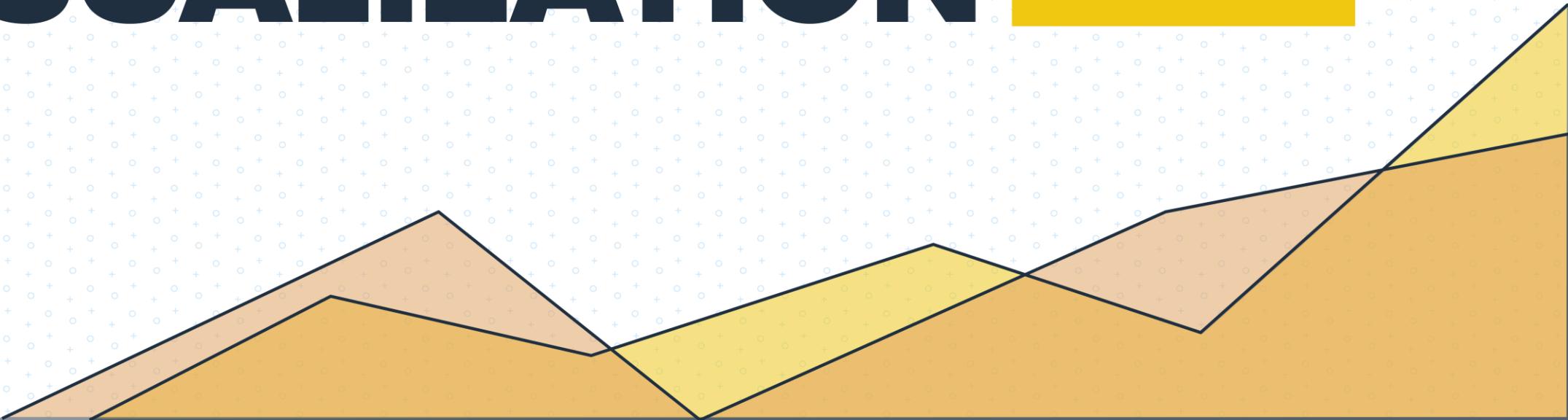


TODAY'S LECTURE:

POWERBI AND DATA VISUALIZATION



DATA IS THE NEW OIL

**WE NEED SOME WAY TO
PROCESS AND PRESENT DATA**

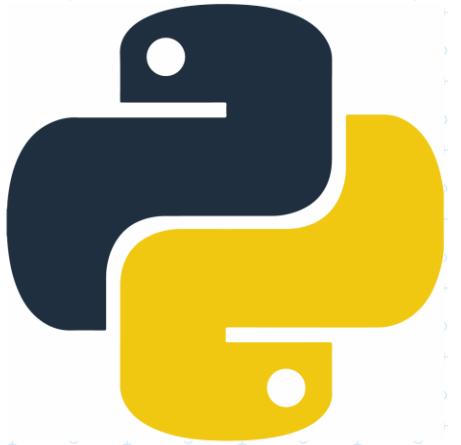


**MICROSOFT
EXCEL**

DATA PROCESSING



R



PYTHON

*angelic music
begins playing*

ID NO.	SPACE / ACTIVITY	EXISTING SPACE	SPACE CRITERIA SF	NO. OF PEOPLE	SPACE SUB-TOTAL	NO. OF SPACES	SF REQUIRED	NOTES
1.0 Entry, Lobby, Admissions, Store								
1.1	Entry Vestibule	0			150	1	150	
1.2	Lobby / Orientation	240			500	1	500	Includes artwork
1.3	Admissions / Tickets	0			50	1	50	
1.4	Museum Store	320			420	1	420	
1.5	Storage	0			80	1	80	
Sub-Total Net Assignable							1200	
2.0 Activity / Program Areas								
2.1	Exhibit Floor	2770			4000	1	4000	1.5x larger than original space
2.2	Art Space	396			700	1	70	
2.3	Toddler Area	384			700	1	70	
2.4	Birthday Room	440	25	28	700	1	70	
2.5	Multi-purpose Room				300	1	300	
2.6	Kitchen	218			120	1	120	
Sub-Total Net Assignable							6520	
3.0 Administration								
3.1	Reception / Waiting	0	80	1	80	1	80	
3.2	Executive Director	240	200	1	200	1	200	
3.3	Executive Toilet	35	50	1	50	1	50	
3.4	Dir. Of Administration	80	100	1	100	1	100	
3.5	Office Manager	64	80	1	80	1	80	
3.6	Bookkeeper	64	75	1	75	1	75	
3.7	Store Manager	64	75	1	75	1	75	
3.8	Dir. Of External Affairs	80	80	1	80	1	80	
3.9	PR Coordinator	64	75	1	75	1	75	
3.10	Future Staff	0	75	1	75	2	150	
3.11	Copy Room	210	180	1	180	1	180	
3.12	Meeting Area	0	100	1	100	1	100	
3.13	Filing and Storage	0	80	1	80	1	80	
Sub-Total Net Assignable							1325	

marvels at the beautiful spreadsheet

**WE (USUALLY) ARE
VISUAL LEARNERS**

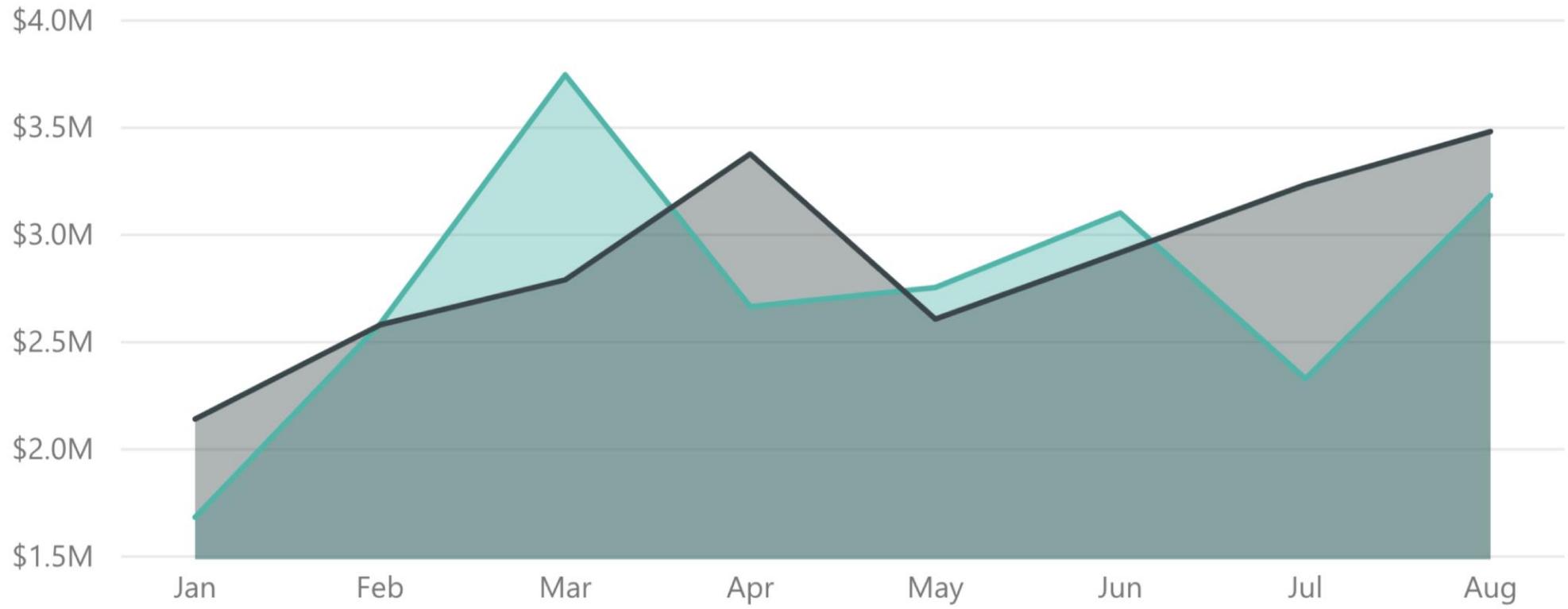
**Imagine learning calculus
but the professor only spoke, never wrote.**

ID NO.	SPACE / ACTIVITY	EXISTING SPACE	SPACE CRITERIA SF	NO. OF PEOPLE	SPACE SUB-TOTAL	NO. OF SPACES	SF REQUIRED	NOTES
1.0 Entry, Lobby, Admissions, Store								
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1.2	Lobby / Orientation	240			500	1	500	Includes artwork
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1.4	Museum Store	320			420	1	420	
1.5	Storage	0			80	1	80	
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3.4	Dir. Of Administration	80	100	1	100	1	100	
3.5	Office Manager	64	80	1	80	1	80	
3.6	Bookkeeper	64	75	1	75	1	75	
3.7	Store Manager	64	75	1	75	1	75	
3.8	Dir. Of External Affairs	80	80	1	80	1	80	
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3.13	Filing and Storage	0	80	1	80	1	80	
Sub-Total Net Assignable								1325

still marveling at the beautiful spreadsheet

This Year Sales and Last Year Sales by FiscalMonth

● This Year Sales ● Last Year Sales



well this is a lot easier to read

```

"name","pop2019","Rate"
"Bulgaria","7000.1190","15.4330"
"Ukraine","43993.6380","15.1920"
"Latvia","1906.7430","14.6690"
"Lesotho","2125.2680","14.1440"
"Lithuania","2759.6270","13.7370"
"Serbia","8772.2350","13.1940"
"Croatia","4130.3040","13.1700"
"Romania","19364.5570","13.0990"
"Georgia","3996.7650","12.8160"
"Russia","145872.2560","12.7850"
"Hungary","9684.6790","12.6130"
"Belarus","9452.4110","12.5570"
"Central African Republic","4745.1850","12.1780"
"Chad","15946.8760","12.0450"
"Nigeria","200963.5990","11.7710"
"Estonia","1325.6480","11.7270"
"Sierra Leone","7813.2150","11.6980"
"Moldova","4043.2630","11.6970"
"Germany","83517.0450","11.2750"
"Greece","10473.4550","10.9240"
"Bosnia and Herzegovina",3301,"10.8000"
"Somalia","15442.9050","10.7780"
"Montenegro","627.9870","10.7290"
"Portugal","10226.1870","10.7020"
"Japan","126860.3010","10.6460"
"Czech Republic","10689.2090","10.5710"
"Italy","60550.0750","10.5660"
"South Sudan","11062.1130","10.4300"
"Poland","37887.7680","10.2010"
"Slovenia","2078.6540","10.0440"
"Ivory Coast","25716.5440","10.0030"
"Slovakia","5457.0130","9.9680"
"Austria","8955.1020","9.8960"
"Armenia","2957.7310","9.8620"
"Finland","5532.1560","9.7950"
"Belgium","11539.3280","9.7890"
"Denmark","5771.8760","9.7830"
"Mali","19658.0310","9.5860"
"Guinea-Bissau","1920.9220","9.5570"
"Grenada","112.0030","9.5470"
"Puerto Rico","2933.4080","9.5400"
"South Africa","58558.2700","9.4940"
"Uruguay","3461.7340","9.4700"
"DR Congo","86790.5670","9.4150"
"United Kingdom","67530.1720","9.3980"
"France","65129.7280","9.3170"
"Saint Vincent and the Grenadines","110.5890","9.2810"
"Equatorial Guinea","1355.9860","9.2350"
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"Uzbekistan","32981.7160","5.7940"
"French Polynesia","279.2870","5.7000"
"Senegal","16296.3640","5.6910"
"Cape Verde","549.9350","5.6110"
"Colombia","50339.4430","5.6060"
"Bangladesh","163046.1610","5.5450"
"Peru","32510.4530","5.5390"
"Paraguay","7044.6360","5.5270"
"Kenya","52573.9730","5.4830"
"Turkey","83429.6150","5.4440"
"Israel","8519.3770","5.3280"
"Guam","167.2940","5.2490"
"Samoa","197.8970","5.2360"
"Vanuatu","299.8820","5.2360"
"Rwanda","12626.9500","5.2350"
"Syria","17070.1350","5.2320"
"Malaysia","31949.7770","5.1390"
"Costa Rica","5047.5610","5.1220"
"Ecuador","17373.6620","5.1210"
"Libya","6777.4520","5.1000"
"Panama","4246.4390","5.0980"
"Nicaragua","6545.5020","5.0770"
"Morocco","36471.7690","5.0720"
"Western Sahara","582.4630","4.9360"
"Iran","82913.9060","4.8660"
"Tajikistan","9321.0180","4.8360"
"Sao Tome and Principe","215.0560","4.8190"
"Iraq","39309.7830","4.7730"
"Belize","390.3530","4.7440"
"Guatemala","17581.4720","4.7410"
"Algeria","43053.0540","4.7230"
"Singapore","5804.3370","4.6000"
"Brunei","433.2850","4.5130"
"Honduras","9746.1170","4.4530"
"Lebanon","6855.7130","4.4190"
"Solomon Islands","669.8230","4.2550"
"Macau","640.4450","4.0020"
"Jordan","10101.6940","3.8870"
"Saudi Arabia","34268.5280","3.5130"
"Palestine","4981.4200","3.4620"
"French Guiana","290.8320","2.9560"
"Maldives","530.9530","2.8210"
"Kuwait","4207.0830","2.7870"
"Mayotte","266.1500","2.7100"
"Oman","4974.9860","2.4460"
"Bahrain","1641.1720","2.4160"
"United Arab Emirates","9770.5290","1.5190"
"Qatar","2832.0670","1.2440"

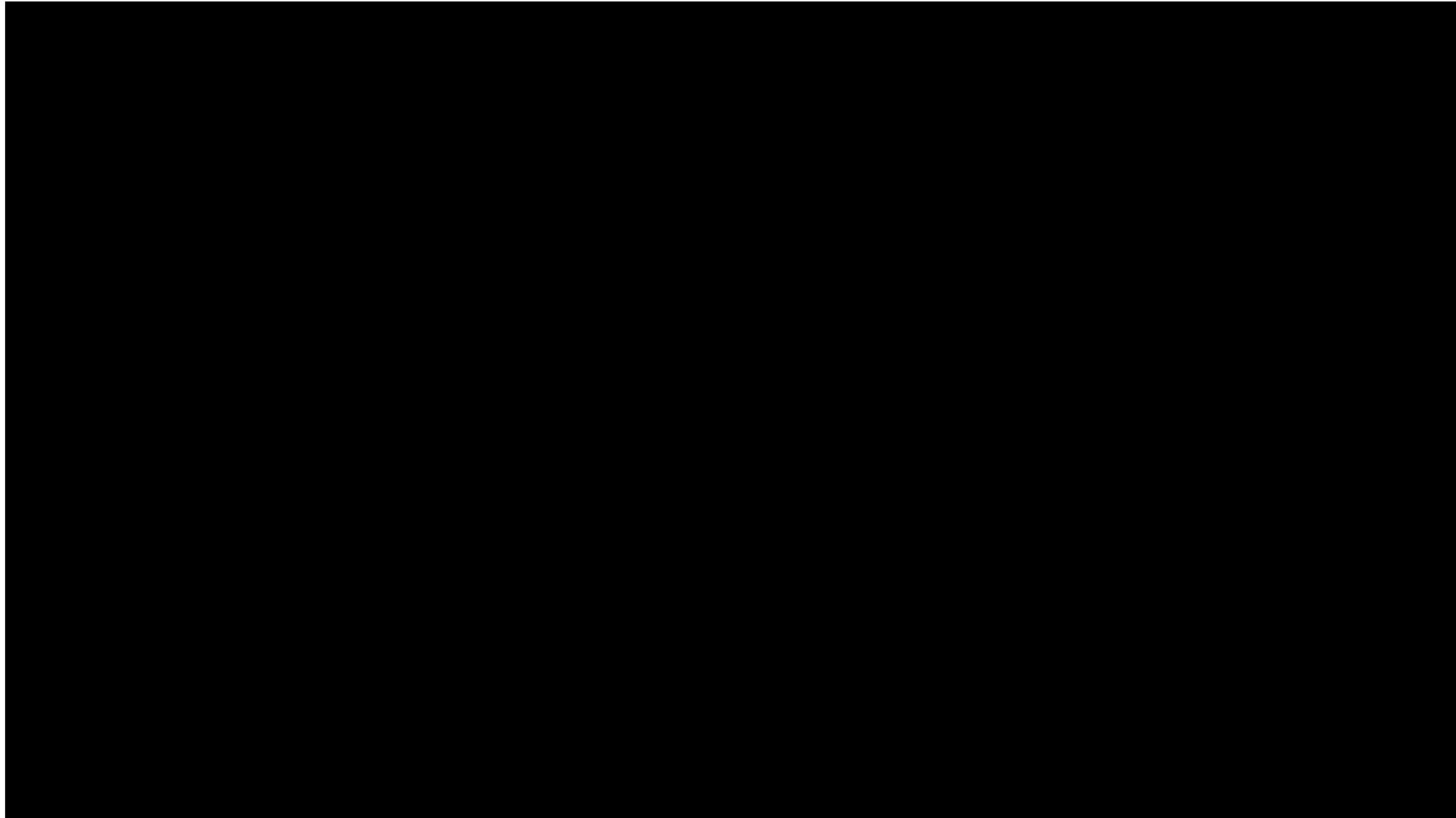
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"Pakistan","216565.3180","6.9340"
"Gabon","2172.5790","6.8220"
"Bahamas","389.4820","6.8170"
"Azerbaijan","10047.7180","6.8080"
"Bolivia","11513.1000","6.7890"
"Iceland","339.0310","6.7360"
"Sri Lanka","21323.7330","6.7170"
"Hong Kong","7436.1540","6.7160"
"Republic of the Congo","5380.5080","6.7010"
"Micronesia","113.8150","6.6260"
"Australia","25203.1980","6.6220"
"Malawi","18628.7470","6.6100"
"Ethiopia","112078.7300","6.5290"
"Uganda","44269.5940","6.5270"
"Indonesia","270625.5680","6.5100"
"Brazil","211049.5270","6.5030"
"Zambia","17861.0300","6.4760"
"Laos","7169.4550","6.4310"
"Antigua and Barbuda","97.1180","6.4090"
"Afghanistan","38041.7540","6.3930"
"Tanzania","58005.4630","6.3870"
"Nepal","28608.7100","6.3580"
"Vietnam","96462.1060","6.3540"
"Mongolia","3225.1670","6.3510"
"Kiribati","117.6600","6.3200"
"Tunisia","11694.7190","6.2670"
"Bhutan","763.0920","6.2650"
"Reunion","888.9270","6.2560"
"Chile","18952.0380","6.2150"
"Dominican Republic","10738.9580","6.1770"
"Ireland","4882.4950","6.1390"
"South Korea","51225.3080","6.1110"
"Mexico","127575.5290","6.0390"
"Cambodia","16486.5420","6.0190"
"Madagascar","26969.3070","6.0170"
"Kyrgyzstan","6415.8500","6.0110"
"Yemen","29161.9220","5.9910"
"Philippines","108116.6150","5.9000"
"Botswana","2303.6970","5.8250"
"Egypt","100388.0730","5.8080"
>New Caledonia","282.7500","5.8070"
"Uzbekistan","32981.7160","5.7940"
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"Senegal","16296.3640","5.6910"
"Cape Verde","549.9350","5.6110"
"Colombia","50339.4430","5.6060"
"Bangladesh","163046.1610","5.5450"
"Peru","32510.4530","5.5390"
"Paraguay","7044.6360","5.5270"
"Kenya","52573.9730","5.4830"

```

Death Rates in the World



INFORMATION VISUALIZATION

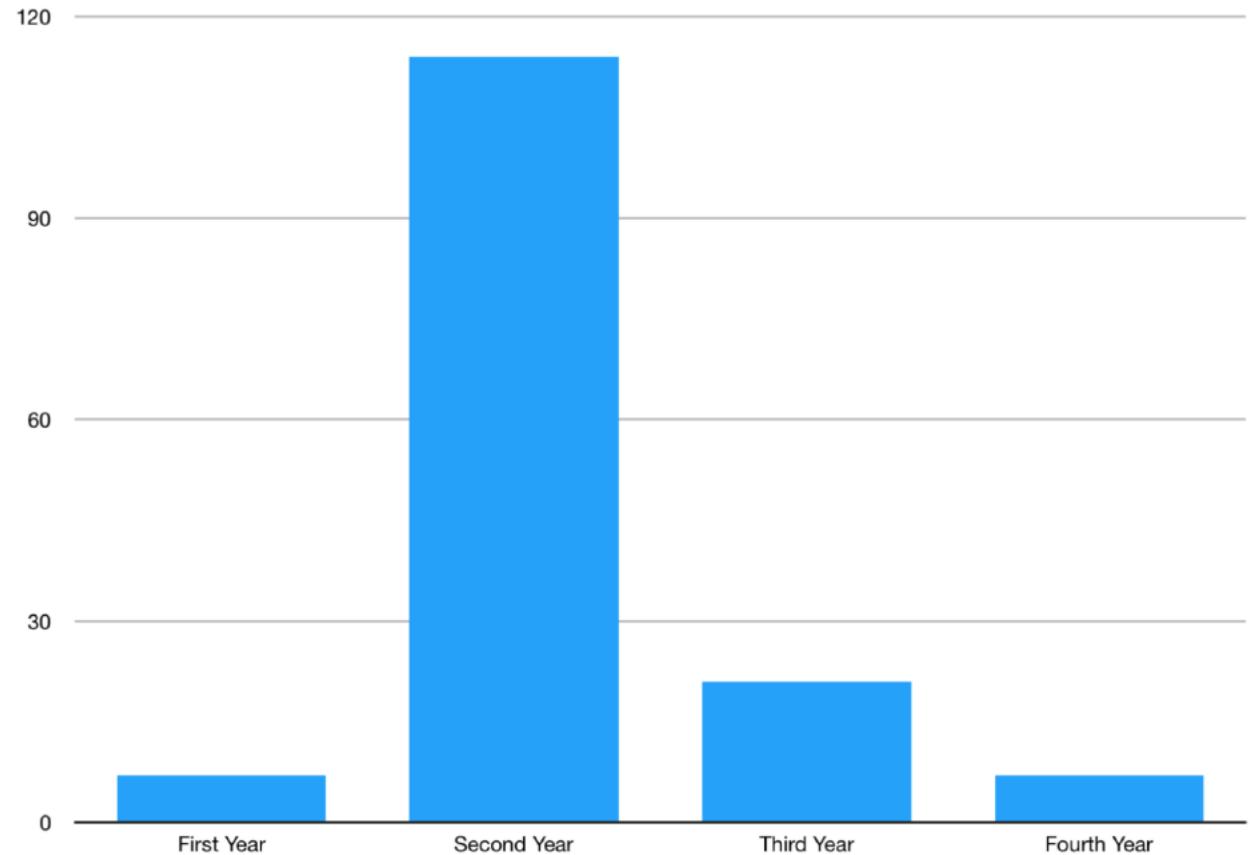
INFORMATION **VISUALIZATION**

Visually encoding the results of information analysis in order to **communicate insights, tell stories, and facilitate decision making.**

INFO 200-B Winter 2019 Enrollment by Class Standing

**What data values
are encoded into
this visualization?**

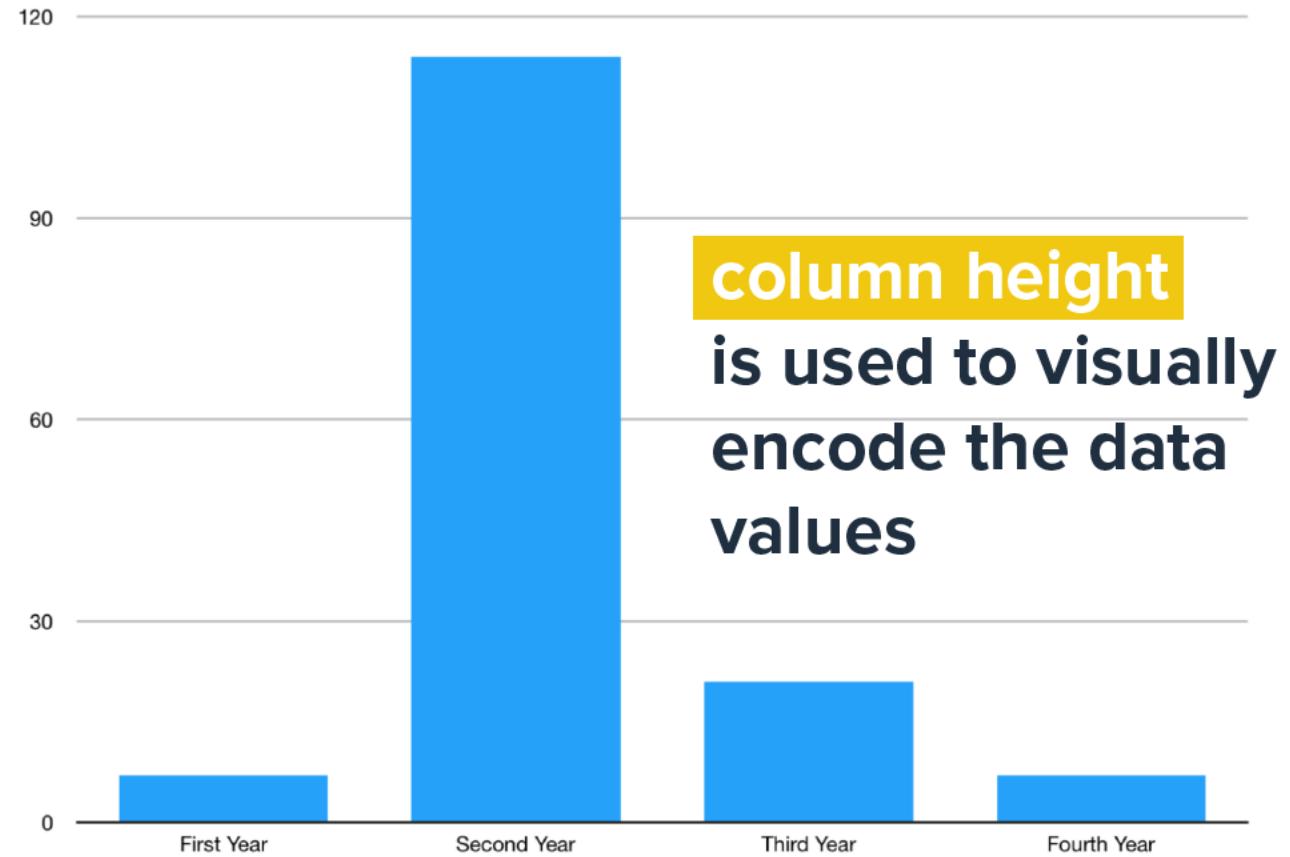
**What visual property
is used for encoding?**



INFO 200-B Winter 2019 Enrollment by Class Standing

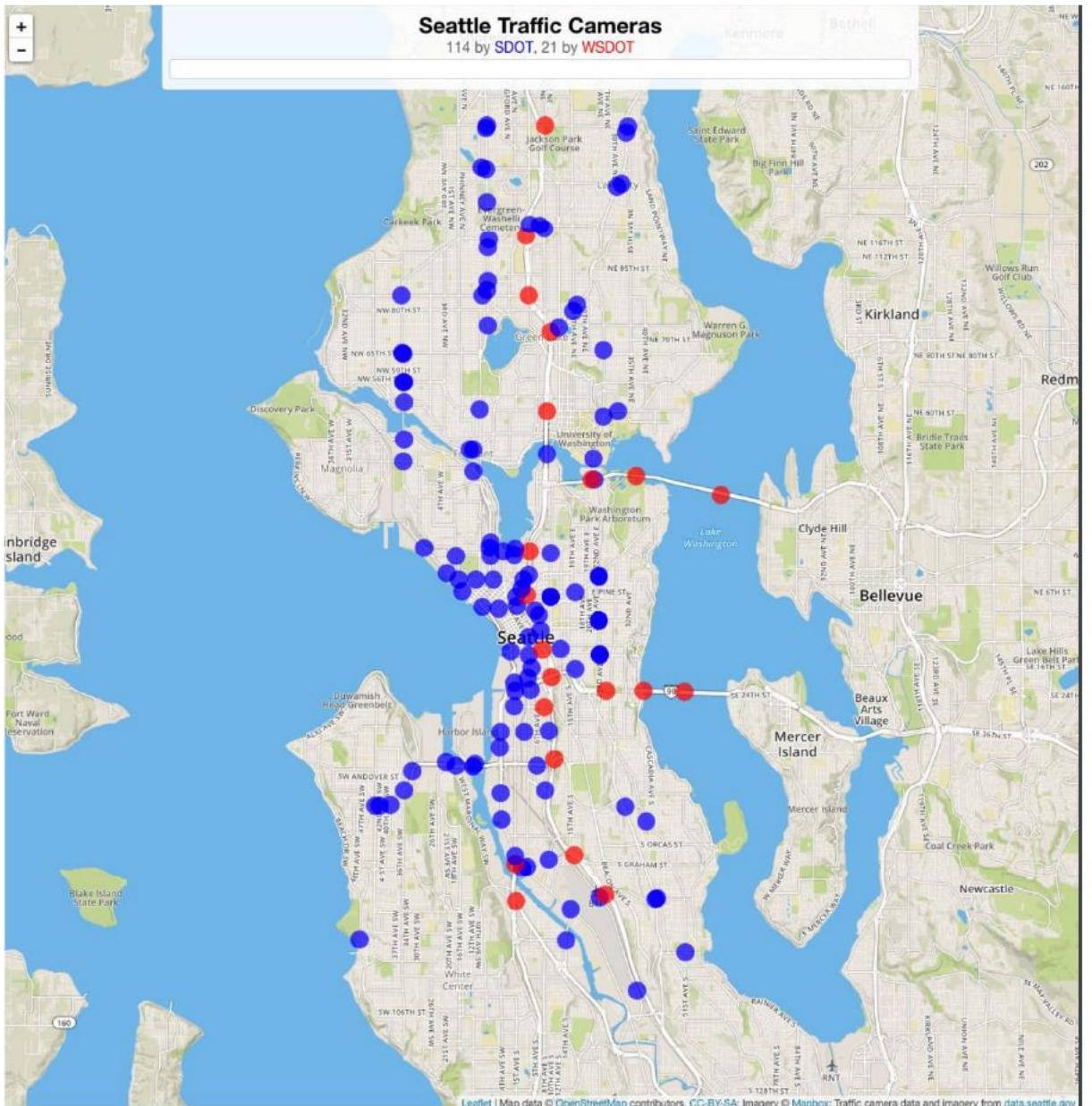
**What data values
are encoded into
this visualization?**

**What visual property
is used for encoding?**



**What data values
are encoded into
this visualization?**

**What visual property
is used for encoding?**



<http://hint.fm/wind/>

<info362>

VISUAL INFORMATION DESIGN

VISUAL POTENTIAL

VISUAL POTENTIAL

The potential a piece of information has to be converted into a **visual format.**

forms
the five ~~infinity stones~~ of

VISUAL POTENTIAL

forms
the five ~~infinity stones~~ of

VISUAL POTENTIAL



appearance

the five ~~infinity stones~~^{forms} of

VISUAL POTENTIAL



appearance



relationships

the five ~~infinity stones~~^{forms} of

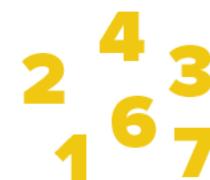
VISUAL POTENTIAL



appearance



relationships



numbers

the five ~~infinity stones~~ forms of

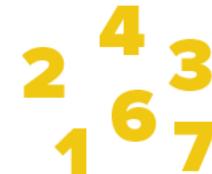
VISUAL POTENTIAL



appearance



relationships



numbers



location

the five ~~infinity stones~~ forms of

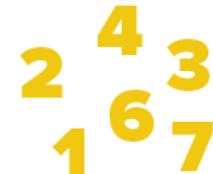
VISUAL POTENTIAL



appearance



relationships



numbers



location



time

the five ~~infinity stones~~ forms of

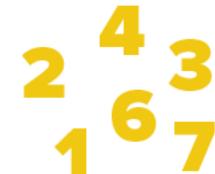
VISUAL POTENTIAL



appearance



relationships



numbers



location



time

the five ~~infinity stones~~^{forms} of

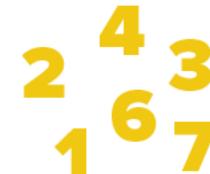
VISUAL POTENTIAL



appearance*



relationships*



numbers



location*



time*

premium subscription only*

Rank	Artist	Listeners per month (millions)	Chg	Ref(s)
1	Justin Bieber	65.92	▲	[1]
2	Billie Eilish	61.91	▲	[2]
3	Ed Sheeran	61.07	▼	[3]
4	Camila Cabello	56.96	▼	[4]
5	J Balvin	56.77	▲	[5]
6	Khalid	55.46	▲	[6]
7	Post Malone	53.99	▼	[7]
8	The Weeknd	53.27	▲	[8]
9	Drake	52.29	▼	[9]
10	Dua Lipa	51.70	▼	[9]
11	Nicki Minaj	50.21	▼	[10]
12	Maroon 5	49.11	▲	[11]
13	Eminem	46.99	▼	[12]
14	Tones and I	46.94	—	[13]
15	Halsey	46.05	▲	[14]
16	Selena Gomez	45.03	▼	[14]
17	Shawn Mendes	44.55	—	[15]
18	Daddy Yankee	42.74	▲	[16]
19	Ariana Grande	42.59	▼	[17]
20	Sam Smith	40.09	▲	[18]

As of February 23, 2020

Visual Potential of Numbers

Rank	Artist	Listeners per month (millions)	Chg	Ref(s)
1	Justin Bieber	65.92	▲	[1]
2	Billie Eilish	61.91	▲	[2]
3	Ed Sheeran	61.07	▼	[3]
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6	Khalid	55.46	▲	[6]
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13	Eminem	46.99	▼	[12]
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15	Halsey	46.05	▲	[14]
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18	Daddy Yankee	42.74	▲	[16]
19	Ariana Grande	42.59	▼	[17]
20	Sam Smith	40.09	▲	[18]

As of February 23, 2020

Which artist has the most monthly listeners on Spotify?



*these are in relation to 2019 so they're off

Visual Potential of Numbers

**EXPLOITING THE VISUAL POTENTIAL
OF NUMBERS IS FARILY EASY!**

**THERE ARE SEVERAL WAYS,
SUCH AS...**

SIZE

10

11

100

100

AREA

10

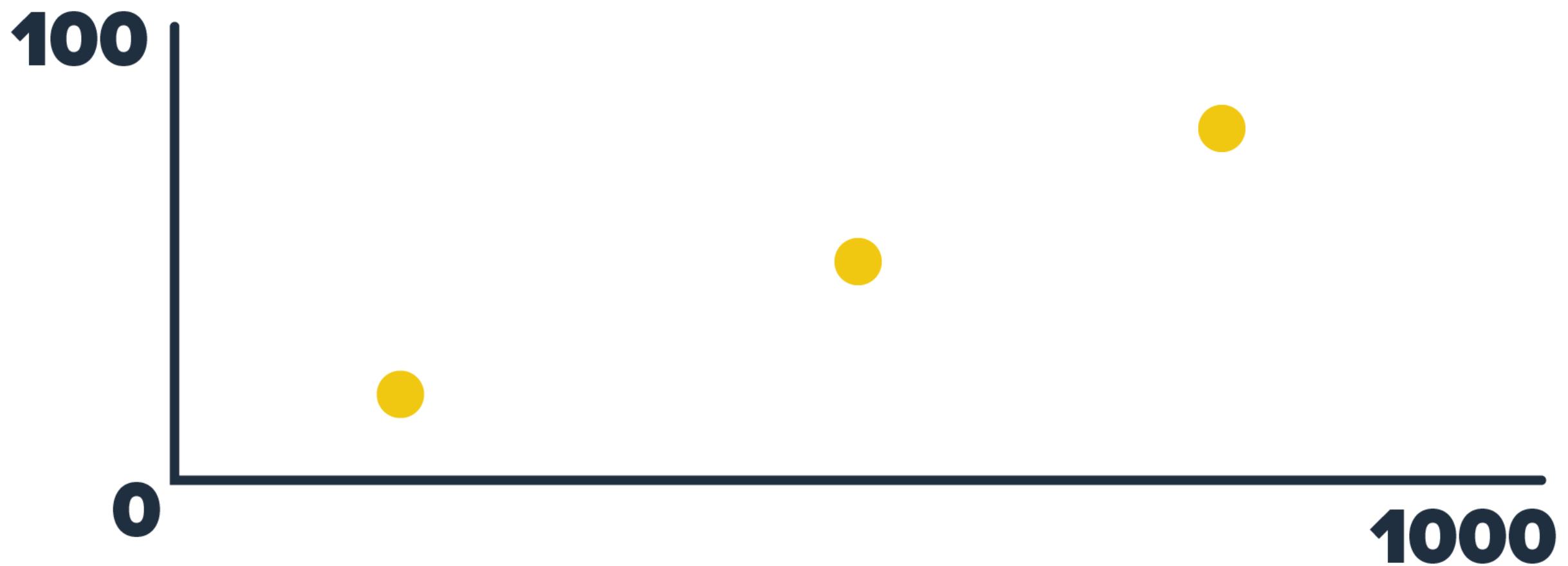
100

LENGTH

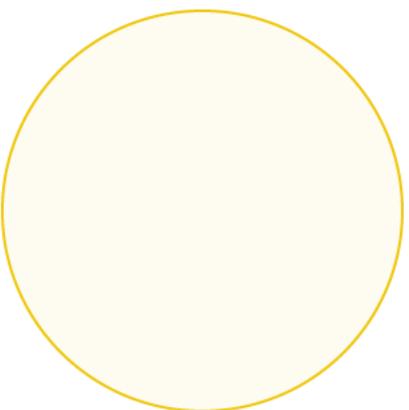
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100

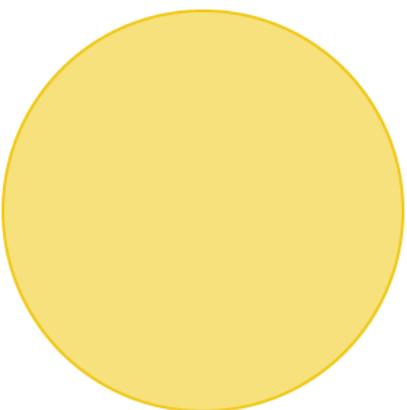
POSITION



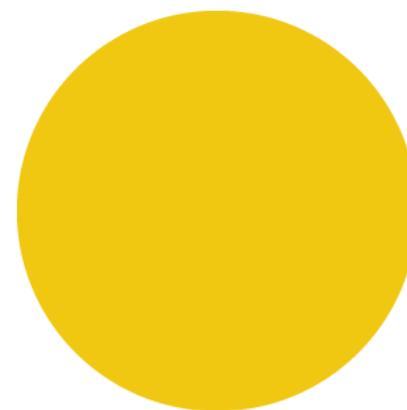
SATURATION



a lil

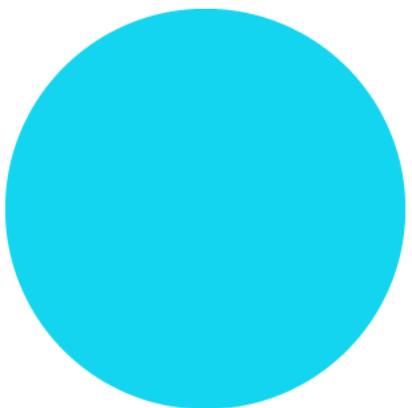


some

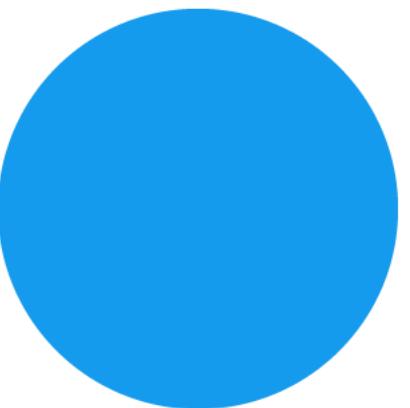


a lot

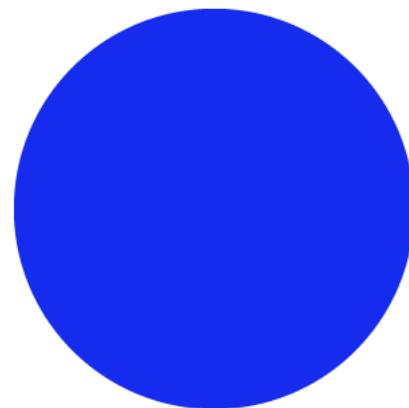
HUE



a lil



some



a lot

the five ~~infinity stones~~^{forms} of

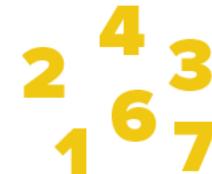
VISUAL POTENTIAL



appearance*



relationships*



numbers



location*



time*

premium subscription only*

Exploiting the visual potential of information is how we can turn reports and data sheets...

Spotify

From Wikipedia, the free encyclopedia

Spotify Technology S.A. ([/spotfai/](#)) is an international media services provider. It is legally domiciled in [Luxembourg](#) and is headquartered in [Stockholm](#), Sweden.^[6]

Founded in 2006, the company's primary business is providing an audio [streaming](#) platform, the "Spotify" platform, that provides [DRM](#)-protected music, videos and [podcasts](#) from record labels and media companies. As a [freemium](#) service, basic features are free with advertisements or automatic music videos, while additional features, such as offline listening and commercial-free listening, are offered via paid subscriptions.

Launched on 7 October 2008, the Spotify platform provides access to over 50 million tracks.^[7] Users can browse by parameters such as artist, album, or genre, and can create, edit, and share playlists. Spotify is available in most of Europe and the Americas, Australia, New Zealand, and parts of Africa and Asia, and on most modern devices, including [Windows](#), [macOS](#), and [Linux](#) computers, and [iOS](#), and [Android](#) smartphones and tablets.^{[8][9]} As of February 2020, the company had 271 million monthly [active users](#), including 124 million paying subscribers.^[10]

Unlike physical or download sales, which pay artists a fixed price per song or album sold, Spotify pays [royalties](#) based on the number of artist streams as a proportion of total songs streamed. It distributes approximately 70% of its total revenue^[11] to rights holders, who then pay artists based on their individual agreements. Spotify has faced criticism from artists and producers including [Taylor Swift](#) and [Thom Yorke](#), who have argued that it does not fairly compensate musicians. In 2017, as part of its efforts to renegotiate license deals for an interest in [going public](#), Spotify announced that artists would be able to make albums temporarily exclusive to paid subscribers if the albums are part of [Universal Music Group](#) or the [Merlin Network](#).

Spotify's international headquarters are in Stockholm, Sweden, though each region has its own headquarters. Since February 2018, it has been listed on the [New York Stock Exchange](#) and in September 2018, the company relocated its [New York City](#) offices to [4 World Trade Center](#).^[12]

Contents [hide]	
1	History

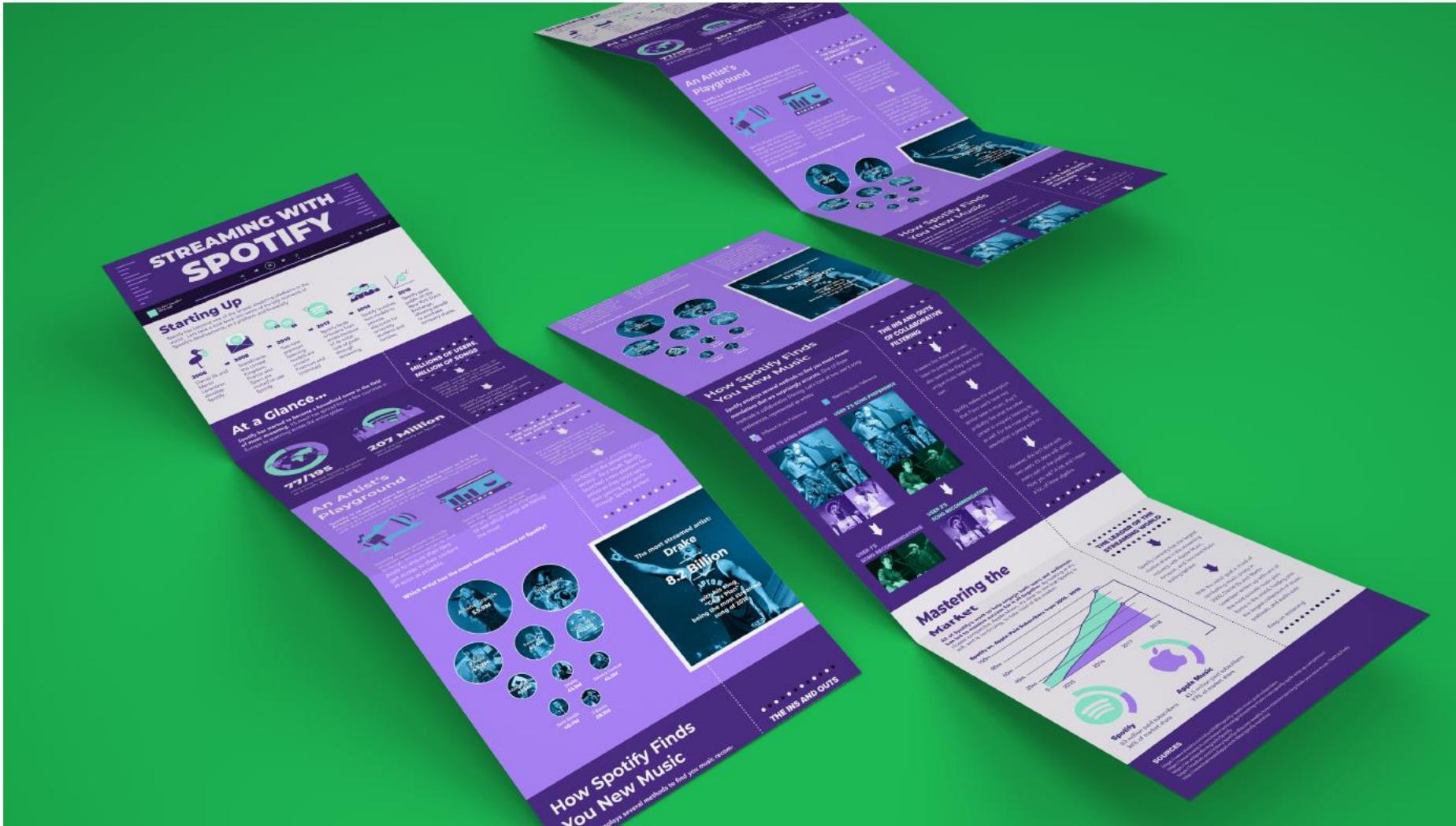
Spotify Technology S.A.	
	Screenshot [show]
Type of business	Public
Traded as	NYSE: SPOT
Founded	23 April 2006; 13 years ago
Headquarters	Legal: Luxembourg, Luxembourg Operational: Stockholm, Sweden
Country of origin	Sweden
No. of locations	20 ^[1]
Founder(s)	Daniel Ek Martin Lorentzon
Read more [details]	

100 most-streamed songs [edit]

The following table lists the top 100 most-streamed songs on Spotify, with streams rounded to the nearest million, as well as the artist(s), the album it is currently published to Spotify on, and the date it was originally published on Spotify

Rank	Song	Artist(s)	Album	Streams (millions)	Date published
1	"Shape of You"	Ed Sheeran	+ <i>÷</i>	2,430	6 January 2017
2	"Rockstar"	Post Malone featuring 21 Savage	Bearbongs & Bentleys	1,829	15 September 2017
3	"One Dance"	Drake featuring Wizkid and Kyla	Views	1,816	5 April 2016
4	"Closer"	The Chainsmokers featuring Halsey	Collage	1,722	29 July 2016
5	"Thinking Out Loud"	Ed Sheeran	x	1,491	20 June 2014
6	"God's Plan"	Drake	Scorpion	1,481	19 January 2018
7	"Havana"	Camila Cabello featuring Young Thug	Camila	1,397	3 August 2017
8	"Sunflower"	Post Malone and Swae Lee	Spider-Man: Into the Spider-Verse & Hollywood's Bleeding	1,372	18 October 2018
9	"Perfect"	Ed Sheeran	+ <i>÷</i>	1,349	3 March 2017
10	"Love Yourself"	Justin Bieber	Purpose	1,345	9 November 2015
11	"Say You Won't Let Go"	James Arthur	Back from the Edge	1,342	9 September 2016
12	"Despacito (Remix)"	Luis Fonsi and Daddy Yankee featuring Justin Bieber	Vida	1,327	17 April 2017
13	"Lean On"	Major Lazer and DJ Snake featuring MØ	Peace Is the Mission	1,325	2 March 2015
14	"Photograph"	Ed Sheeran	x	1,312	20 June 2014
15	"New Rules"	Dua Lipa	Dua Lipa	1,303	2 June 2017
16	"Starboy"	The Weeknd featuring Daft Punk	Starboy	1,298	21 September 2016
17	"Believer"	Imagine Dragons	Evolve	1,285	1 February 2017
18	"Sorry"	Justin Bieber	Purpose	1,279	22 October 2015
19	"Don't Let Me Down"	The Chainsmokers featuring Daya	Collage	1,266	5 February 2016
20	"Señorita"	Shawn Mendes and Camila Cabello	Shawn Mendes & Romance	1,262	21 June 2019
21	"Something Just Like This"	The Chainsmokers and Coldplay	Memories...Do Not Open	1,245	22 February 2017

...into infographics!



</info362>

VISUAL INFORMATION DESIGN

Which visual properties work best?

Those that enable people to quickly
and accurately percieve the data

**When the next slide starts,
figure out how many 3s there are.**

**4747293740918402894719056199602
5483641783054618730461827465109
4561946192804132404651983461893**

don't you dare say “a lot” 

how many 3s are there?

ATTENTIVE PROCESSING

**closely observing and searching through
an item to recognize particular features.**

**Let's try that again.
This time, how many 5s?**

4747293740913840283947190561996
0254836417830546187304618274651
0945619461392804132404651983461

gogogogogogogogogogo

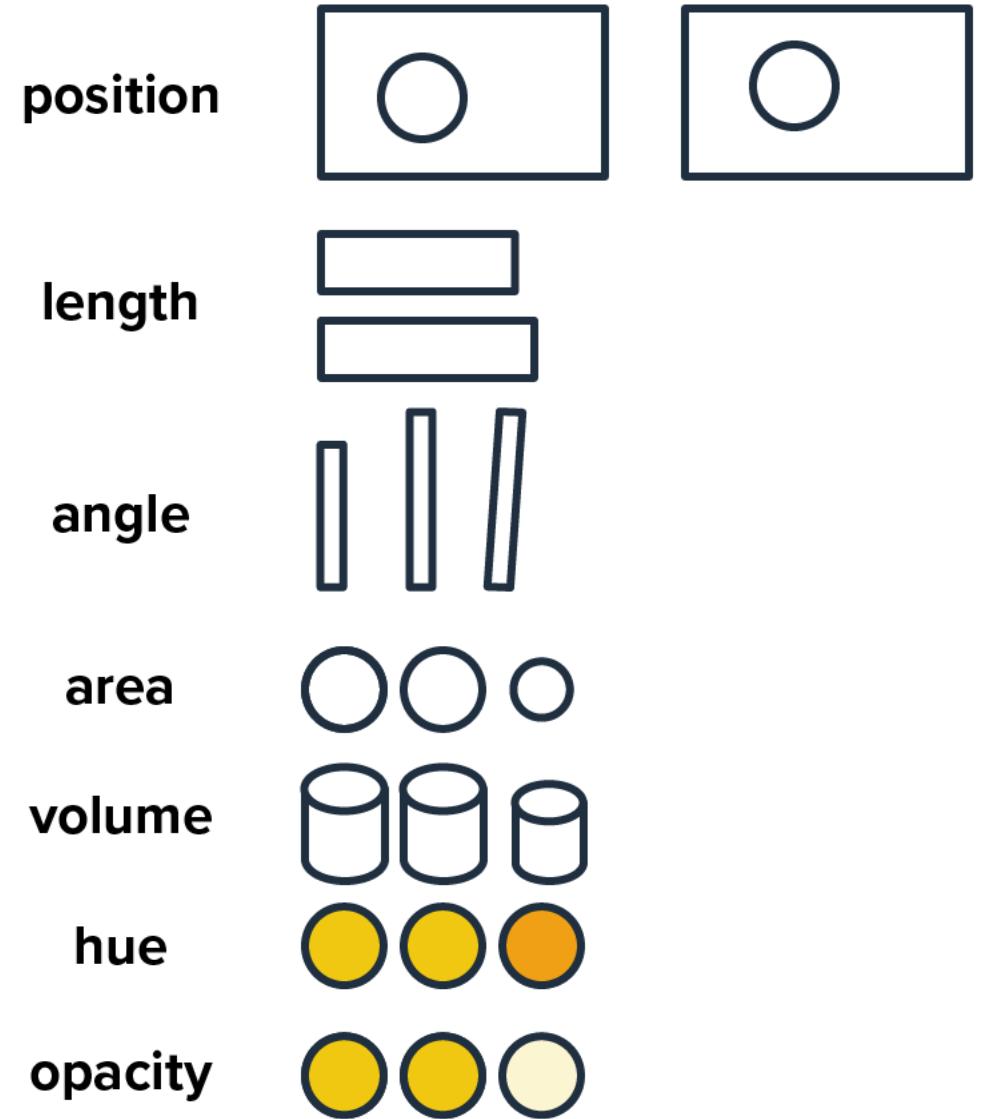
how many 5s are there?

PREATTENTIVE PROCESSING

the body's processing of sensory information that occurs **before** the conscious mind **starts to pay attention** to any specific objects

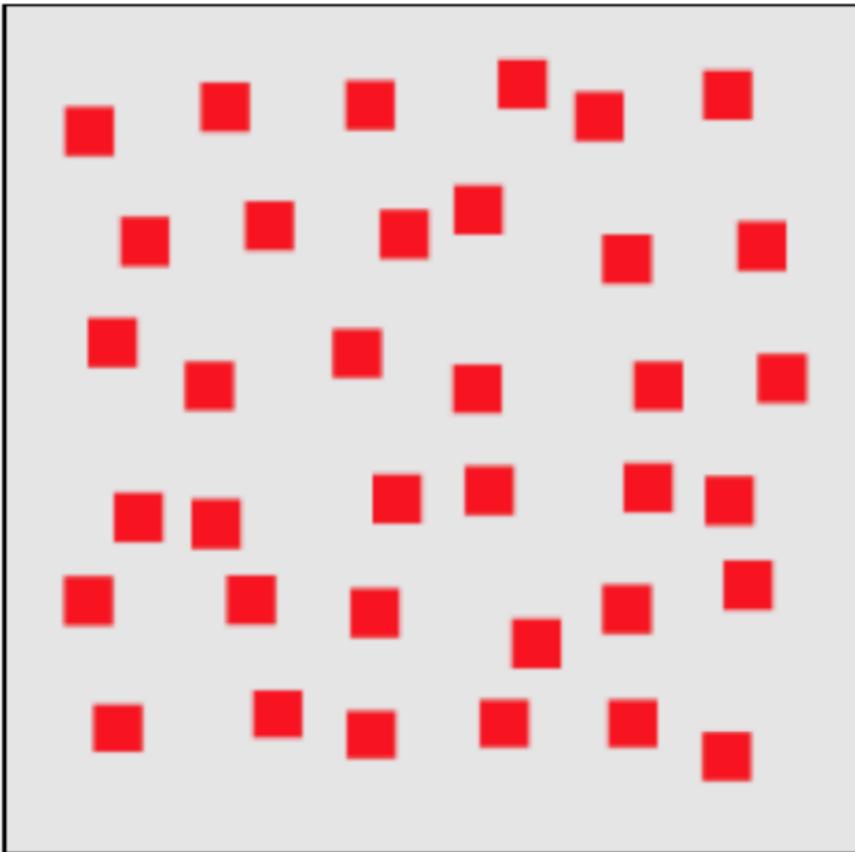
**Some qualities we can
perceive quickly with
little difference.**

**Other qualities require
more difference to be
perceived.**

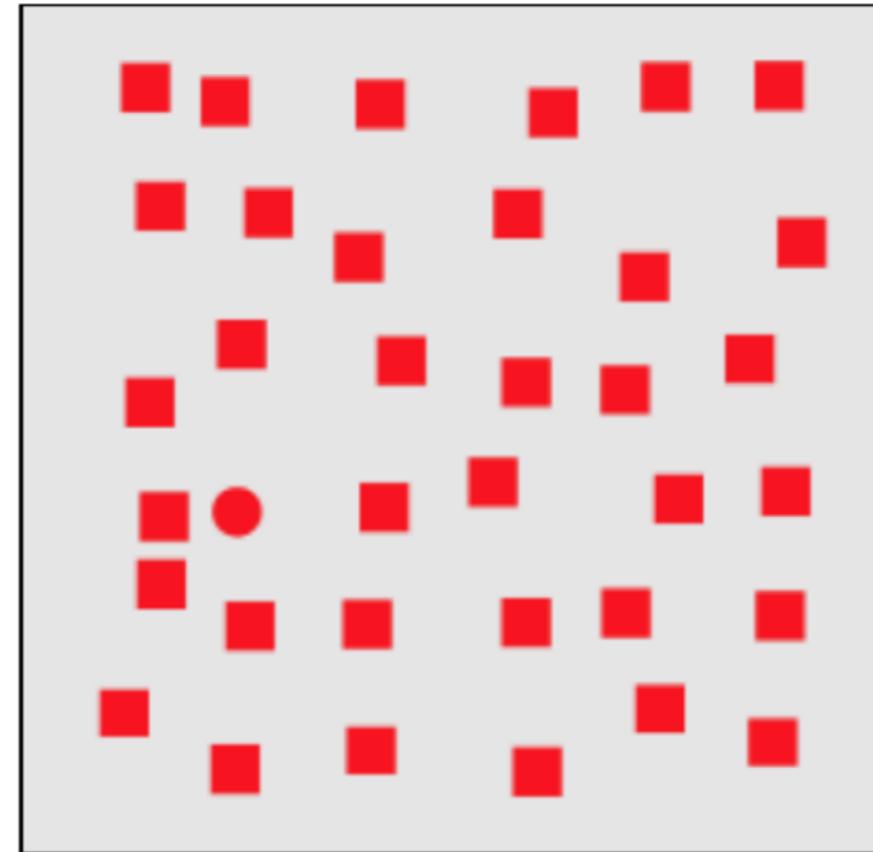


Which side has the red circle? ●

Which side has the red circle? •



(a)



(b)

Which side has the red circle? ●

kinda tough right

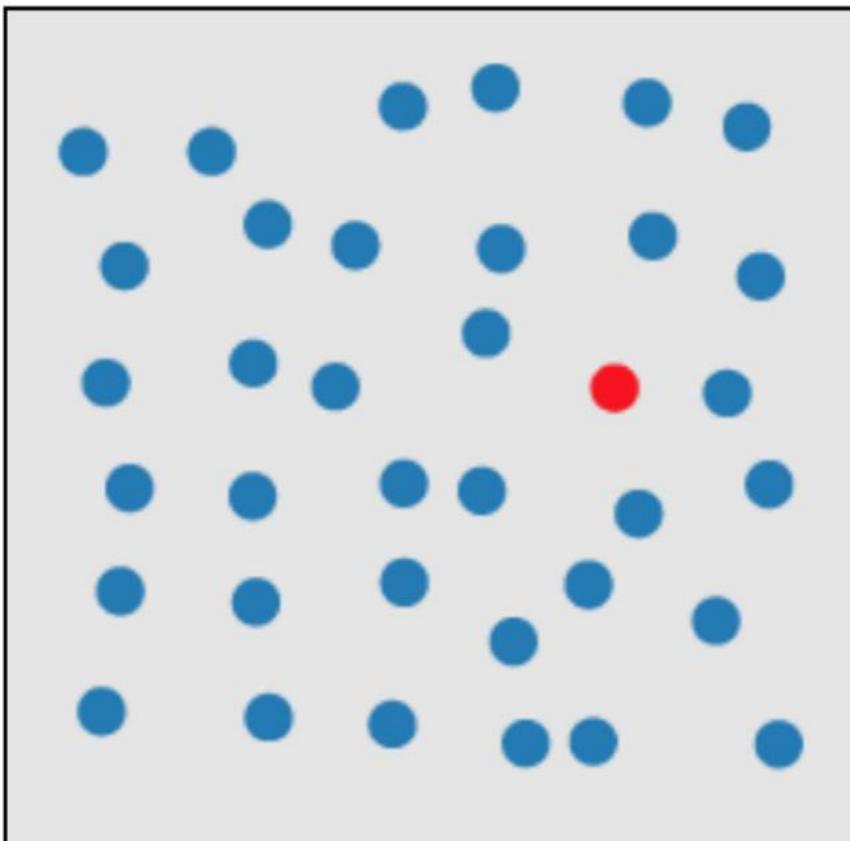
**ok ok let's try again.
one change tho**

**this is a safety slide so
my dumb self doesn't accidentally
click too far ahead**

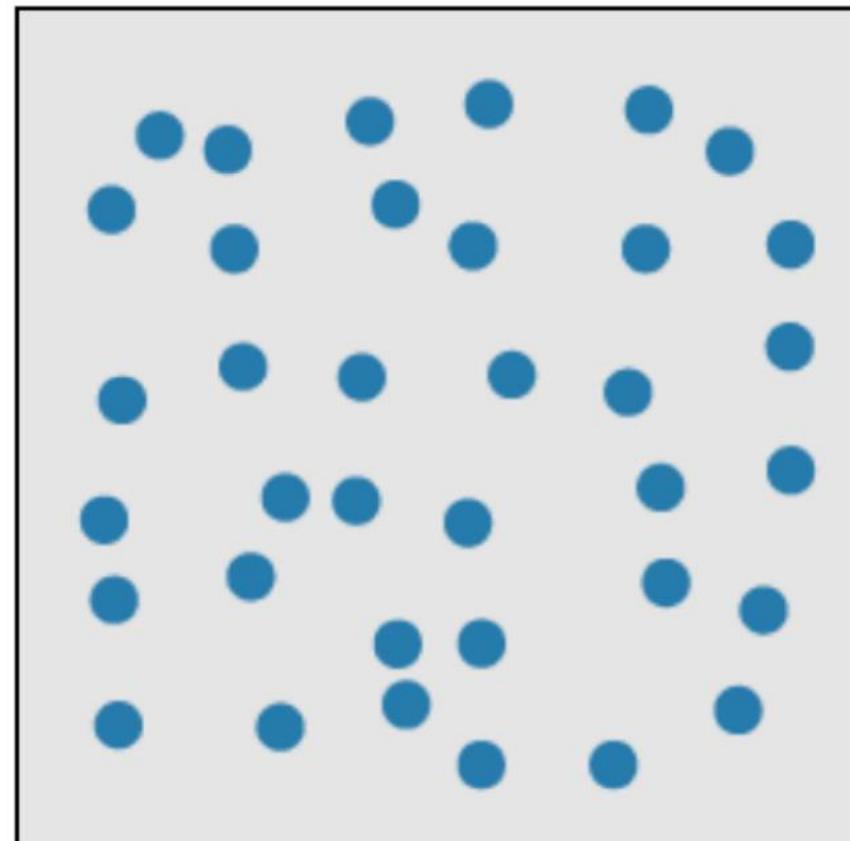
reset here my guy

Which side has the red circle? •

Which side has the red circle?



(a)

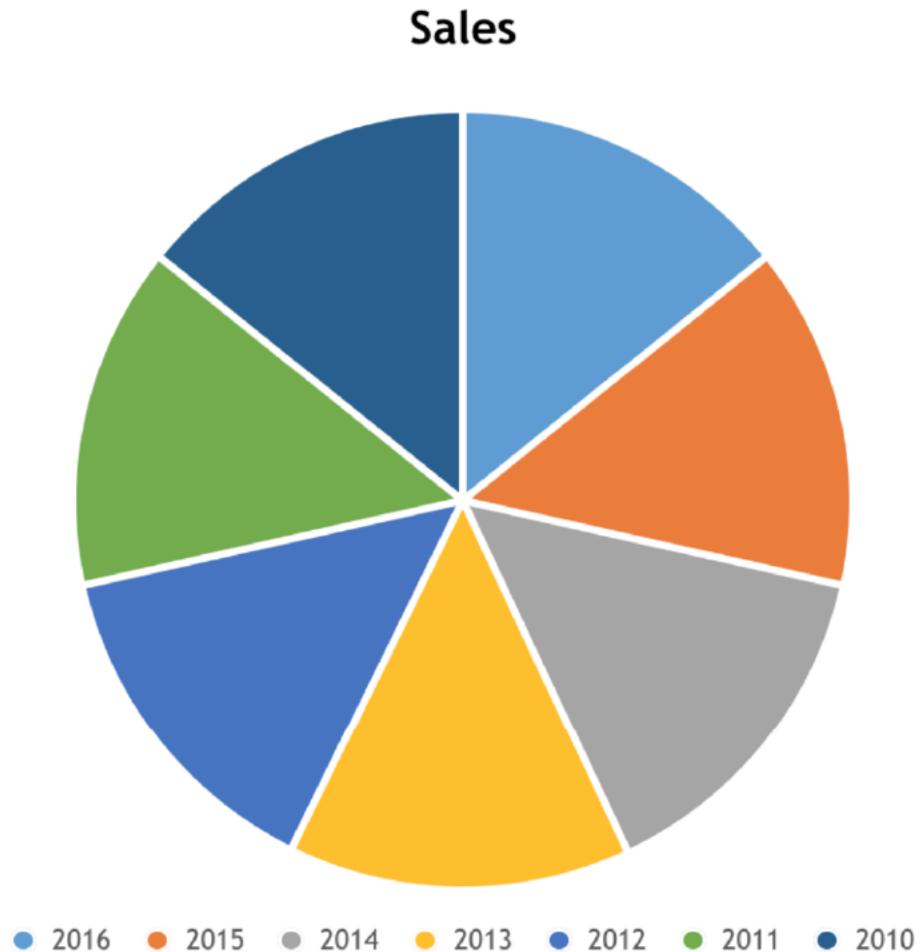


(b)

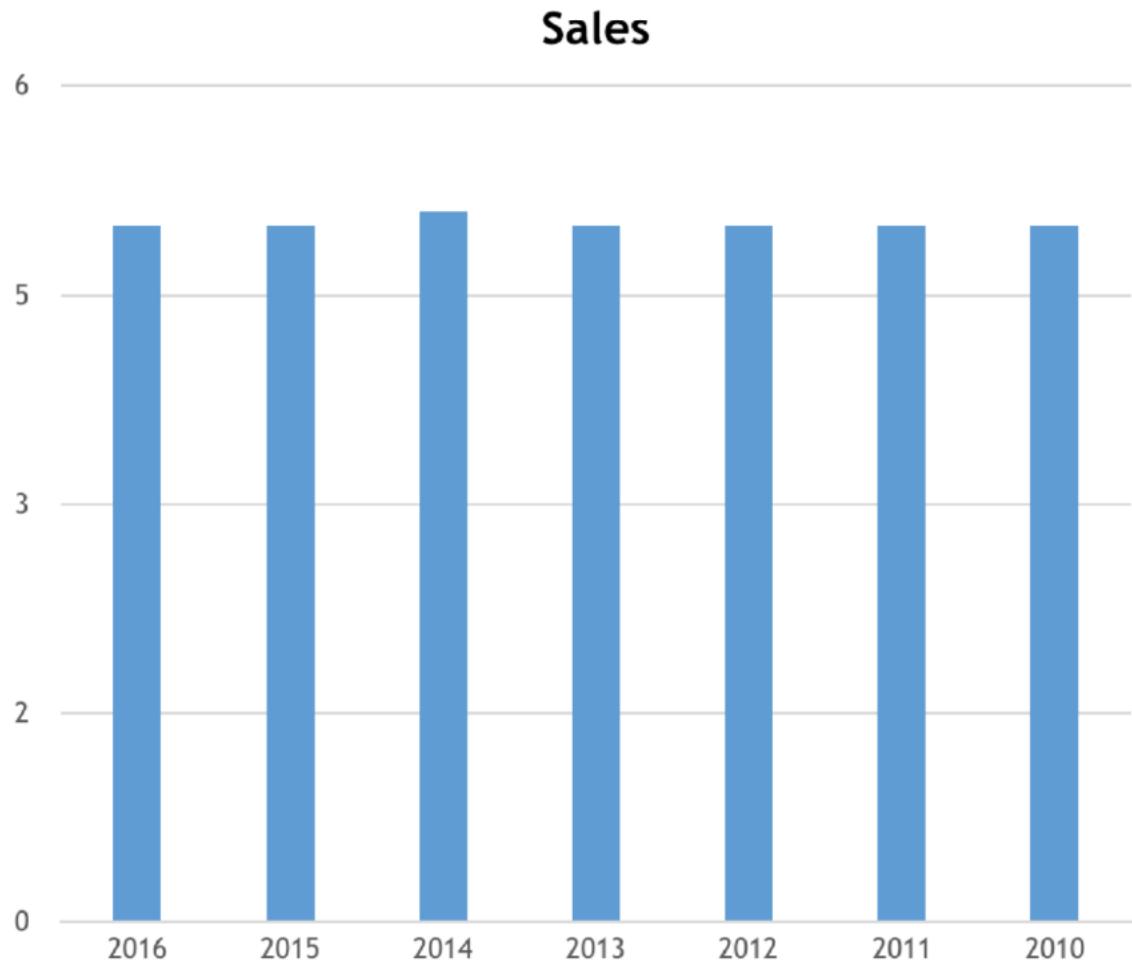
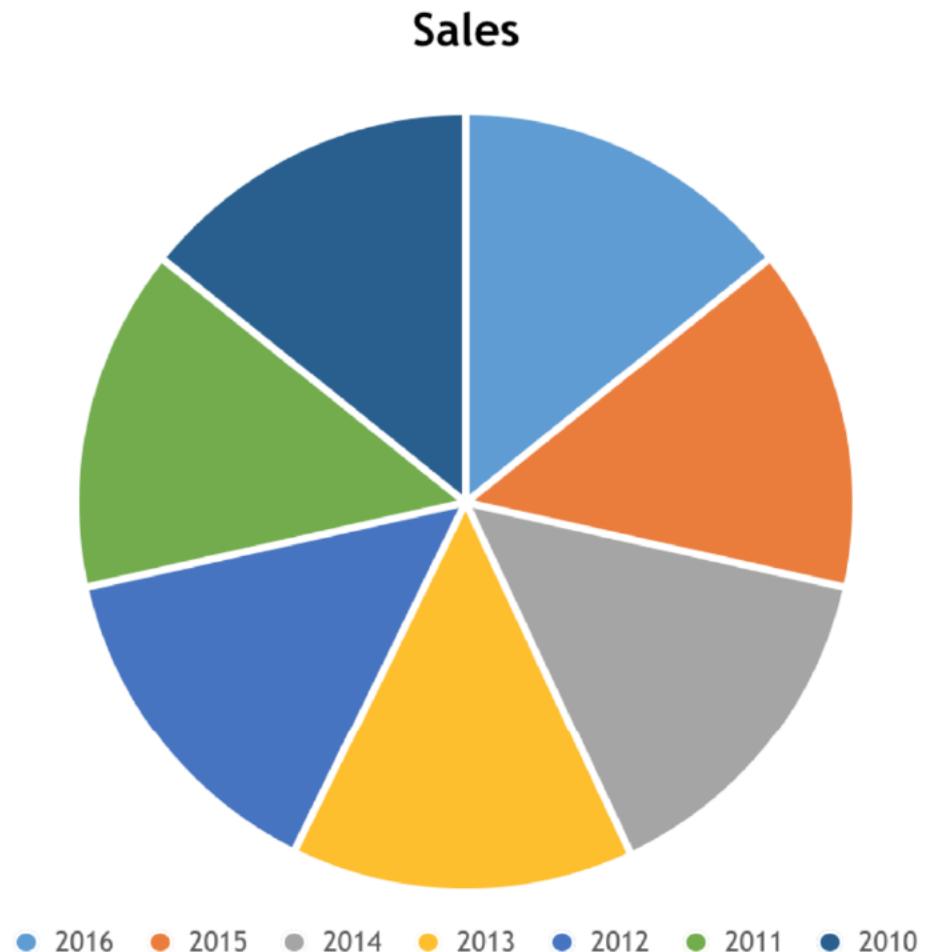
Which side has the red circle? •

What year had more sales?

What year had more sales?



What year had more sales?



Some qualities we can perceive quickly with little difference.

Other qualities require more difference to be perceived.

position



length



angle



area



volume



hue

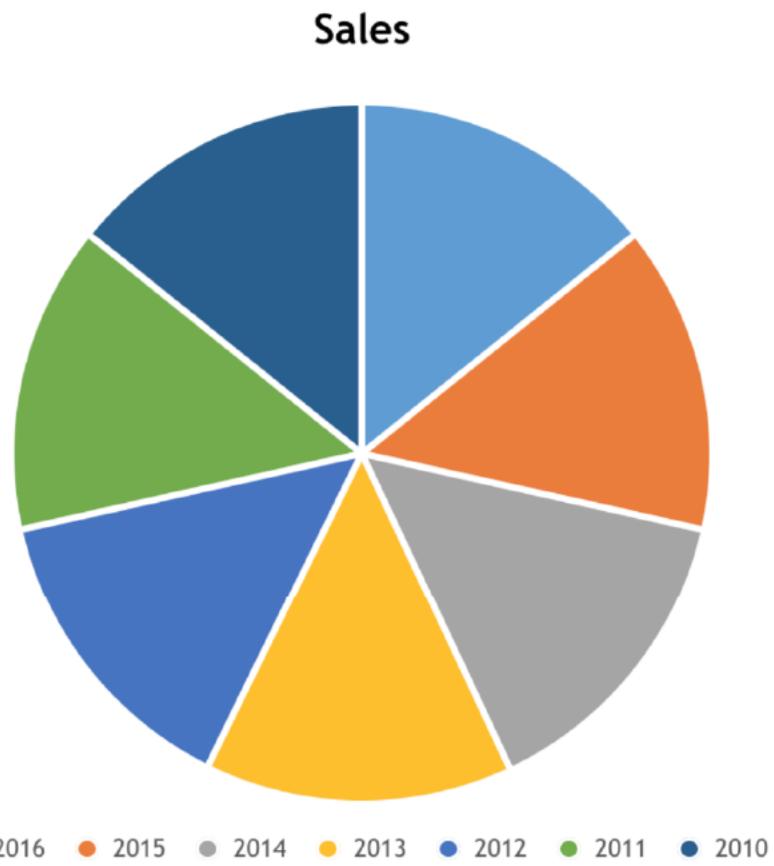


opacity



Pie charts are (mostly) bad when it comes to communicating data.

It utilizes too many visual aspects.



MAIN

SECONDARY

SIZE

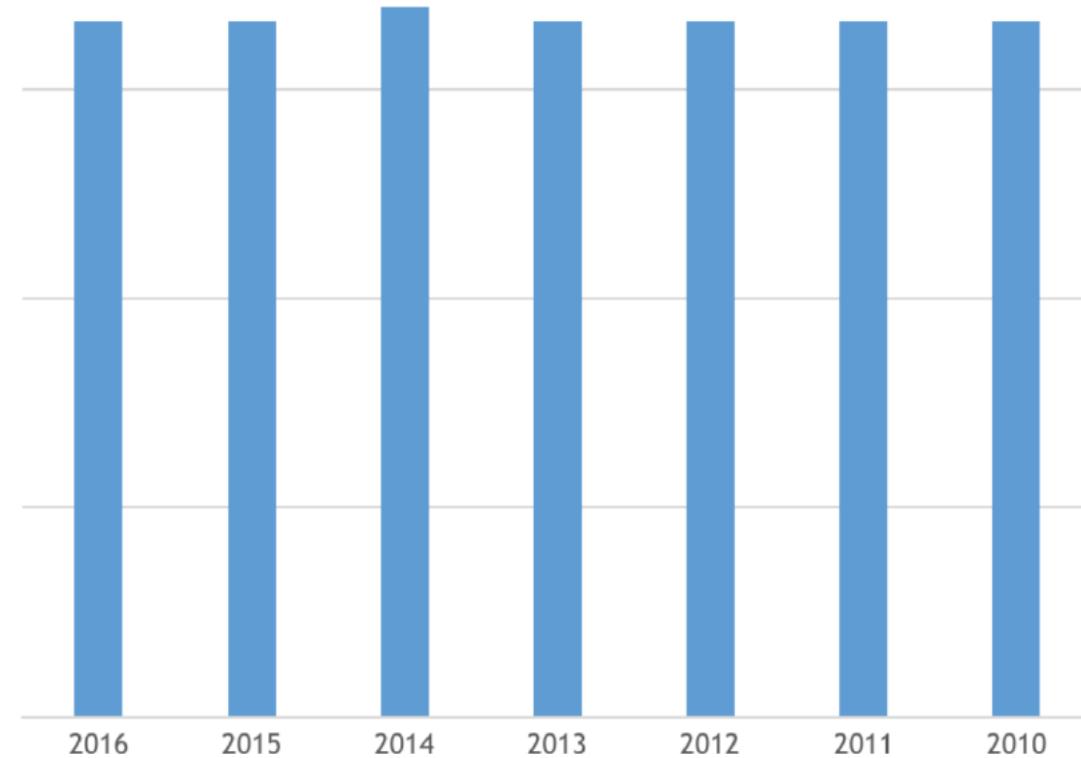
WIDTH

COLOR

2D POSITIONING

ANGLE

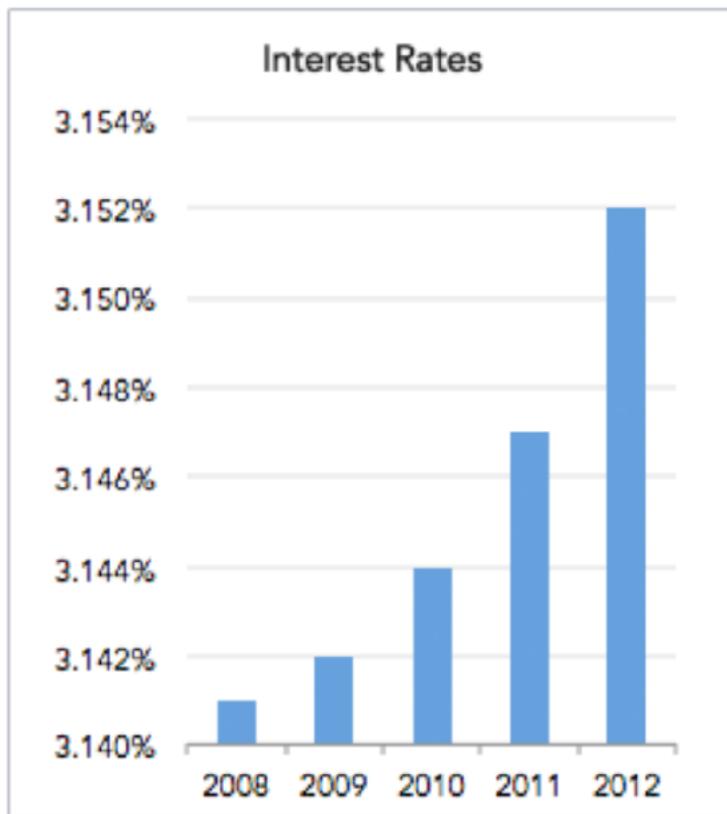
Sales



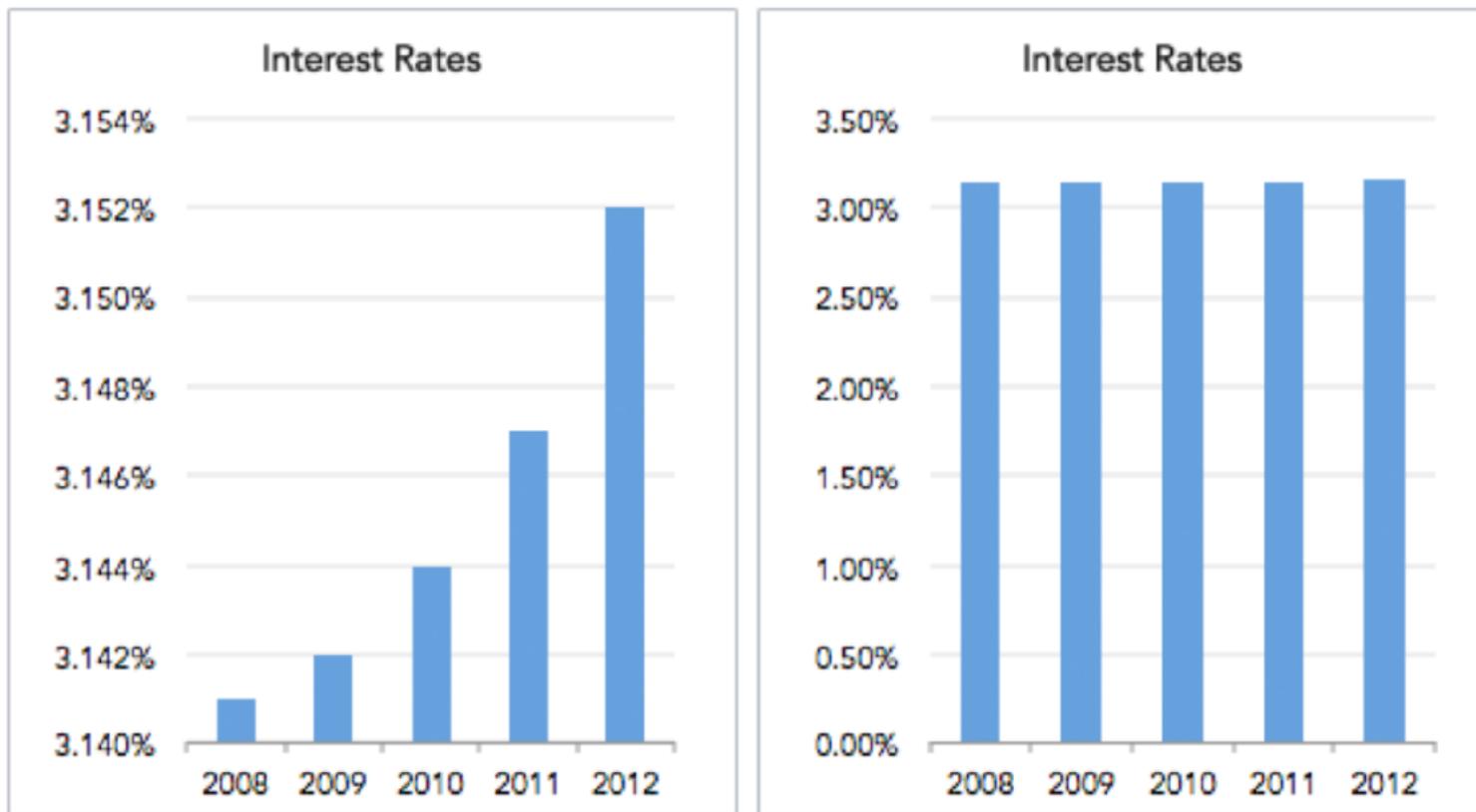
LENGTH

Visualizations can be misleading however...

Visualizations can be misleading however...



Visualizations can be misleading however...

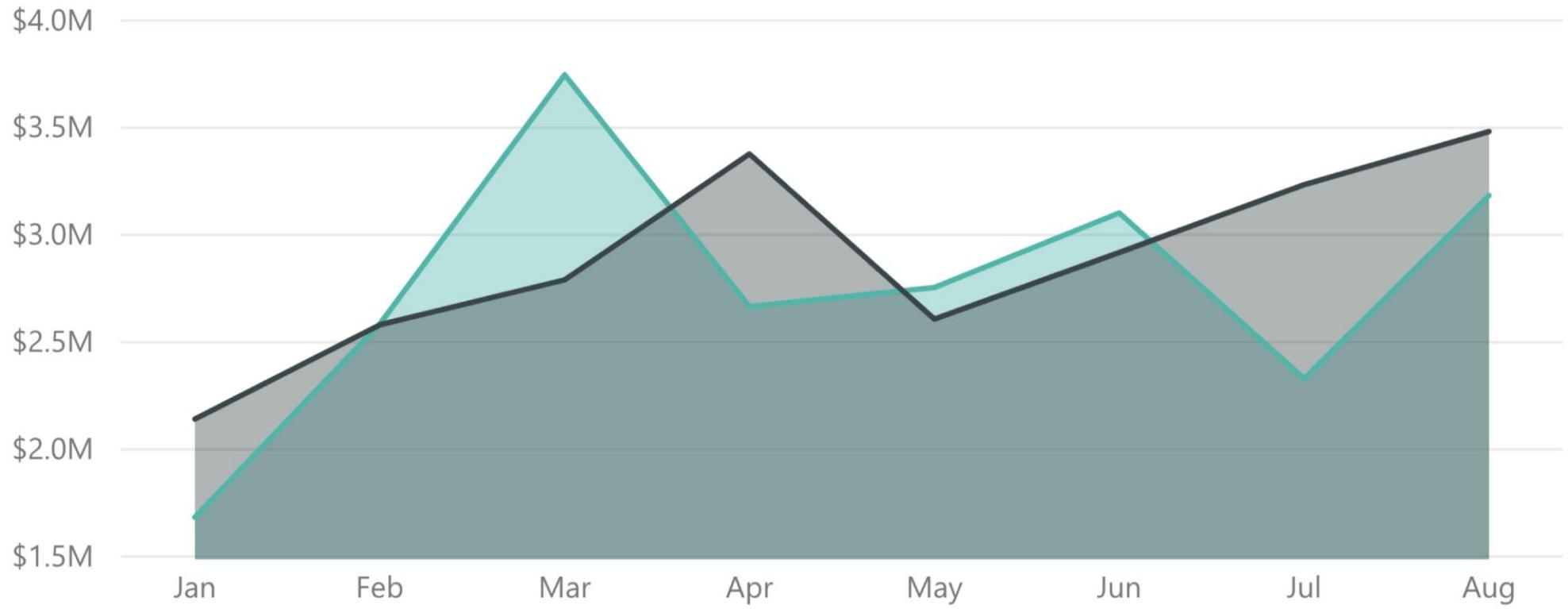


ID NO.	SPACE / ACTIVITY	EXISTING SPACE	SPACE CRITERIA SF	NO. OF PEOPLE	SPACE SUB-TOTAL	NO. OF SPACES	SF REQUIRED	NOTES
1.0 Entry, Lobby, Admissions, Store								
1.1	Entry Vestibule	0			150	1	150	
1.2	Lobby / Orientation	240			500	1	500	Includes artwork
1.3	Admissions / Tickets	0			50	1	50	
1.4	Museum Store	320			420	1	420	
1.5	Storage	0			80	1	80	
Sub-Total Net Assignable								1200
2.0 Activity / Program Areas								
2.1	Exhibit Floor	2770			4000	1	4000	1.5x larger than original space
2.2	Art Space	396			700	1	70	
2.3	Toddler Area	384			700	1	70	
2.4	Birthday Room	440	25	28	700	1	70	
2.5	Multi-purpose Room				300	1	300	
2.6	Kitchen	218			120	1	120	
Sub-Total Net Assignable								6520
3.0 Administration								
3.1	Reception / Waiting	0	80	1	80	1	80	
3.2	Executive Director	240	200	1	200	1	200	
3.3	Executive Toilet	35	50	1	50	1	50	
3.4	Dir. Of Administration	80	100	1	100	1	100	
3.5	Office Manager	64	80	1	80	1	80	
3.6	Bookkeeper	64	75	1	75	1	75	
3.7	Store Manager	64	75	1	75	1	75	
3.8	Dir. Of External Affairs	80	80	1	80	1	80	
3.9	PR Coordinator	64	75	1	75	1	75	
3.10	Future Staff	0	75	1	75	2	150	
3.11	Copy Room	210	180	1	180	1	180	
3.12	Meeting Area	0	100	1	100	1	100	
3.13	Filing and Storage	0	80	1	80	1	80	
Sub-Total Net Assignable								1325

still marveling at the beautiful spreadsheet

This Year Sales and Last Year Sales by FiscalMonth

● This Year Sales ● Last Year Sales



well this is a lot easier to read

Designing a Visualization

Who are you designing for?

What decision do they need to make?

What is the story you want to tell?

What visual properties will you use?

What will the axis (x, y, maybe z) represent?

Types of Data Visualizations

Static

The user is just a viewer, they can't change anything

INFO 362 - Visual Information Design

Interactive

User can change the parameters

INFO 474 - Interactive Information Visualization

So interactive or static?

So interactive or static?

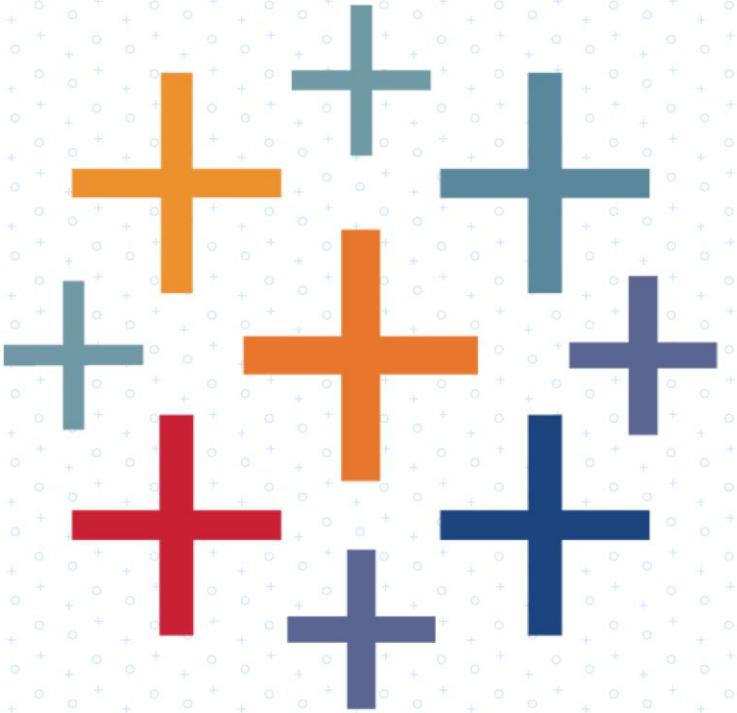
Static Infographics are great for **telling stories**

So interactive or static?

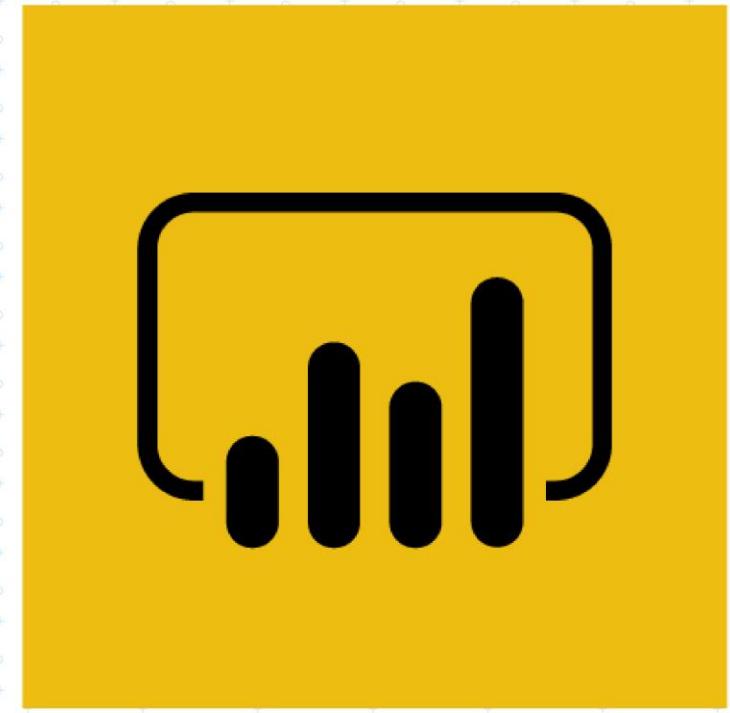
Static Infographics are great for **telling stories**

Interactive Visualizations are great for **allowing people to seek the information they want**

**WE NEED SOME WAY TO
PROCESS AND PRESENT DATA**



Tableau



PowerBI





- Not as popular as the other
- Really effective at it's job
- Plenty of cool “tricks in his bag”