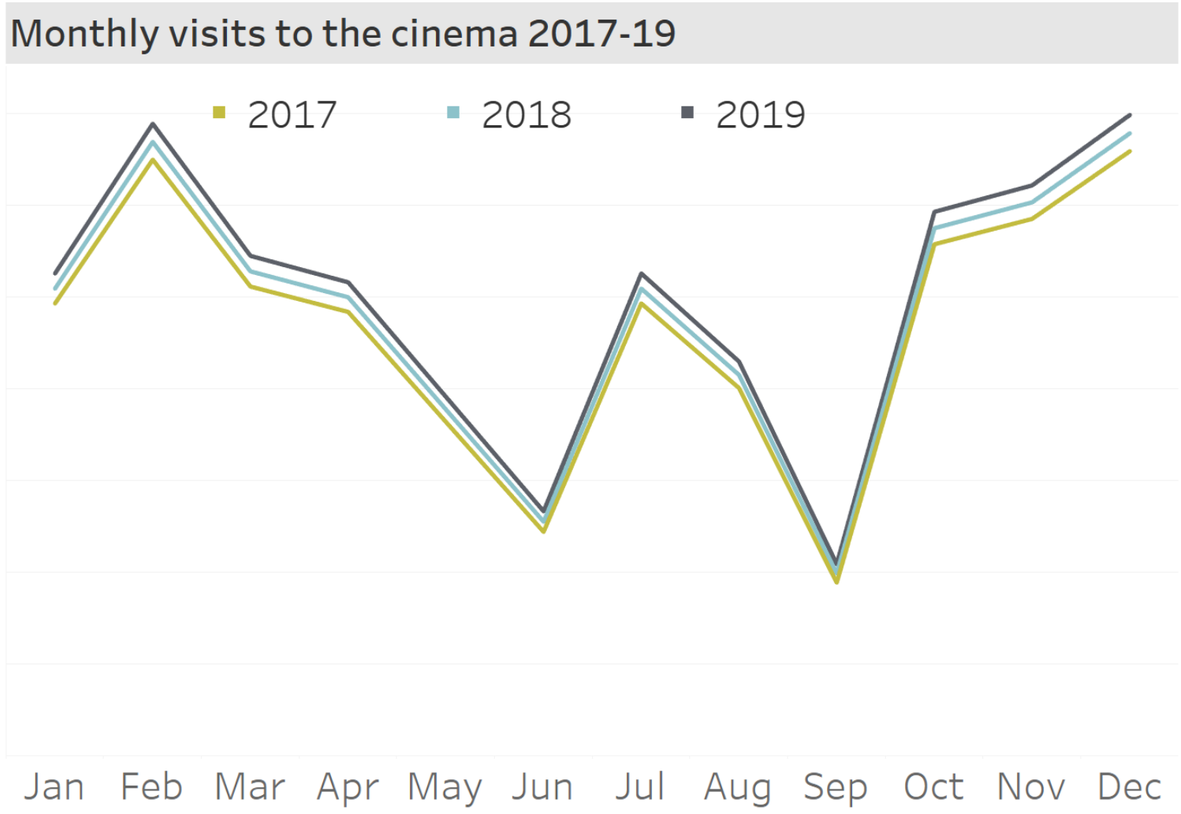
Study of **repetitive patterns** in data

- Detect predictable trends
- Determine high and low seasons
- Improve forecasting decisions

**Year-over-year comparison:**

- Comparison of results per discrete date intervals (e.g., months) across various years.

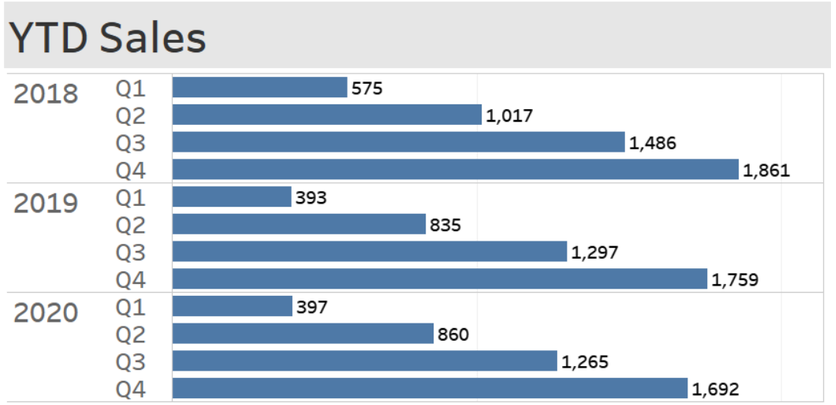
**Seasonality of cinema visits, year-over-year:**



# Year-to-date and custom fiscal years

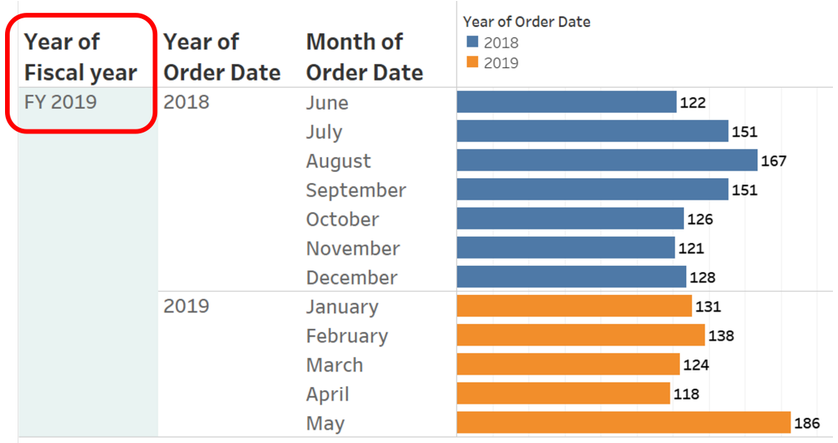
## Year-to-date (YTD):

- A Quick Table Calculation
- Calculates from the start of the year to the last known data point in that year
- Also possible as MTD, QTD etc.




## Custom Fiscal Year

- Built-in date property
- Possible to work with various year types in one workbook



# Calculating growth

**Year over Year Growth :**

- A Quick Table Calculation
- Comparing change in a measure to the same period last year (e.g. Q1'19 to Q1'18)
- Requires discrete date dimensions

**Calculation behind YoY growth:**

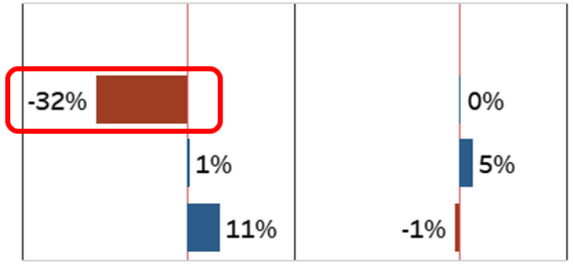
```
(SUM([Sales]) - LOOKUP(SUM([Sales]), -1))
/
ABS(LOOKUP(SUM([Sales]), -1))
```

- Table (down) calculation

**Year over Year Growth in Tableau:**

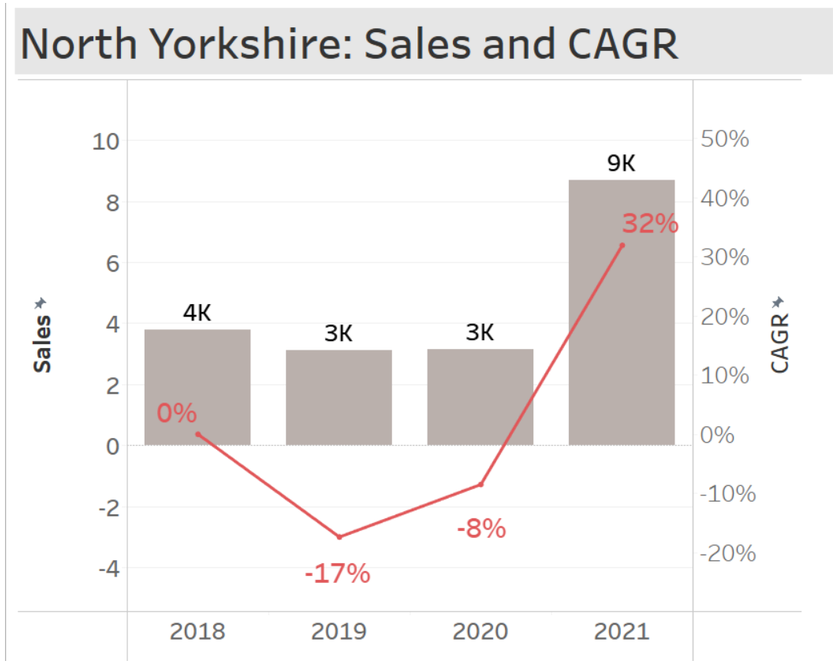
Year-over-year growth per Quarter

| | Q1 | Q2 |
|---|---|---|
| 2018 | 575,333 | 441,540 |
| 2019 | 392,631 | 442,019 |
| 2020 | 396,923 | 463,477 |
| 2021 | 442,204 | 456,686 |



# Compound Annual Growth Rate - CAGR

**CAGR** - mean annual growth rate of a measure over a specified period of time longer than one year (1)




**CAGR as a mathematical calculation:**

$$\text{CAGR} = \left(\frac{V_{\text{final}}}{V_{\text{begin}}}\right)^{1/t} - 1$$

**CAGR in Tableau:**

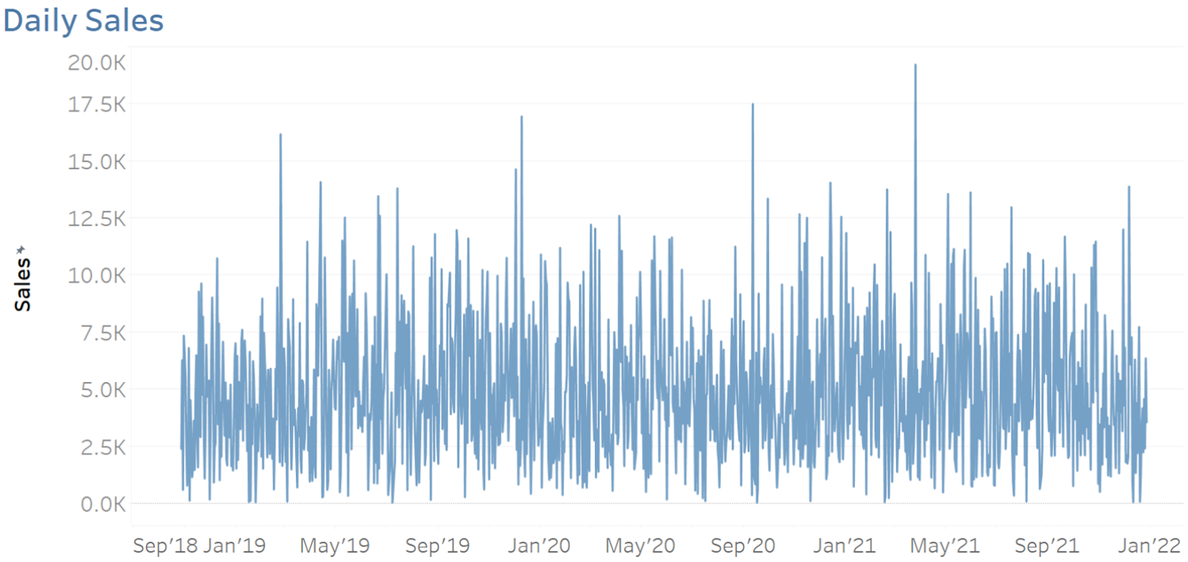
```
POWER(
      ZN(SUM([Sales]))/LOOKUP(ZN(SUM([Sales])), FIRST())
     ,ZN(1/(INDEX()-1))
     ) - 1
```

[1] https://www.investopedia.com/investing/compound-annual-growth-rate-what-you-should-know/

# Moving (rolling) calculations

- Calculations across a specified number of values before and/or after the determined point in time
- Used for smoothing fluctuations in data
- Used for the long-term trends ("The Big Picture")

## Smoothing fluctuations with moving average

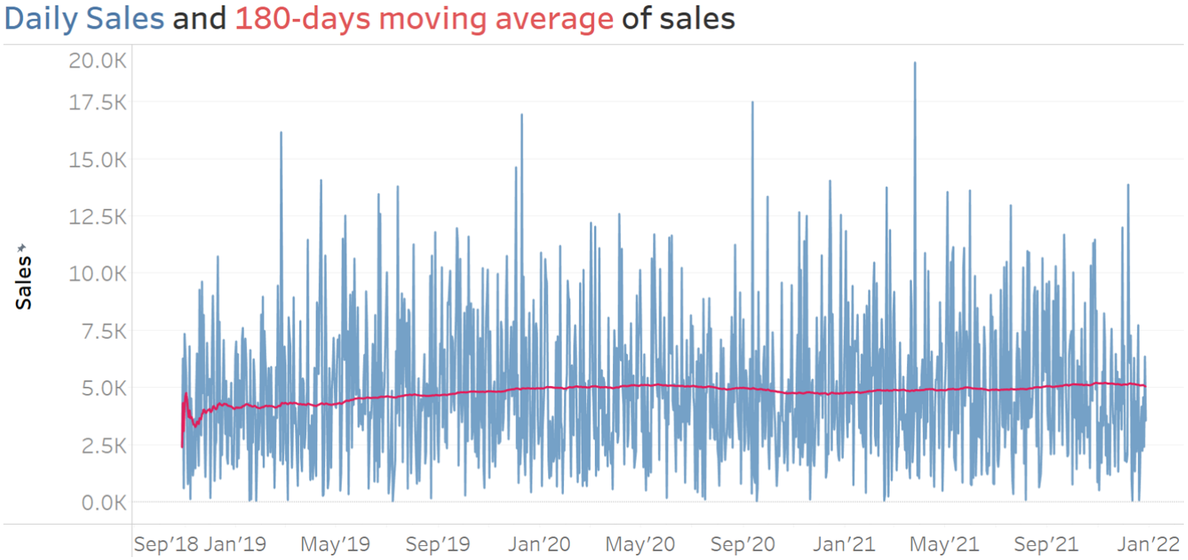


# Moving (rolling) calculations

- Calculations across a specified number of values before and/or after the determined point in time
- Used for smoothing fluctuations in data
- Used for the long-term trends ("The Big Picture")
- E.g., moving `AVG(Sales)` over the last 180 days

```
WINDOW_AVG(SUM([Sales]), -180, 0)
```

## Smoothing fluctuations with moving average

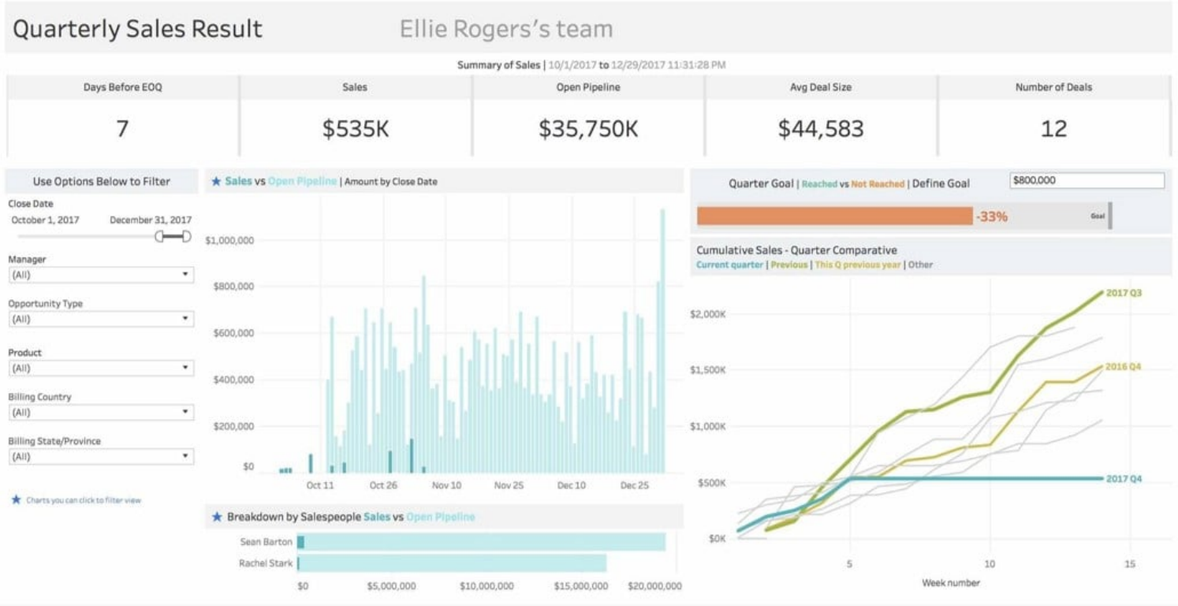


# Keeping it organized

## Visualizing complex calculations:

- Combine a set of time-series visualizations into a dashboard
- Work with parameters and highlighters
- Hide extra information (e.g. formula definition) in a tooltip
- Use Dual Axis sparingly with clear axis names

## Example of a time-series dashboard




[1] https://www.tableau.com/products/accelerators

# Let's practice!

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# Time series analysis in practice

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# Let's practice!

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# Congratulations!

## CALCULATIONS IN TABLEAU

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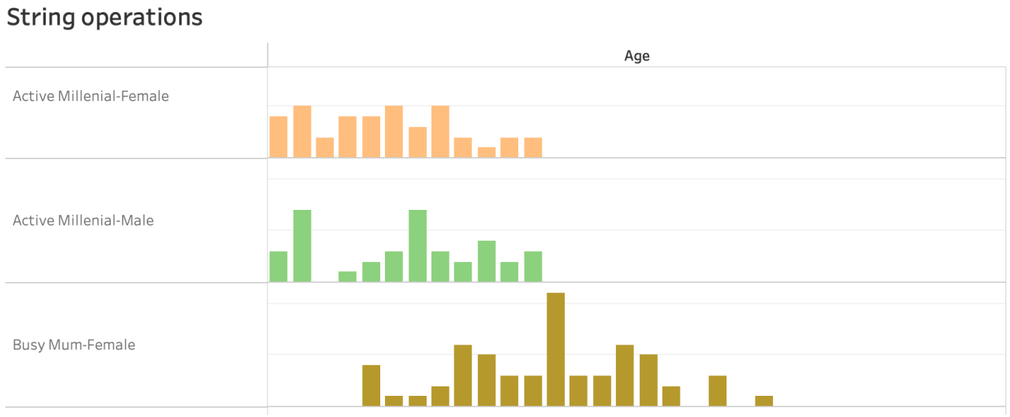
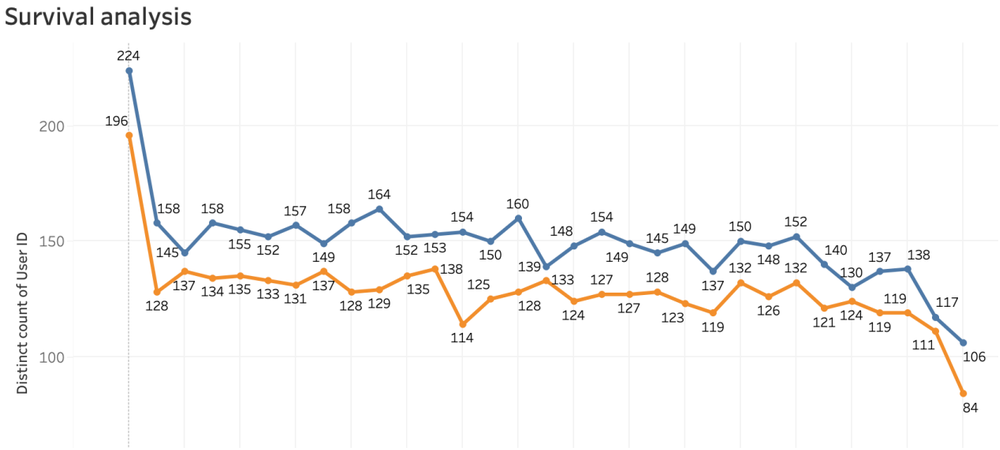
# Chapter 1

- Calculations foundations
- Various calculation types
- Troubleshooting most common errors
- String and logic functions




# Chapter 2

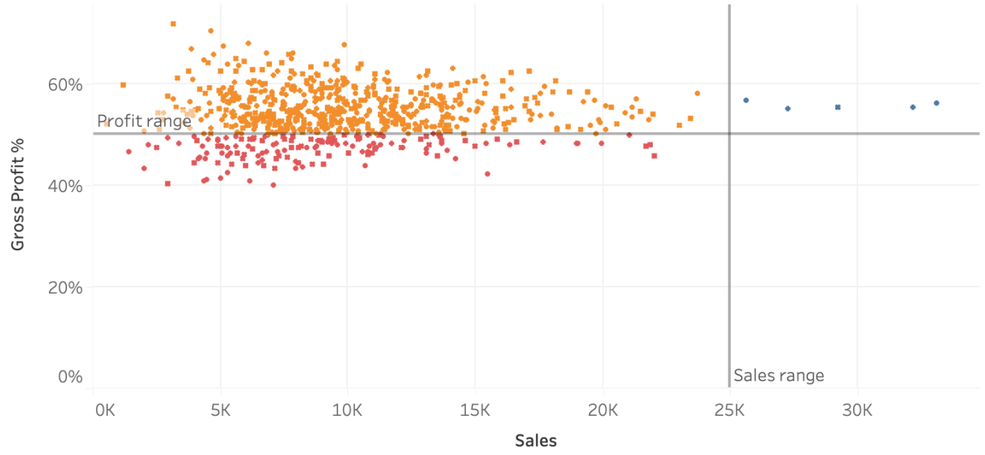
- Navigating data granularity
- Level of Detail expressions
- Calculating independently of dimensions in the view



# Chapter 3

- Table Calculations foundations
- Running and window functions
- Dynamic parameters

Quadrant chart




# Chapter 4

- Date and time functions
- Time series analysis calculations
- Advanced financial calculations e.g., CAGR

Indexed growth

# Thank you!

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