

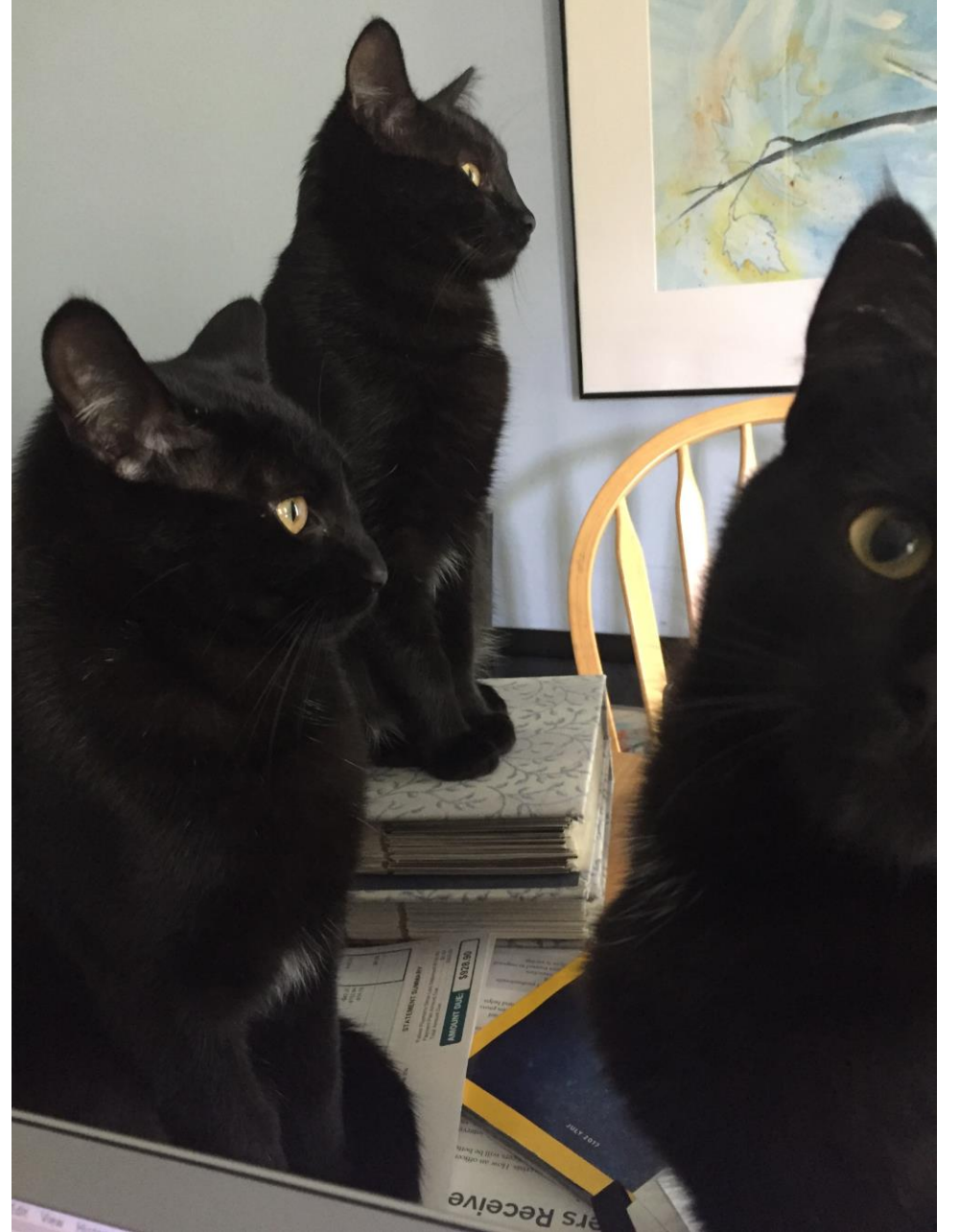
A Bigger Boat

Data Visualization Lessons From the Movies

Mark Vaillancourt - Microsoft

Trish Vaillancourt – St. Catherine University

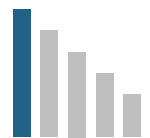
Our Cats



Agenda



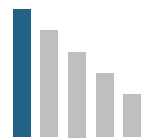
Agenda



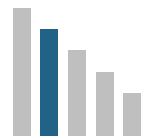
Why Bother?



Agenda



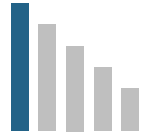
Why Bother?



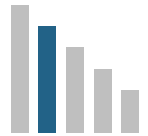
Perception



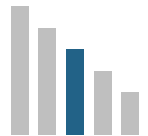
Agenda



Why Bother?



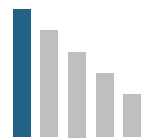
Perception



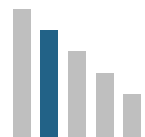
Preattentive Attributes



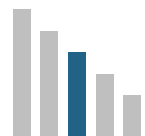
Agenda



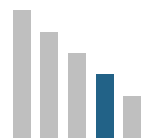
Why Bother?



Perception



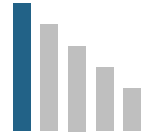
Preattentive Attributes



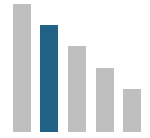
Attribute Encoding



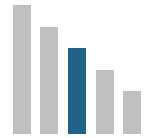
Agenda



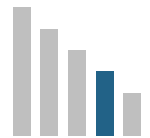
Why Bother?



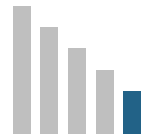
Perception



Preattentive Attributes



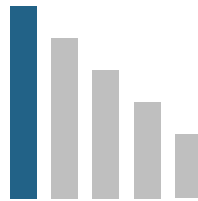
Attribute Encoding



Gestalt Principles



Why Bother?



VIDEO

A Bigger Boat

Why Data Visualization?



Jaws

<https://www.youtube.com/watch?v=2I91DJZKRxs>

Audience Participation Time!

On how many days did Crisp sales exceed 160 bars?

On how many days did Crisp sales exceed 160 bars?

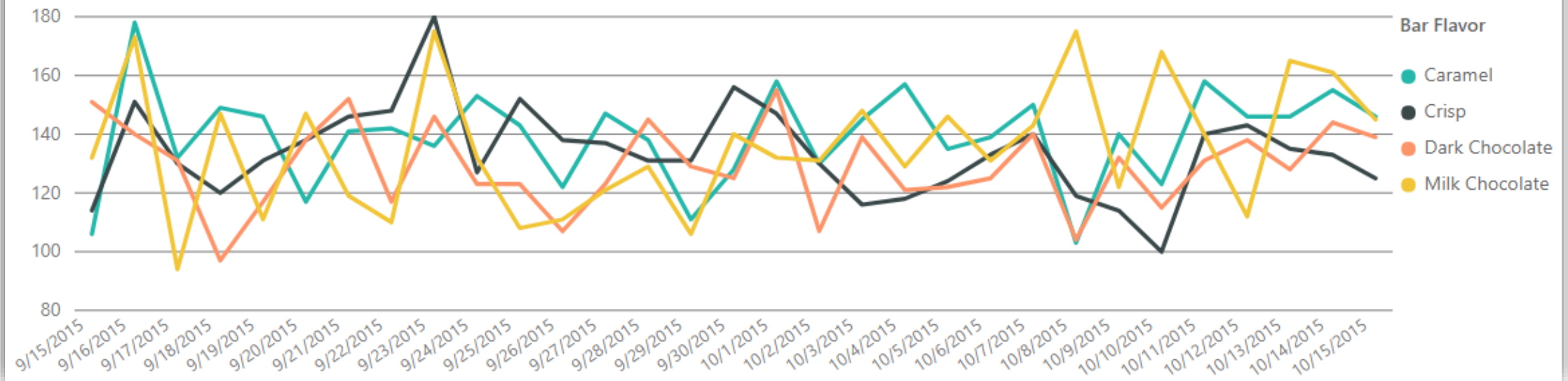
Bar Flavor	9/15/2015	9/16/2015	9/17/2015	9/18/2015	9/19/2015	9/20/2015	9/21/2015	9/22/2015	9/23/2015	9/24/2015	9/25/2015	9/26/2015	9/27/2015	9/28/2015	9/29/2015	9/30/2015
Caramel	106	178	132	149	146	117	141	142	136	153	143	122	147	138	111	128
Crisp	114	151	130	120	131	138	146	148	180	127	152	138	137	131	131	156
Dark Chocolate	151	140	131	97	117	138	152	117	146	123	123	107	123	145	129	125
Milk Chocolate	132	173	94	147	111	147	119	110	175	132	108	111	121	129	106	140
Total	503	642	487	513	505	540	558	517	637	535	526	478	528	543	477	549
<div>< <div></div> ></div>																
Bar Flavor	10/1/2015	10/2/2015	10/3/2015	10/4/2015	10/5/2015	10/6/2015	10/7/2015	10/8/2015	10/9/2015	10/10/2015	10/11/2015	10/12/2015	10/13/2015	10/14/2015	10/15/2015	
Caramel	158	130	145	157	135	139	150	103	140	123	158	146	146	155	146	
Crisp	147	130	116	118	124	133	140	119	114	100	140	143	135	133	125	
Dark Chocolate	155	107	139	121	122	125	140	104	132	115	131	138	128	144	139	
Milk Chocolate	132	131	148	129	146	131	143	175	122	168	140	112	165	161	145	
Total	592	498	548	525	527	528	573	501	508	506	569	539	574	593	555	
<div>< <div></div> ></div>																

On how many days did Crisp sales exceed 160 bars?

Bar Flavor	9/15/2015	9/16/2015	9/17/2015	9/18/2015	9/19/2015	9/20/2015	9/21/2015	9/22/2015	9/23/2015	9/24/2015	9/25/2015	9/26/2015	9/27/2015	9/28/2015	9/29/2015	9/30/2015
Caramel	106	178	132	149	146	117	141	142	136	153	143	122	147	138	111	128
Crisp	114	151	130	120	131	138	146	148	180	127	152	138	137	131	131	156
Dark Chocolate	151	140	131	97	117	138	152	117	146	123	123	107	123	145	129	125
Milk Chocolate	132	173	94	147	111	147	119	110	175	132	108	111	121	129	106	140
Total	503	642	487	513	505	540	558	517	637	535	526	478	528	543	477	549

Bar Flavor	10/1/2015	10/2/2015	10/3/2015	10/4/2015	10/5/2015	10/6/2015	10/7/2015	10/8/2015	10/9/2015	10/10/2015	10/11/2015	10/12/2015	10/13/2015	10/14/2015	10/15/2015
Caramel	158	130	145	157	135	139	150	103	140	123	158	146	146	155	146
Crisp	147	130	116	118	124	133	140	119	114	100	140	143	135	133	125
Dark Chocolate	155	107	139	121	122	125	140	104	132	115	131	138	128	144	139
Milk Chocolate	132	131	148	129	146	131	143	175	122	168	140	112	165	161	145
Total	592	498	548	525	527	528	573	501	508	506	569	539	574	593	555

Quantity Sold - Total by Sale Date and Bar Flavor

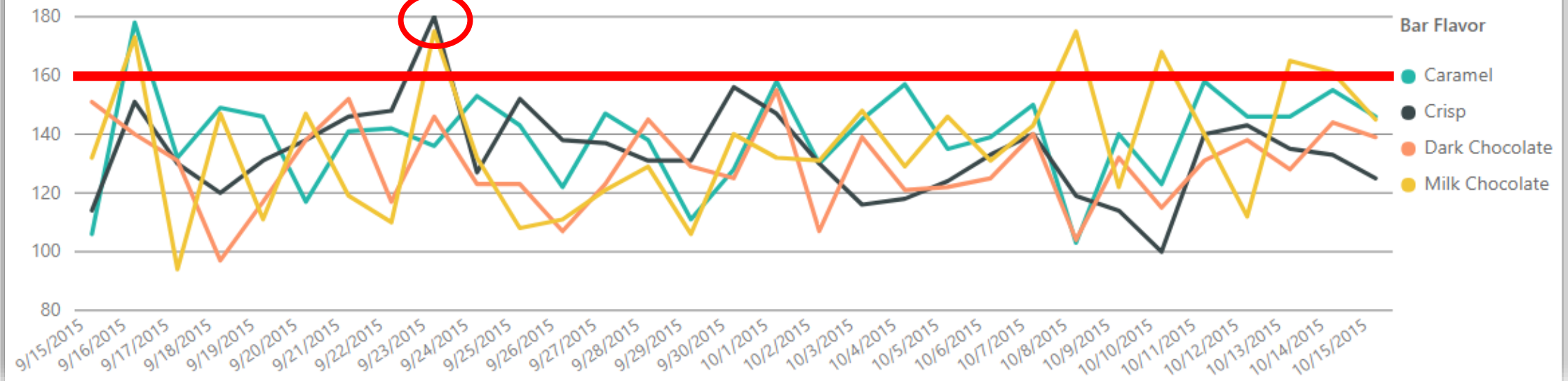


On how many days did Crisp sales exceed 160 bars?

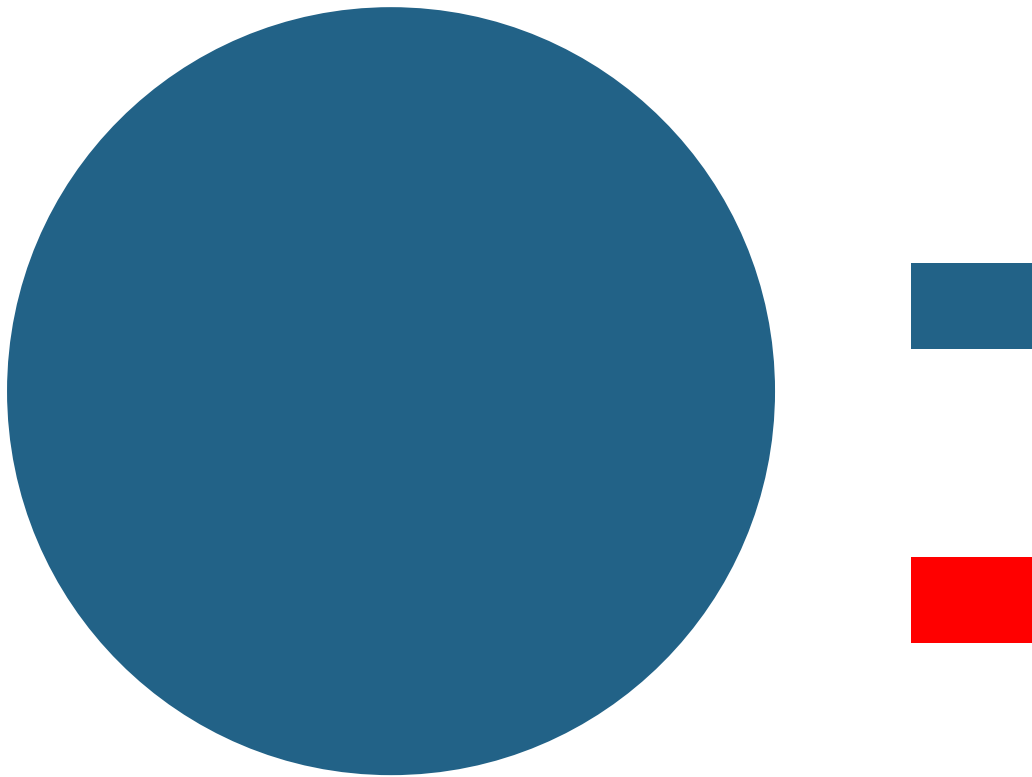
Bar Flavor	9/15/2015	9/16/2015	9/17/2015	9/18/2015	9/19/2015	9/20/2015	9/21/2015	9/22/2015	9/23/2015	9/24/2015	9/25/2015	9/26/2015	9/27/2015	9/28/2015	9/29/2015	9/30/2015
Caramel	106	178	132	149	146	117	141	142	136	153	143	122	147	138	111	128
Crisp	114	151	130	120	131	138	146	148	180	127	152	138	137	131	131	156
Dark Chocolate	151	140	131	97	117	138	152	117	146	123	123	107	123	145	129	125
Milk Chocolate	132	173	94	147	111	147	119	110	175	132	108	111	121	129	106	140
Total	503	642	487	513	505	540	558	517	637	535	526	478	528	543	477	549

Bar Flavor	10/1/2015	10/2/2015	10/3/2015	10/4/2015	10/5/2015	10/6/2015	10/7/2015	10/8/2015	10/9/2015	10/10/2015	10/11/2015	10/12/2015	10/13/2015	10/14/2015	10/15/2015
Caramel	158	130	145	157	135	139	150	103	140	123	158	146	146	155	146
Crisp	147	130	116	118	124	133	140	119	114	100	140	143	135	133	125
Dark Chocolate	155	107	139	121	122	125	140	104	132	115	131	138	128	144	139
Milk Chocolate	132	131	148	129	146	131	143	175	122	168	140	112	165	161	145
Total	592	498	548	525	527	528	573	501	508	506	569	539	574	593	555

Quantity Sold - Total by Sale Date and Bar Flavor



A Pie Chart



VIDEO

A Pie Chart

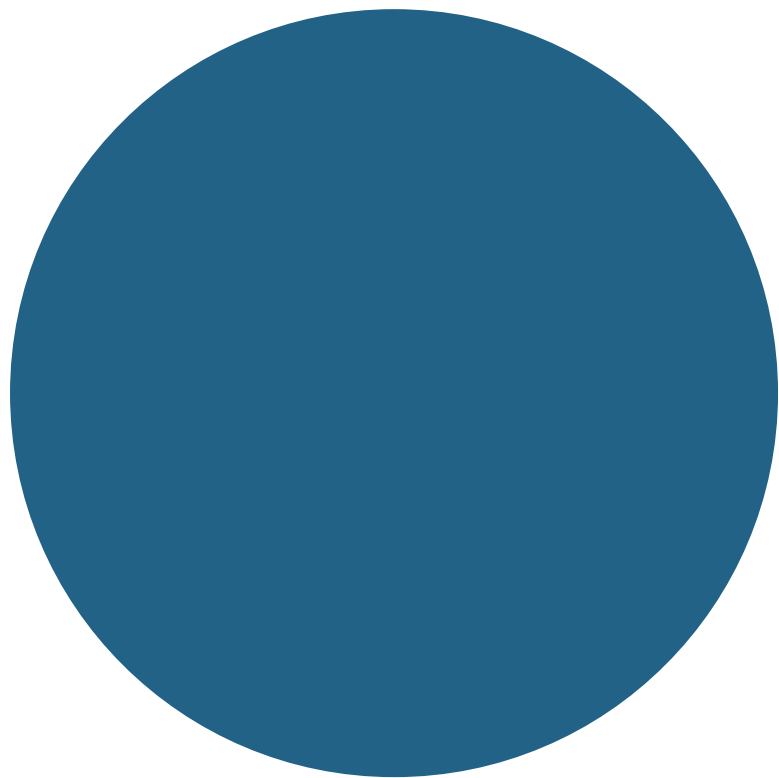
This is REALLY funny to us... mostly Mark



Never Gonna Give You Up, Rick Astley

<https://www.youtube.com/watch?v=oHg5SJYRHA0>

A Pie Chart



■ % of you that just got RickRoll'd

■ % of you eating actual pie

Why Should Librarians Care?

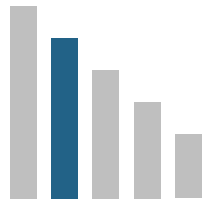
Research Studies

Presentations to funders

Well-displayed information is powerful

Answer questions quickly and easily

Perception



VIDEO

Perception vs Reality

Perception vs Reality



Sneakers

<https://www.youtube.com/watch?v=coDtzN6bXAM>

Perceptual Processing Types

Perceptual Processing Types

Preattentive

Attentive

Perceptual Processing Types

Preattentive

VERY fast

First type of processing that occurs

Like a snapshot

Attentive

Perceptual Processing Types

Preattentive

VERY fast

First type of processing that occurs

Like a snapshot

Attentive

Much slower

Sequential process that can result in
Learning, Understanding, Remembering

Audience Participation Time!

How many 5s do you see?

How many 5s do you see?

12356983124536984123063016
94258963124352178963000165
76489353200612034098763189

Preattentive Processing FTW!

123**5**6983124**5**36984123063016
942**5**89631243**5**217896300016**5**
764893**5**3200612034098763189

Perceptual Processing Types

Preattentive

VERY fast

First type of processing that occurs

Like a snapshot

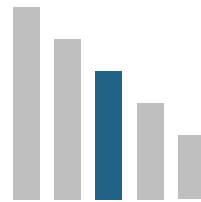


Attentive

Much slower

Sequential process that can result in
Learning, Understanding, Remembering

Preattentive Attributes





Preattentive Attributes



Preattentive Attributes



Source: Stephen Few, *Show Me the Numbers*

Preattentive Attributes



Source: Stephen Few, *Show Me the Numbers*

Preattentive Attributes

Form

Length

Width

Orientation

Shape

Size

Enclosure



Preattentive Attributes

Form

Length

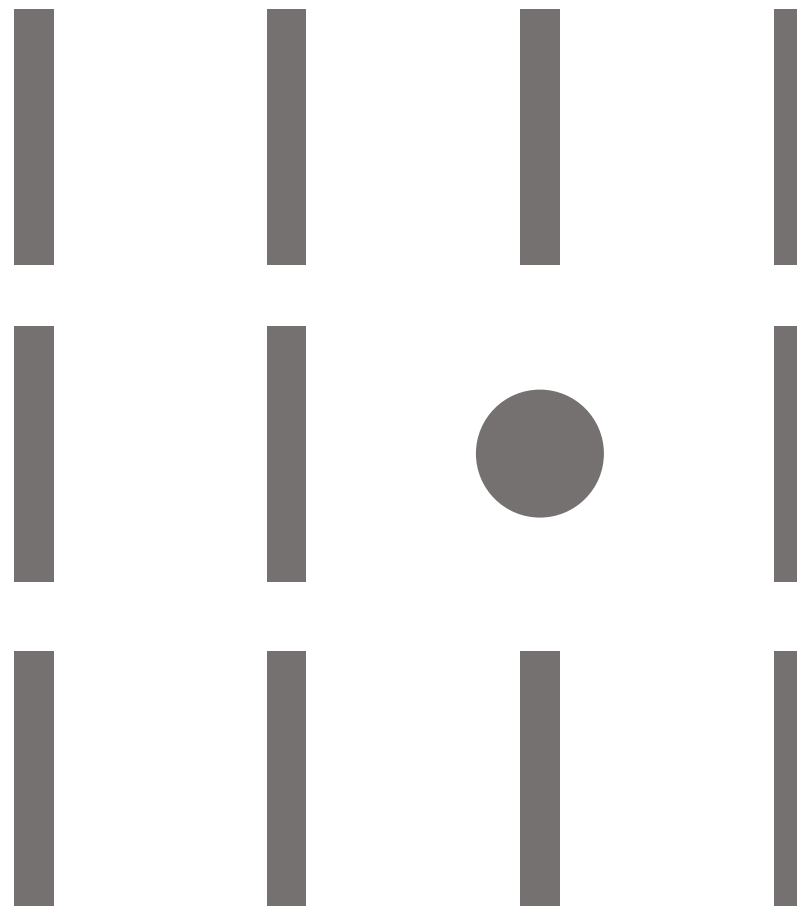
Width

Orientation

Shape

Size

Enclosure



Source: Stephen Few, *Show Me the Numbers*

Preattentive Attributes

Form

Length

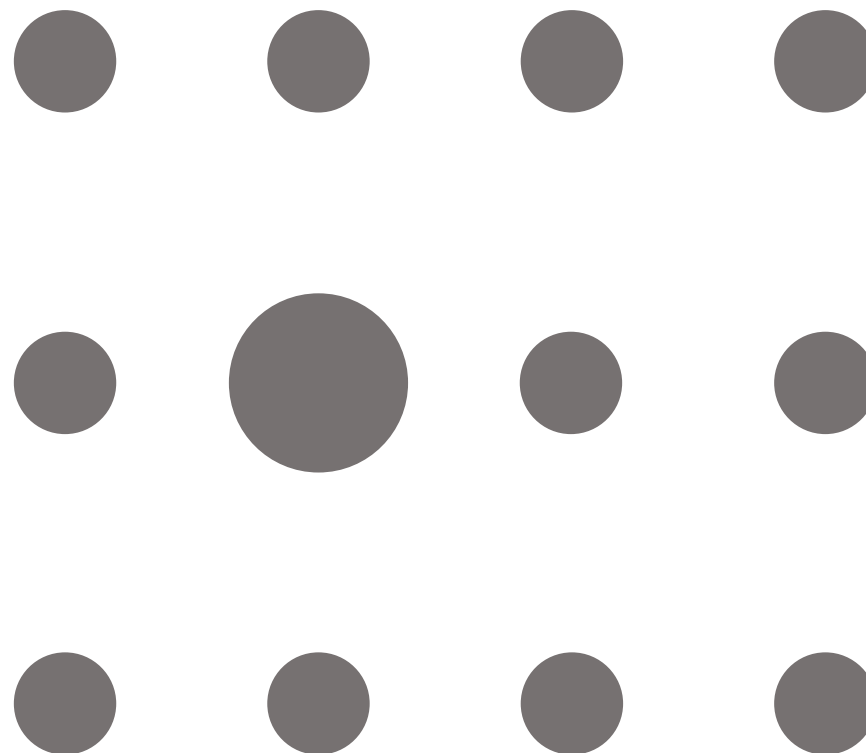
Width

Orientation

Shape

Size

Enclosure



Preattentive Attributes

Form

Length

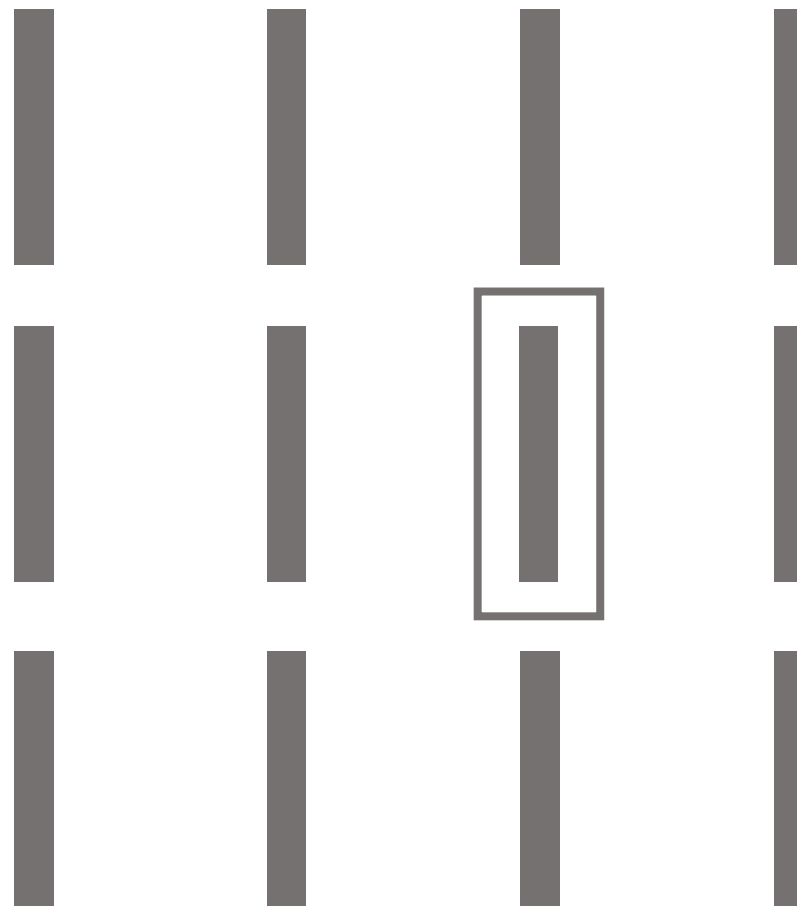
Width

Orientation

Shape

Size

Enclosure



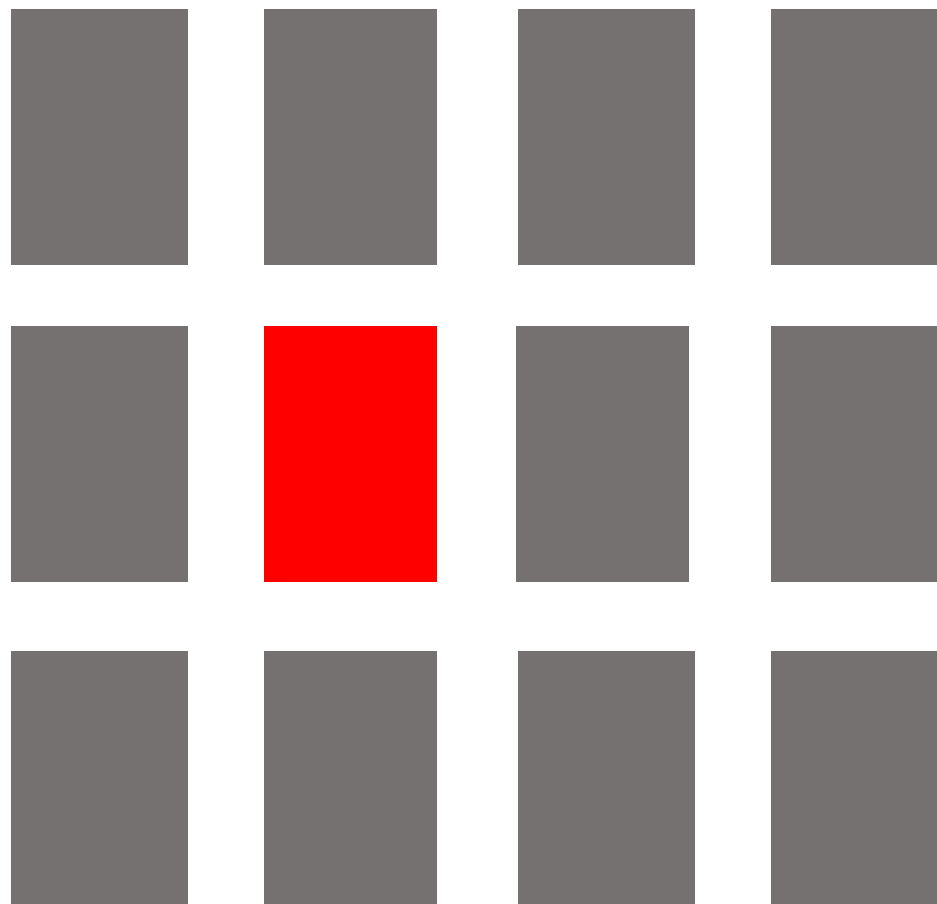
Source: Stephen Few, *Show Me the Numbers*

Preattentive Attributes

Color

Hue

Intensity



Source: Stephen Few, *Show Me the Numbers*

Preattentive Attributes

Color

Hue

Intensity

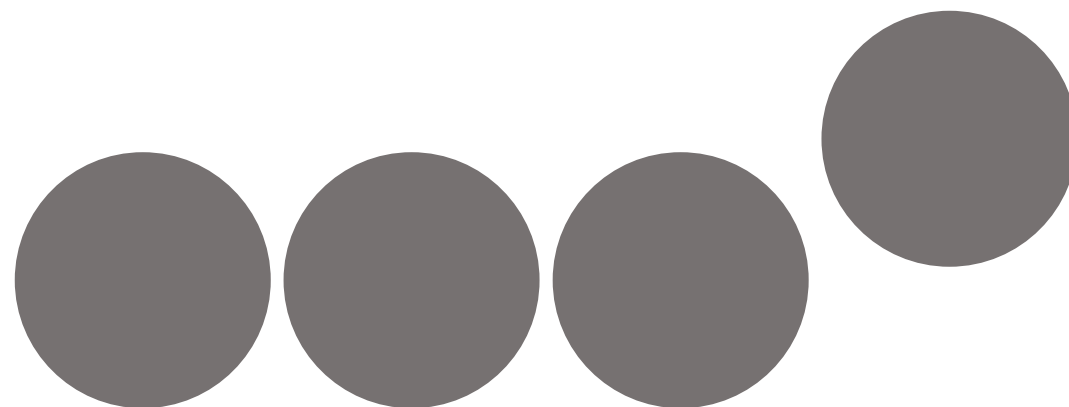


Source: Stephen Few, *Show Me the Numbers*

Preattentive Attributes

Spatial Position

2-D Position



VIDEO

2-Dimensional Thinking

2-Dimensional Thinking



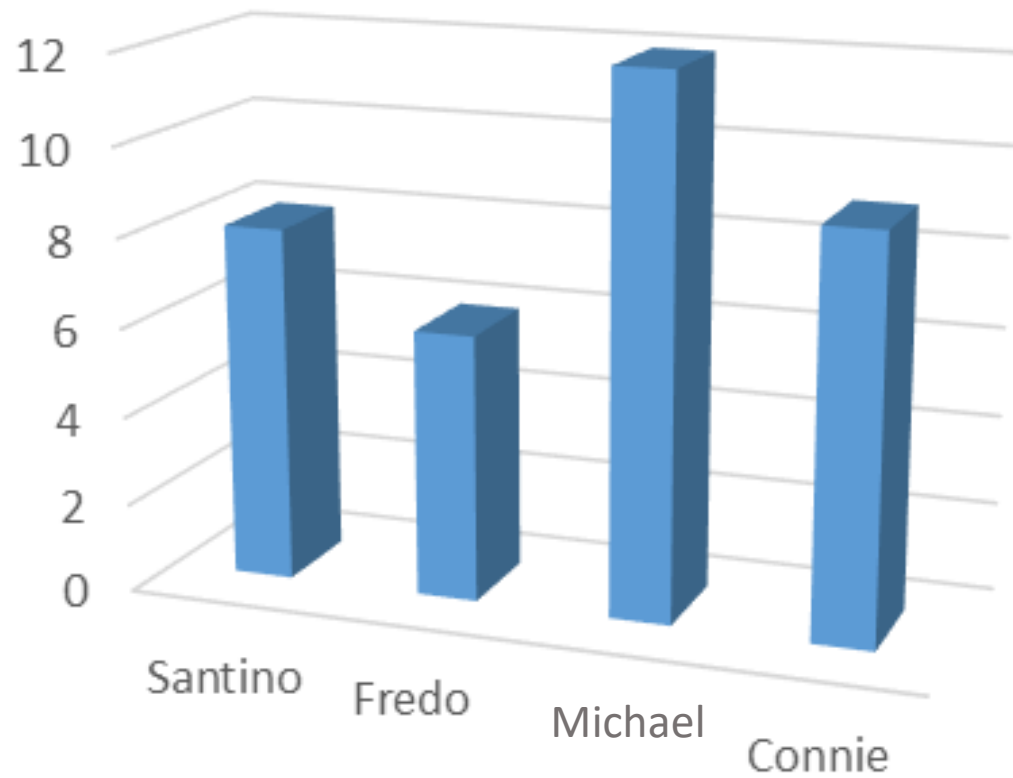
Star Trek II: The Wrath of Khan

<https://www.youtube.com/watch?v=RbTUTNenvCY>

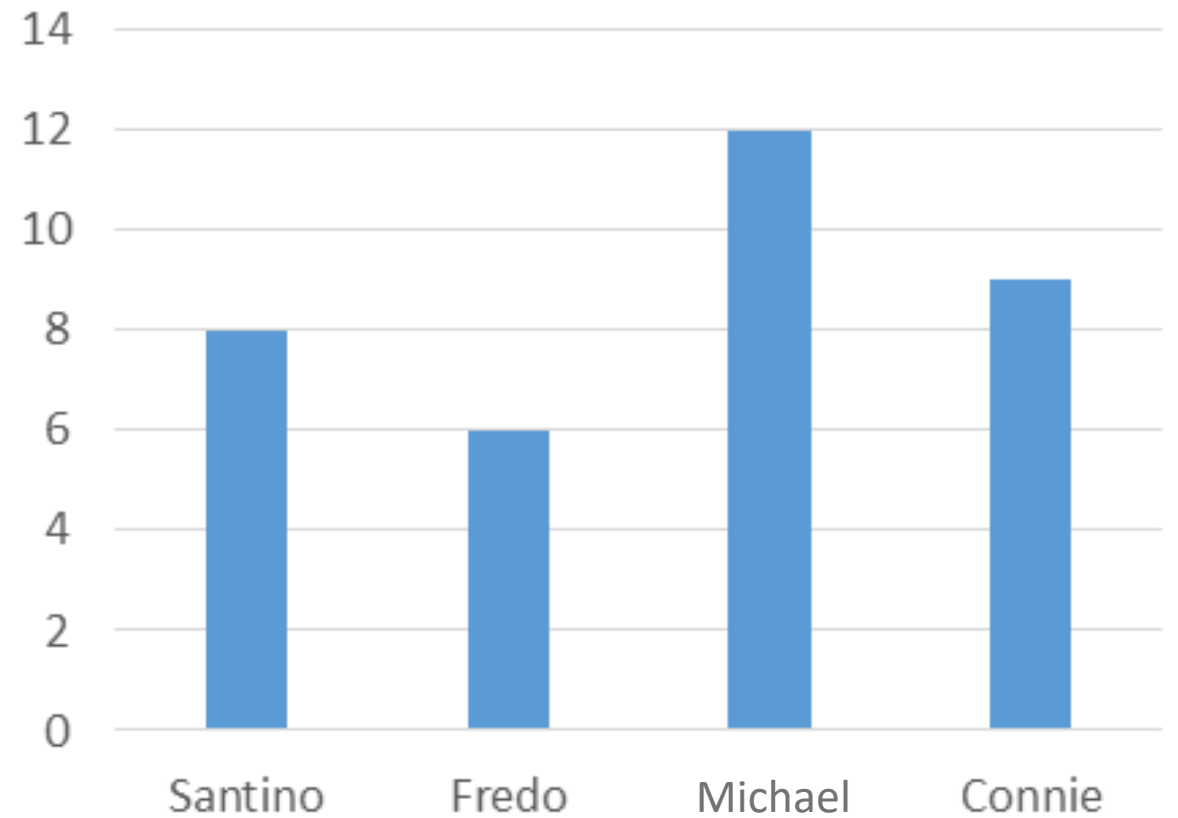
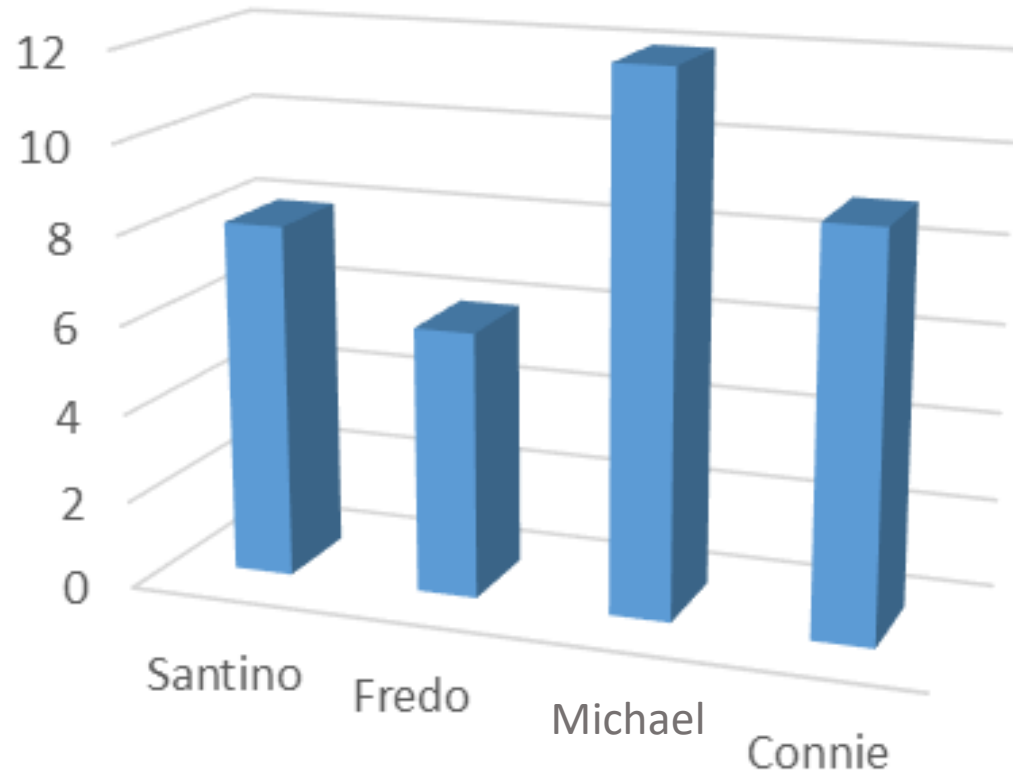
Audience Participation Time!

What is the value for Santino?

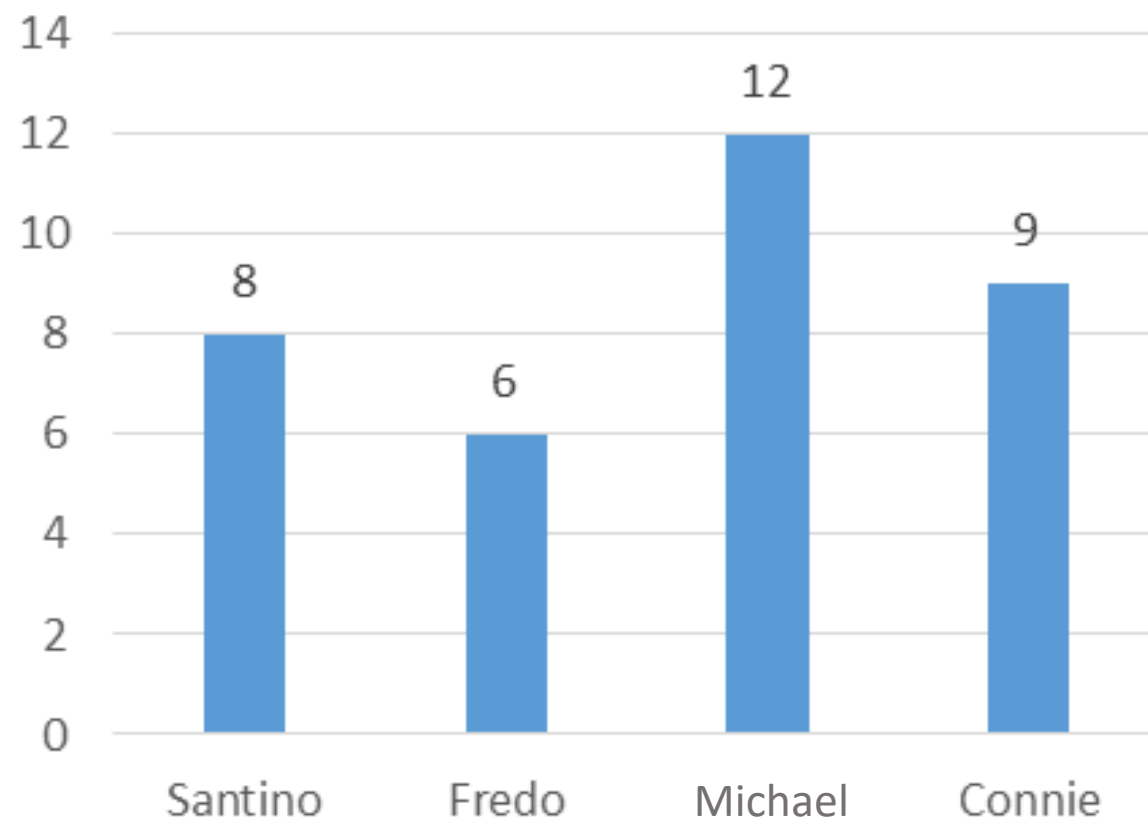
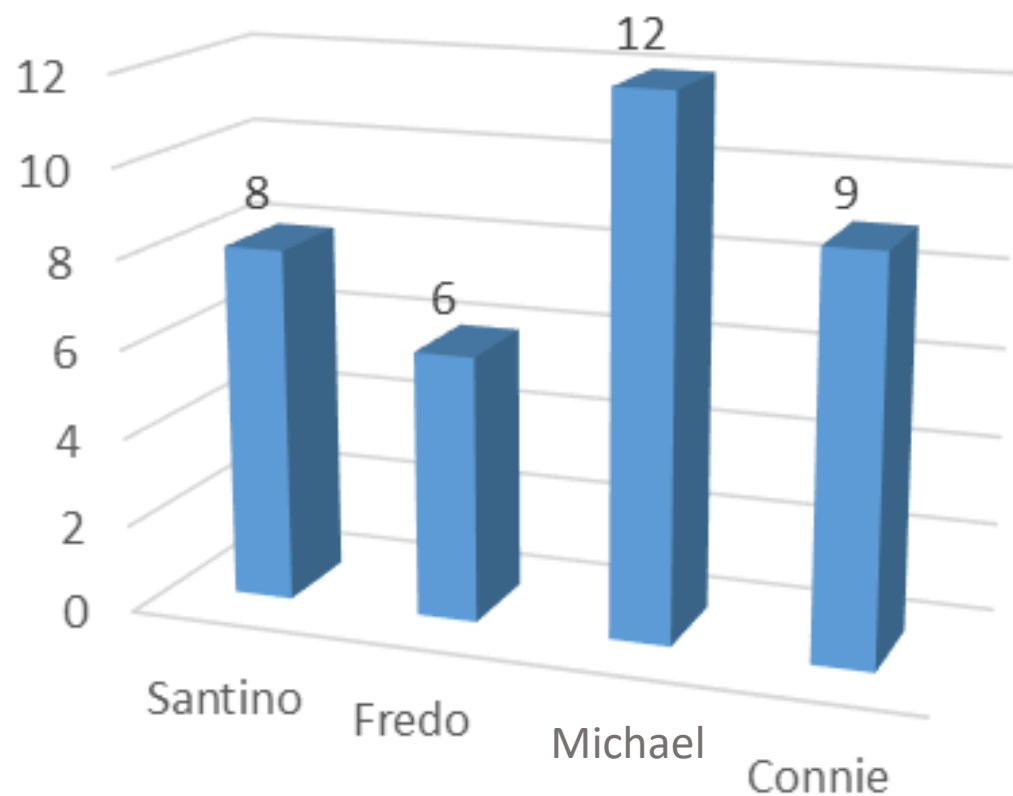
What is the value for Santino?



What is the value for Santino?



What is the value for Santino?



3-Dimensional Thinking



Our perception of Depth is weak

3-D charts and graphs are
GREAT, right?

3-Dimensional??



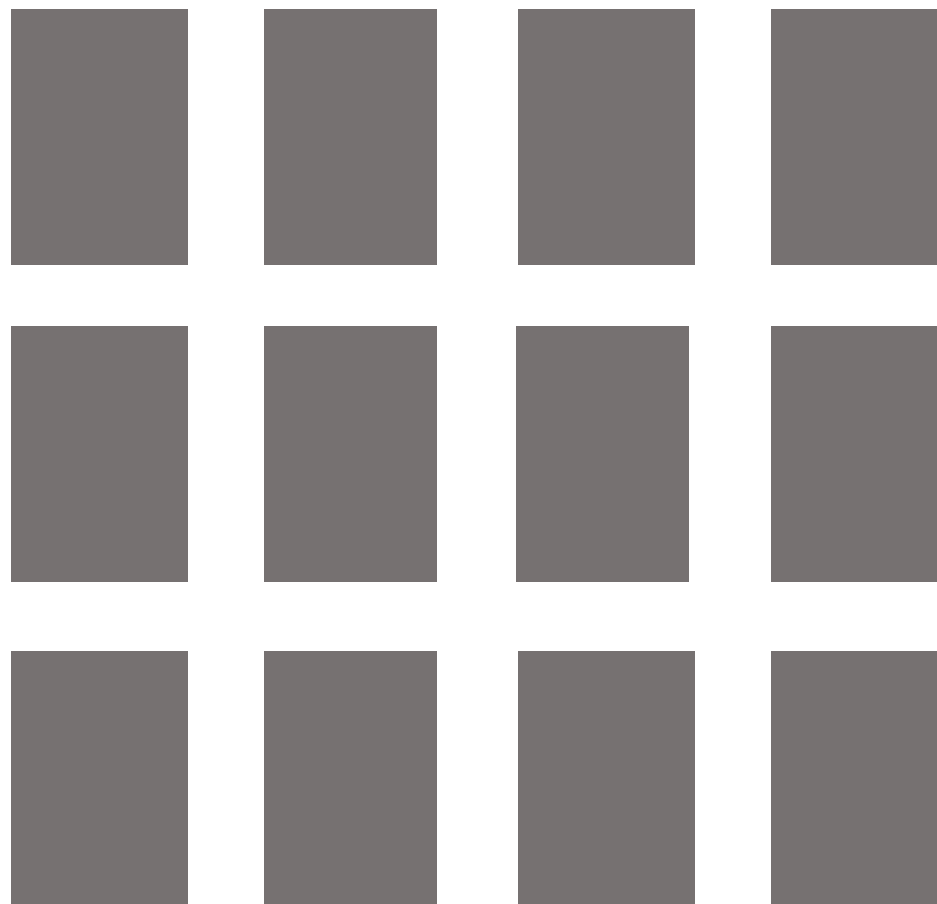
Star Wars: The Empire Strikes Back

<https://www.youtube.com/watch?v=FSWiMoO8zNE>

Preattentive Attributes

Motion

Flicker



Source: Stephen Few, *Show Me the Numbers*

Preattentive Attributes



Preattentive Attributes: Who Cares?



The Breakfast Club

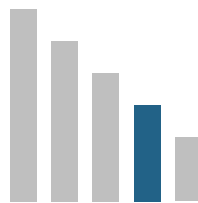
<https://www.youtube.com/watch?v=6sxdm5ktwqk>

Preattentive Attributes: Who Cares?

*“Understanding these attributes enables us to design tables and graphs that **visually emphasize the most important information** they contain.”*

~ Stephen Few, Show Me the Numbers

Attribute Encoding



Attribute Encoding

Attribute Encoding



Quantitative

Categorical

Attribute Encoding

Quantitative

Values across a continuum

Not just difference, but degree of difference

Categorical

Attribute Encoding

Quantitative

Values across a continuum

Not just difference, but degree of difference

Categorical

Difference alone

Attribute Encoding

Form

Length



Attribute Encoding

Form

Length

Source: Stephen Few, *Show Me the Numbers*

Attribute Encoding

Form

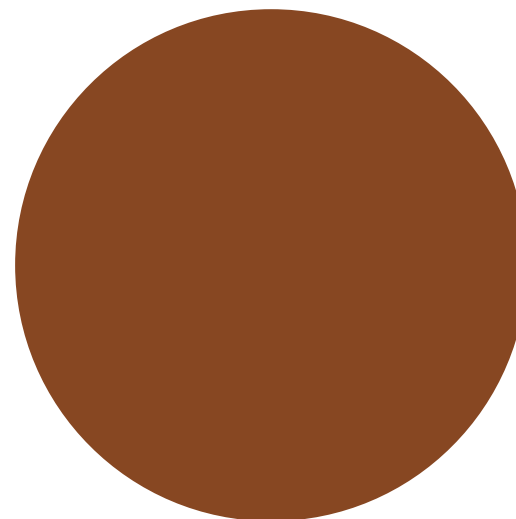
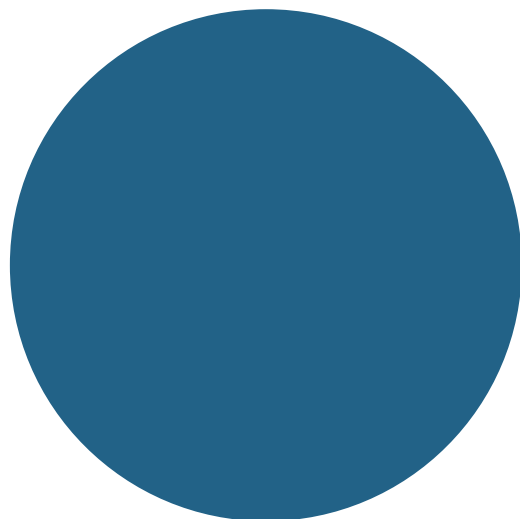
Length

Quantitative

Attribute Encoding

Color

Hue



Source: Stephen Few, *Show Me the Numbers*

Attribute Encoding



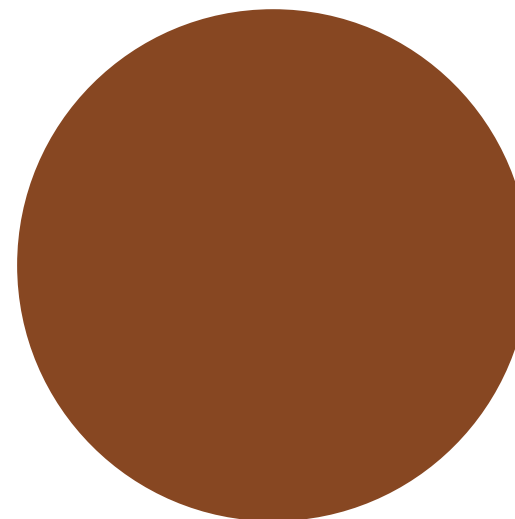
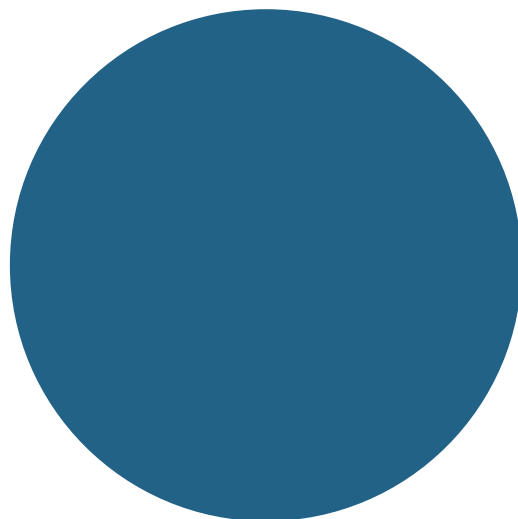
Kung Fu Panda

<https://www.youtube.com/watch?v=lp2blBW5yWw>

Attribute Encoding

Color

Hue



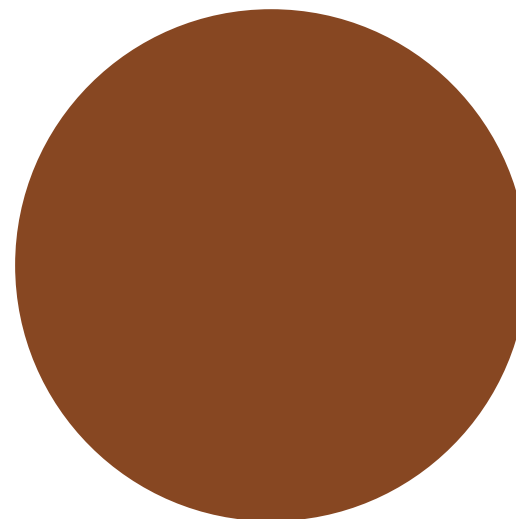
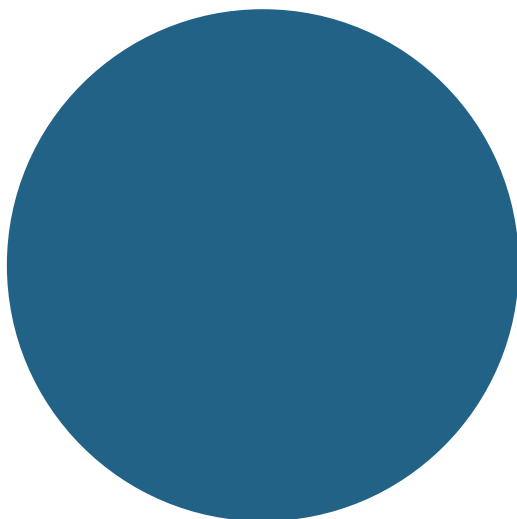
Source: Stephen Few, *Show Me the Numbers*

Attribute Encoding

Color

Hue

Categorical



Source: Stephen Few, *Show Me the Numbers*

Attribute Encoding

Category	Attribute	Quantitatively Perceived
Form	Length	
	Width	
	Orientation	
	Shape	
	Size	
Color	Enclosure	
	Hue	
	Intensity	
	2-D Position	

Source: Stephen Few, *Show Me the Numbers*

Attribute Encoding

Category	Attribute	Quantitatively Perceived
Form	Length	
	Width	
	Orientation	No
	Shape	No
	Size	
	Enclosure	No
Color	Hue	No
	Intensity	
Spatial Position	2-D Position	

Source: Stephen Few, *Show Me the Numbers*

Attribute Encoding

Category	Attribute	Quantitatively Perceived
Form	Length	
	Width	Yes, but limited
	Orientation	No
	Shape	No
	Size	Yes, but limited
	Enclosure	No
Color	Hue	No
	Intensity	Yes, but limited
Spatial Position	2-D Position	

Source: Stephen Few, *Show Me the Numbers*

Attribute Encoding

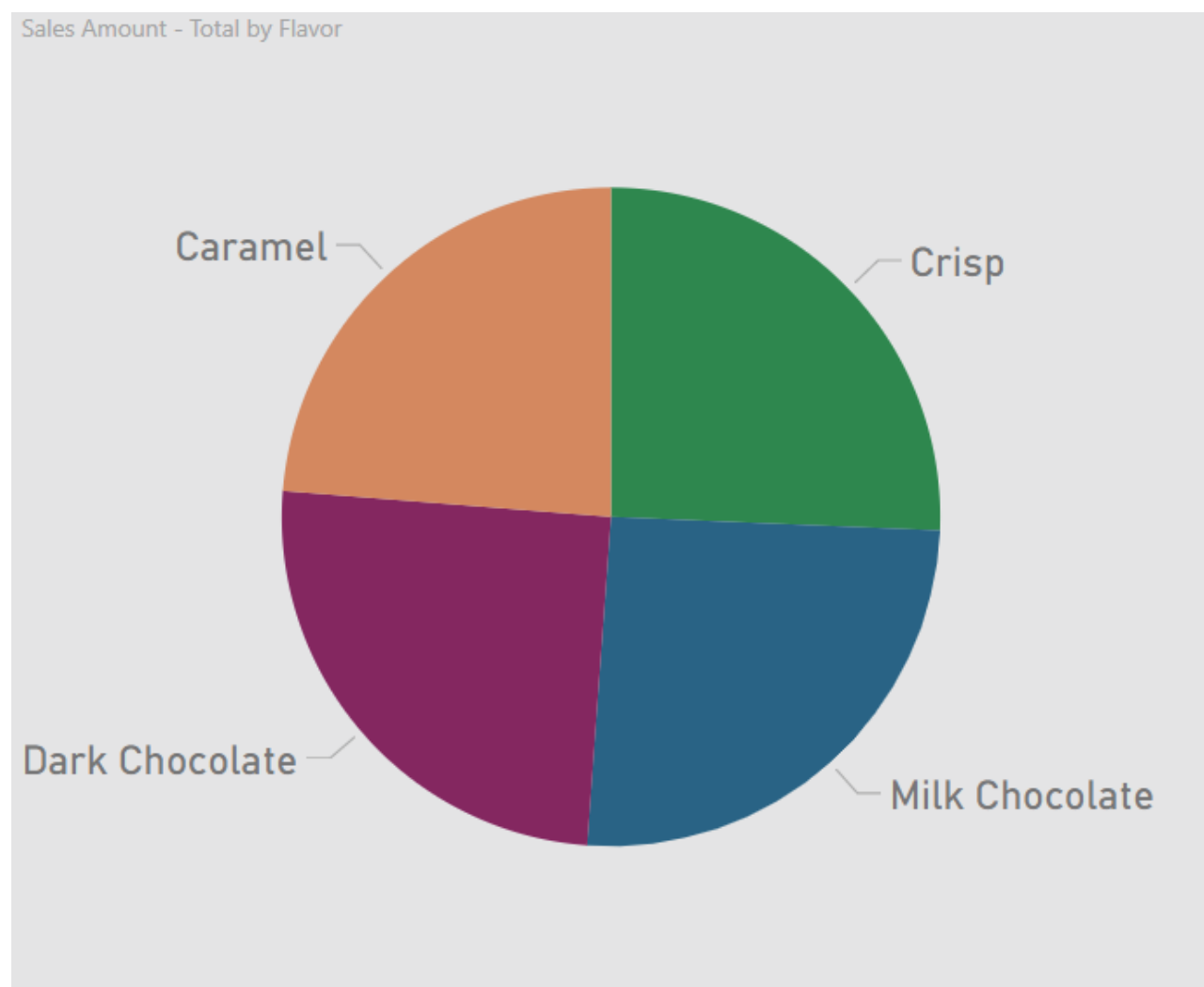
Category	Attribute	Quantitatively Perceived
Form	Length	Yes
	Width	Yes, but limited
	Orientation	No
	Shape	No
	Size	Yes, but limited
	Enclosure	No
Color	Hue	No
	Intensity	Yes, but limited
Spatial Position	2-D Position	Yes

Source: Stephen Few, *Show Me the Numbers*

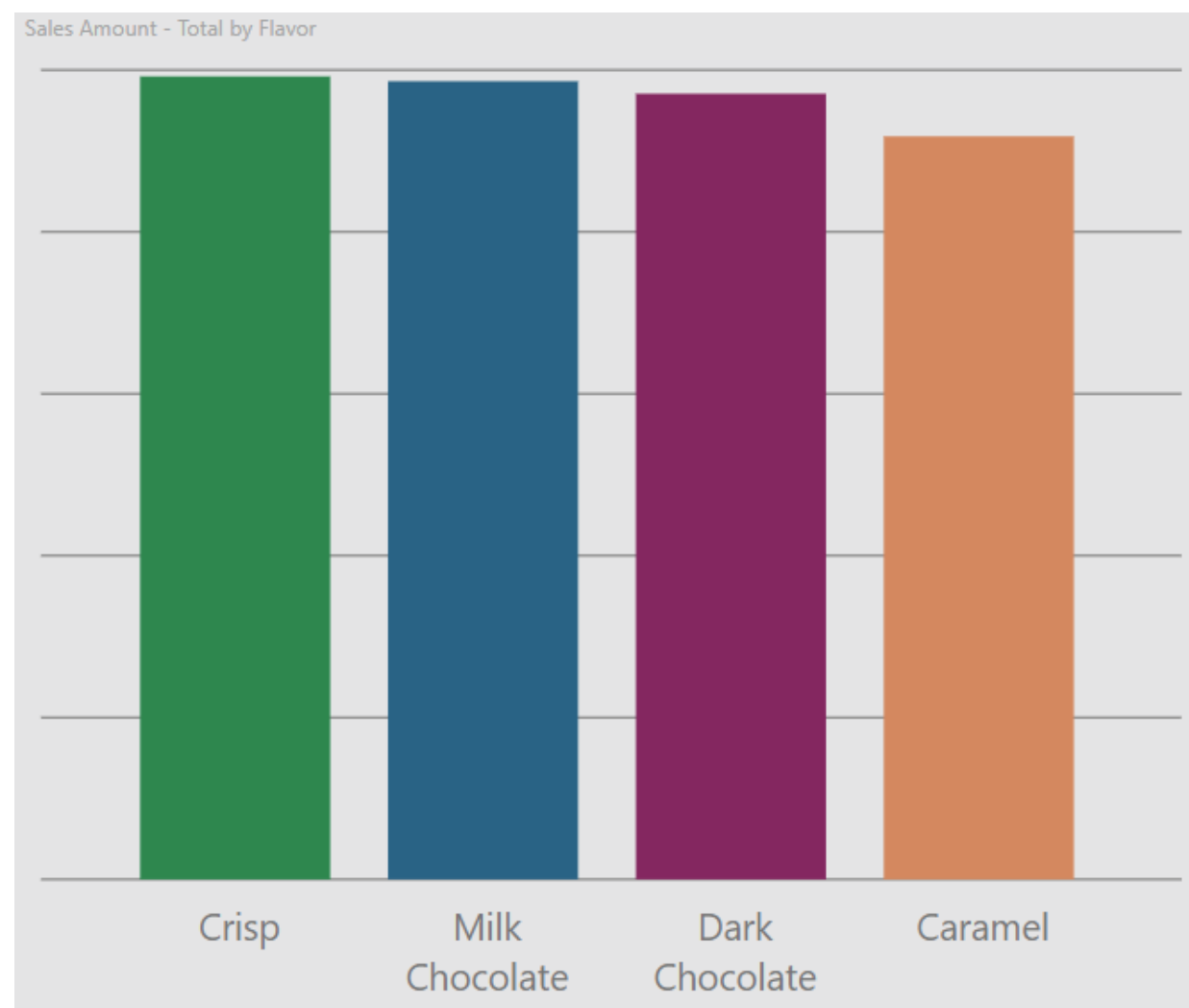
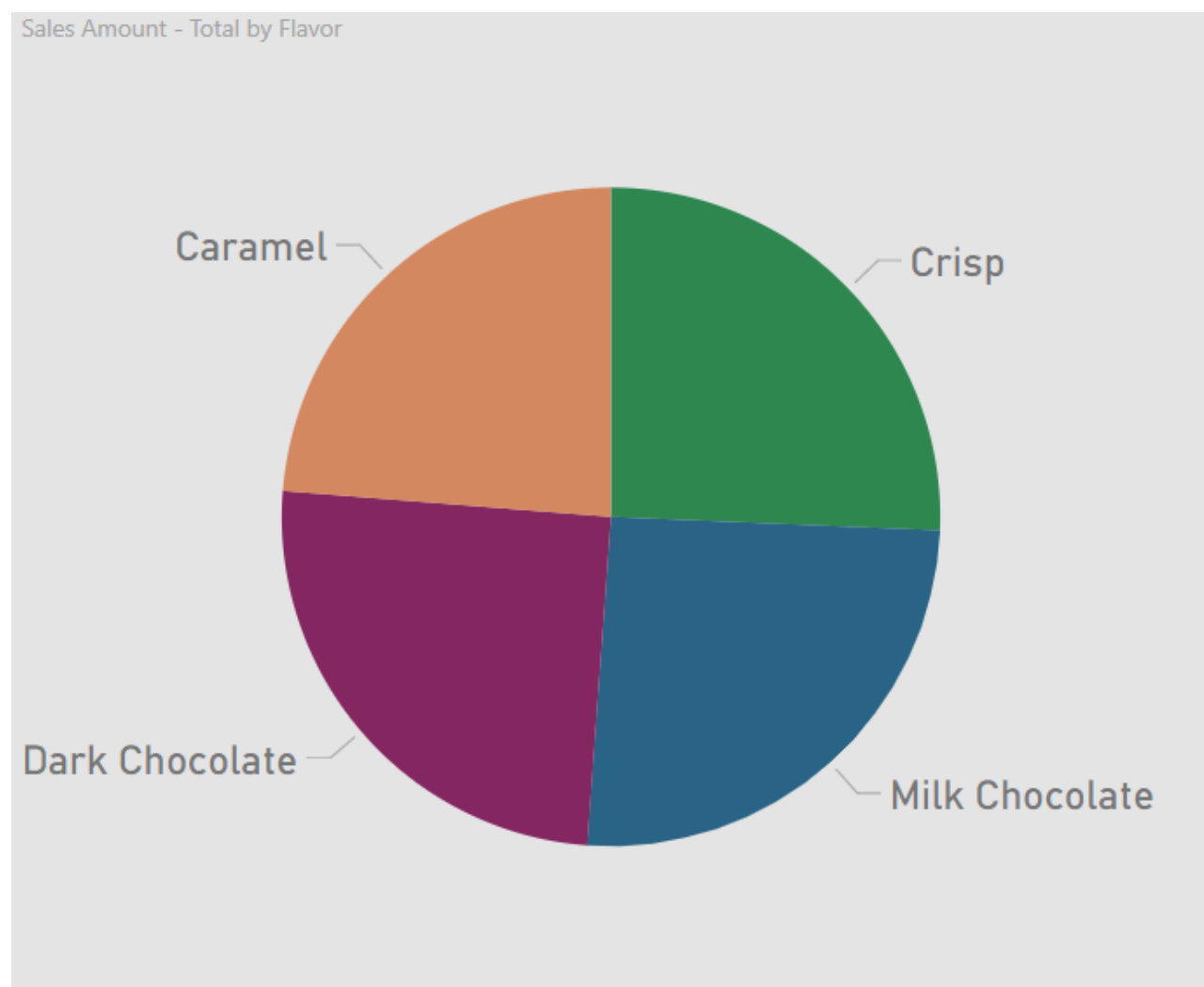
Audience Participation Time!

Which flavor had the highest sales?

Which flavor had the highest sales?

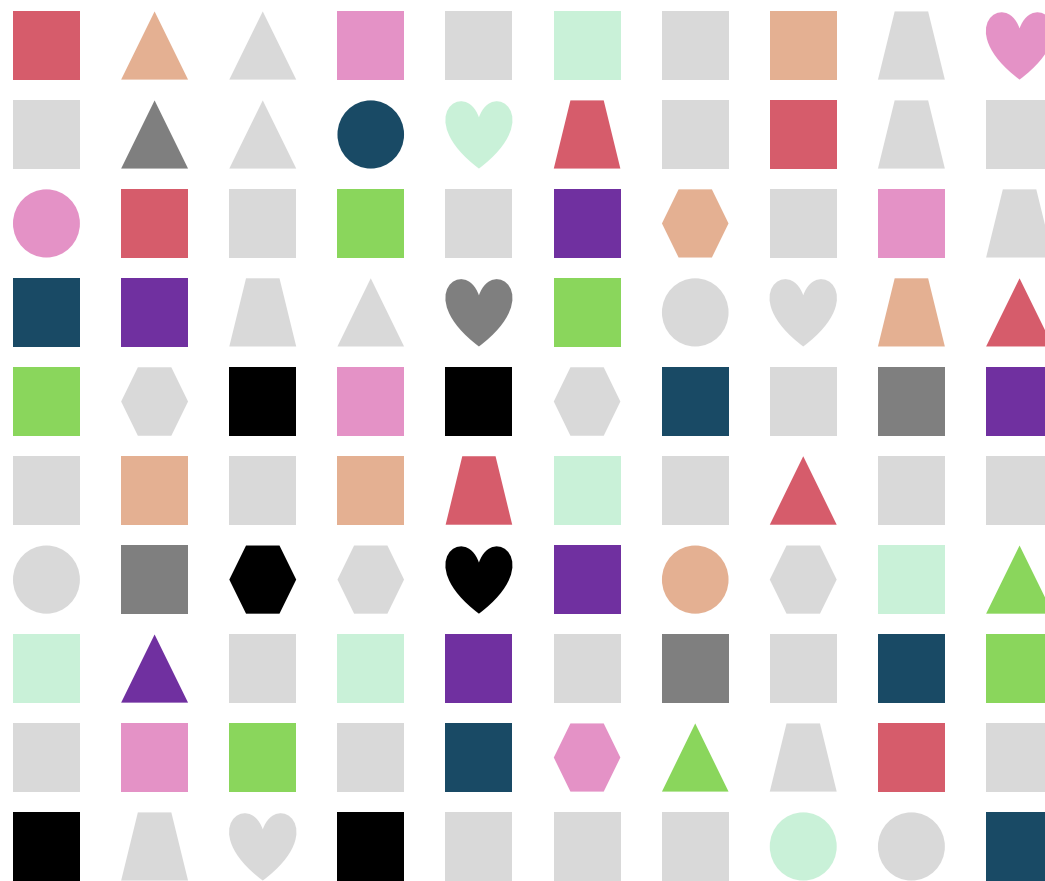


Which flavor had the highest sales?



River Song	Inara Serra	Simon Tam	Arya Stark	Rose Tyler	Robert Barat...	Jack Harkness	Clara Oswald
	Malcolm Reynolds	Montgomery Scott					
Janice Rand	Martha Jones	Barriston Selmy	Hikaru Sulu	River Tam	Donna No...	Pavel Che...	James Kirk
Jayne Cobb	Spock Son Of Sarek	Daenerys Targaryen	Mickey Smith	Hoban Washburne	Rory Willi...	Nyota Uh...	
Samwell Tarly	Tyrion Lannister	Margaery Tyrell	Jon Snow	Amy Pond	Zoe Washburne		
Kaywinnet Frye	Christine Chapel	Derrial Book	Leonard Mccoy	Podrick Payne	Zoe Washburne		

Too Much Variety



Too Much Variety



Return of the Jedi

<https://www.youtube.com/watch?v=HWUQzbYUqGA>

Attribute Encoding

Category	Attribute	Quantitatively Perceived	Max Variations
Form	Length	Yes	4
	Width	Yes, but limited	4
	Orientation	No	4
	Shape	No	4
	Size	Yes, but limited	4
	Enclosure	No	4
Color	Hue	No	8
	Intensity	Yes, but limited	4
Spatial Position	2-D Position	Yes	4

Source: Stephen Few, *Show Me the Numbers*

VIDEO

Everybody's Special

Everybody's Special



But Dad always said our powers are nothing to be ashamed of. Our powers made us special.

The Incredibles

https://www.youtube.com/watch?v=1E9pKU_N15A

Everybody's Special

Option 1



Everybody's Special

Option 1



Option 2



Everybody's Special

Option 1



Option 2



VIDEO

A World of Color

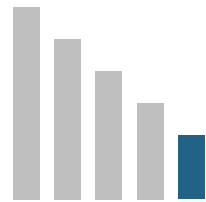
A World of Color



The Wizard of Oz

<https://www.youtube.com/watch?v=8lik-qTakrs>

Gestalt Principles



Gestalt Principles

Proximity

Similarity

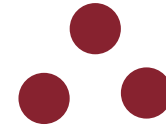
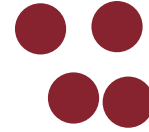
Enclosure

Closure

Continuity

Connection

Principle



Gestalt Principles

Proximity

Similarity

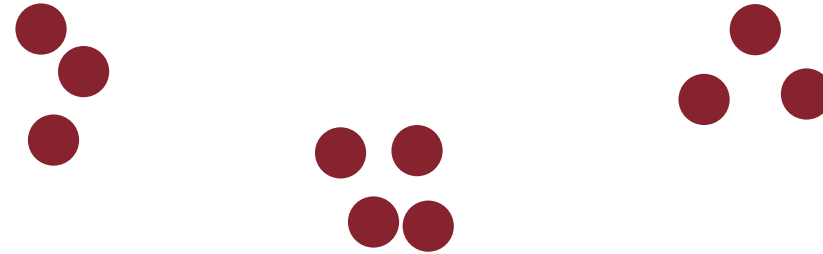
Enclosure

Closure

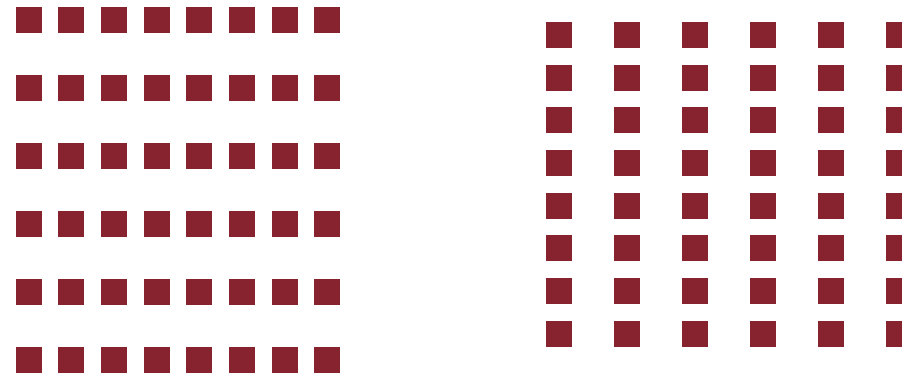
Continuity

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Principle



Application



Gestalt Principles

Proximity

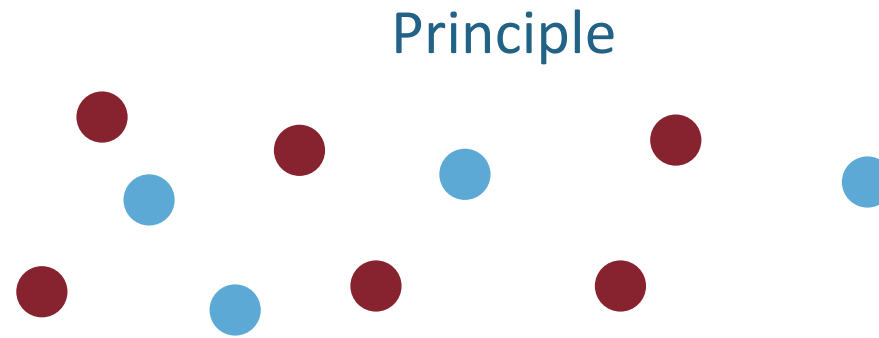
Similarity

Enclosure

Closure

Continuity

Connection



Gestalt Principles

Proximity

Similarity

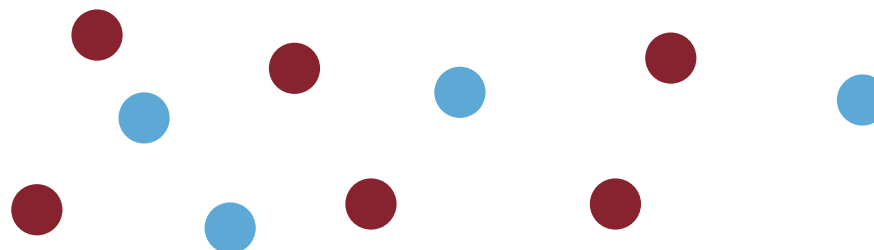
Enclosure

Closure

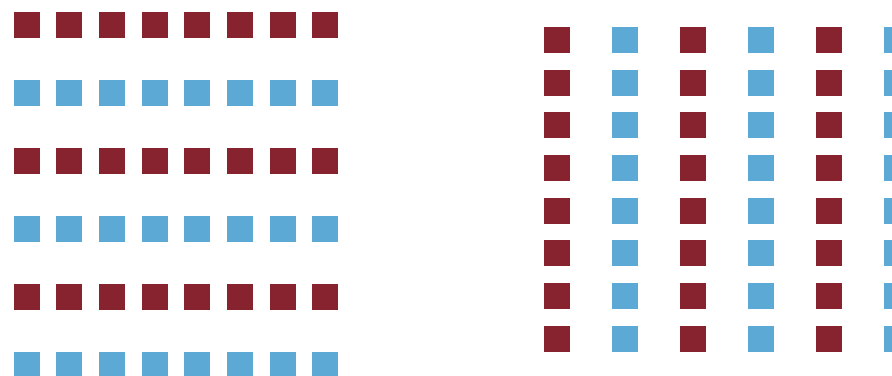
Continuity

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Gestalt Principles

Proximity

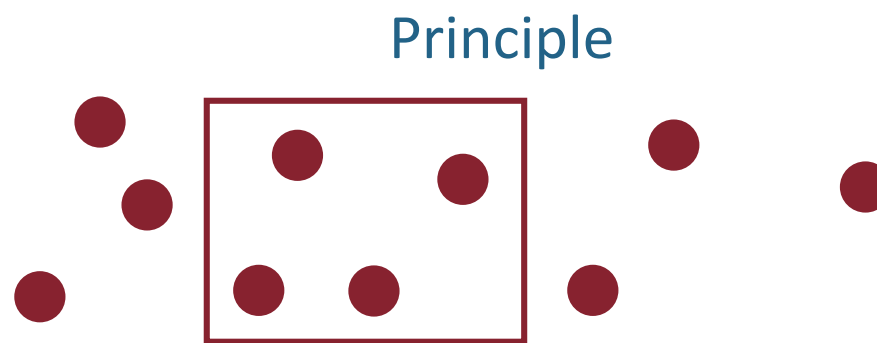
Similarity

Enclosure

Closure

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Connection



Gestalt Principles

Proximity

Similarity

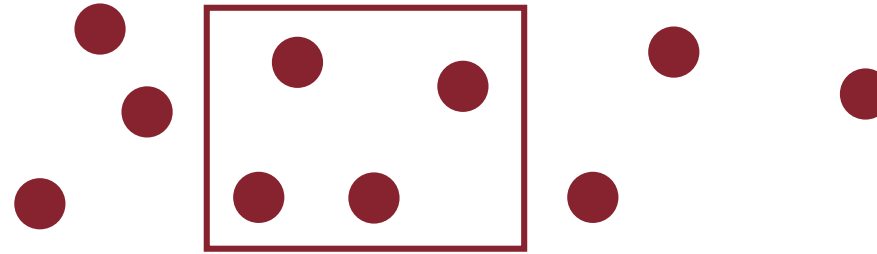
Enclosure

Closure

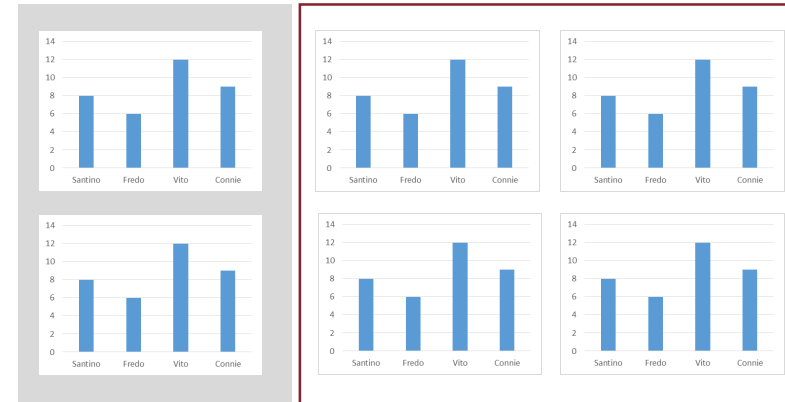
Continuity

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Gestalt Principles

Proximity

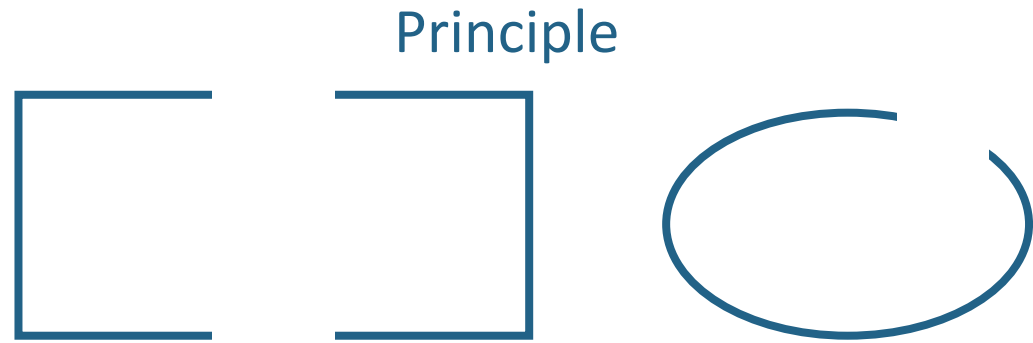
Similarity

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Gestalt Principles

Proximity

Similarity

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Closure

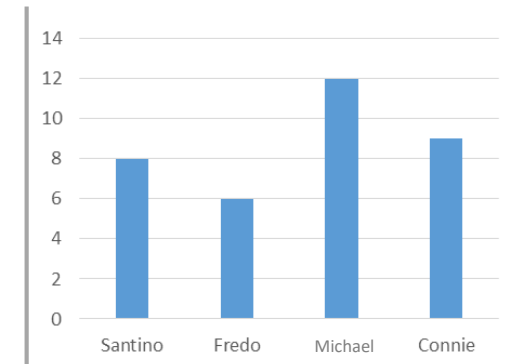
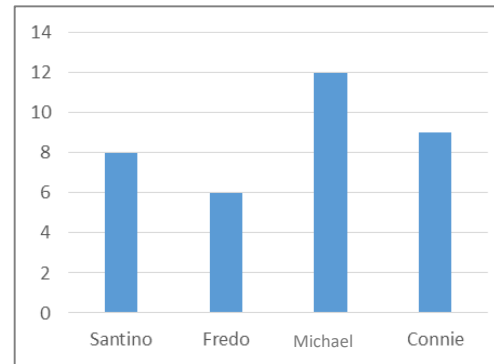
Continuity

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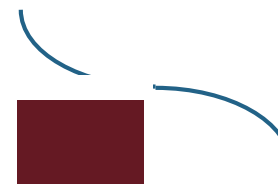
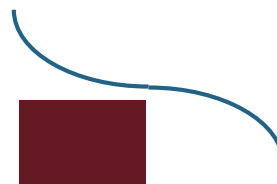
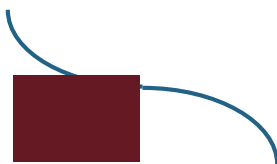
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Gestalt Principles

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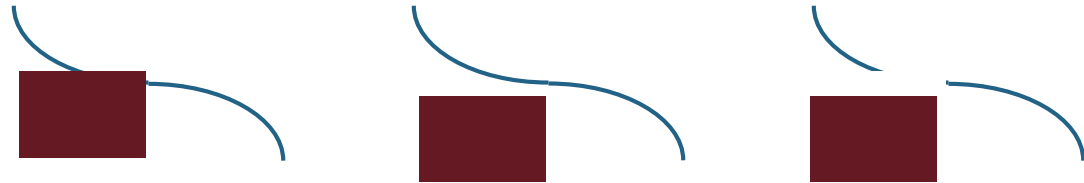
Enclosure

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Application

Fruit	Color	Sales
Apple	Red	4
	Green	6
	Yellow	2
Grape	Red	6
	Green	8
	Black	3

Gestalt Principles

Proximity

Similarity

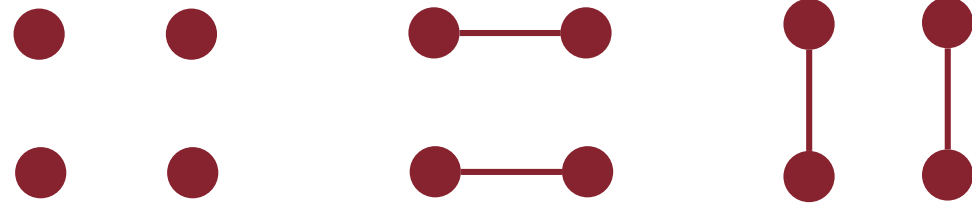
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Gestalt Principles

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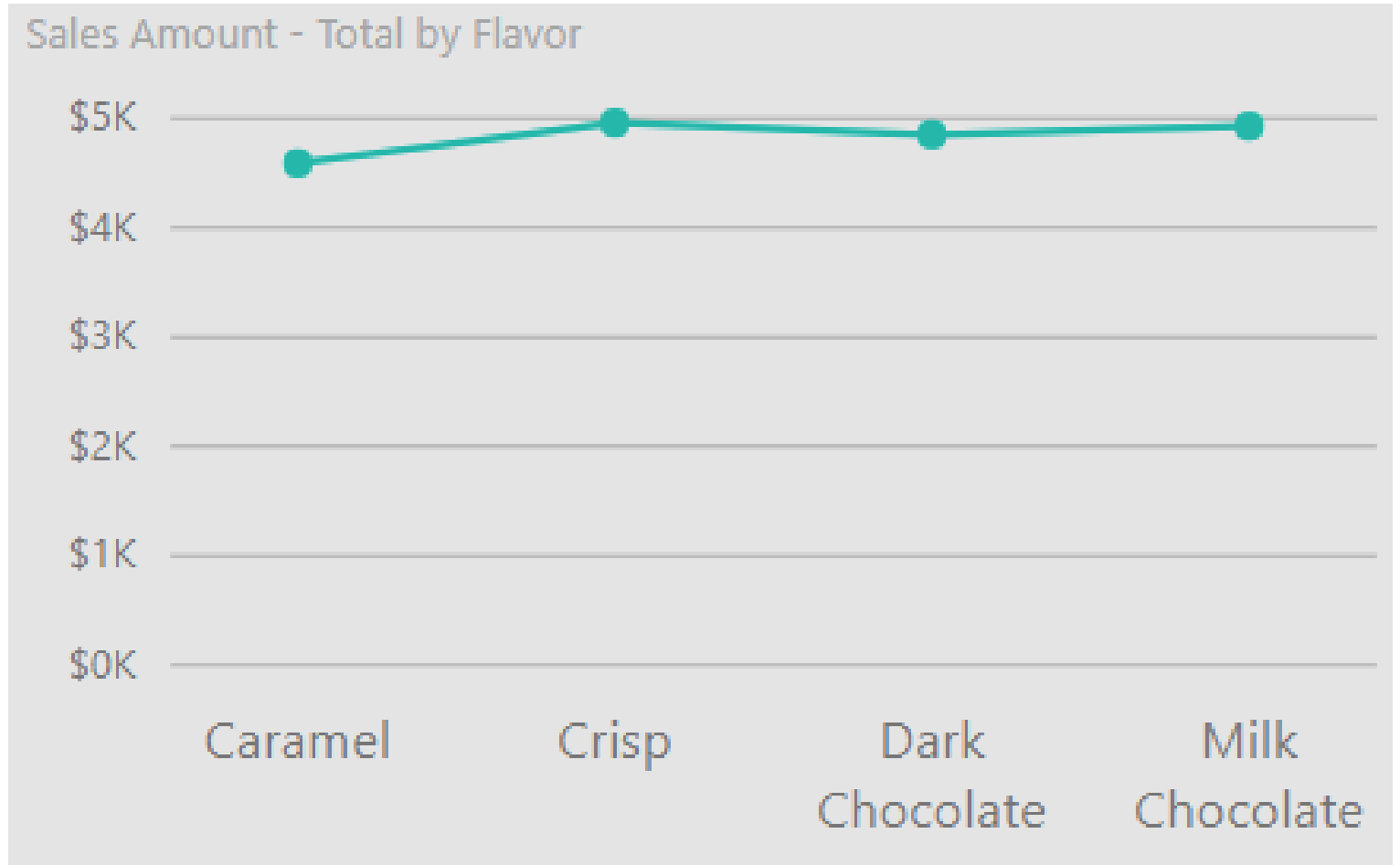
Enclosure

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Source: Stephen Few, *Show Me the Numbers*

Gestalt Principles

Proximity

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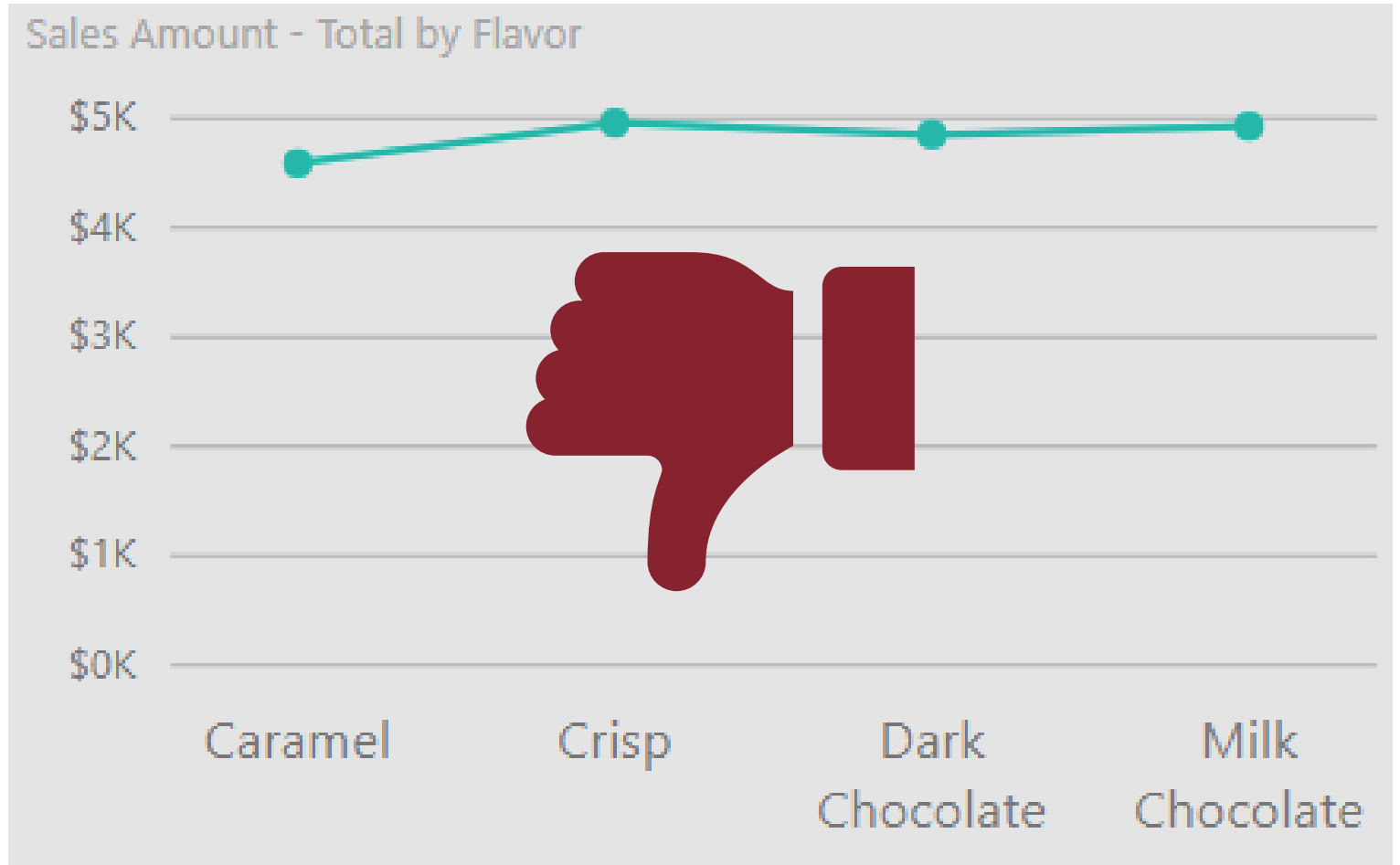
Enclosure

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Source: Stephen Few, *Show Me the Numbers*

Gestalt Principles

Proximity

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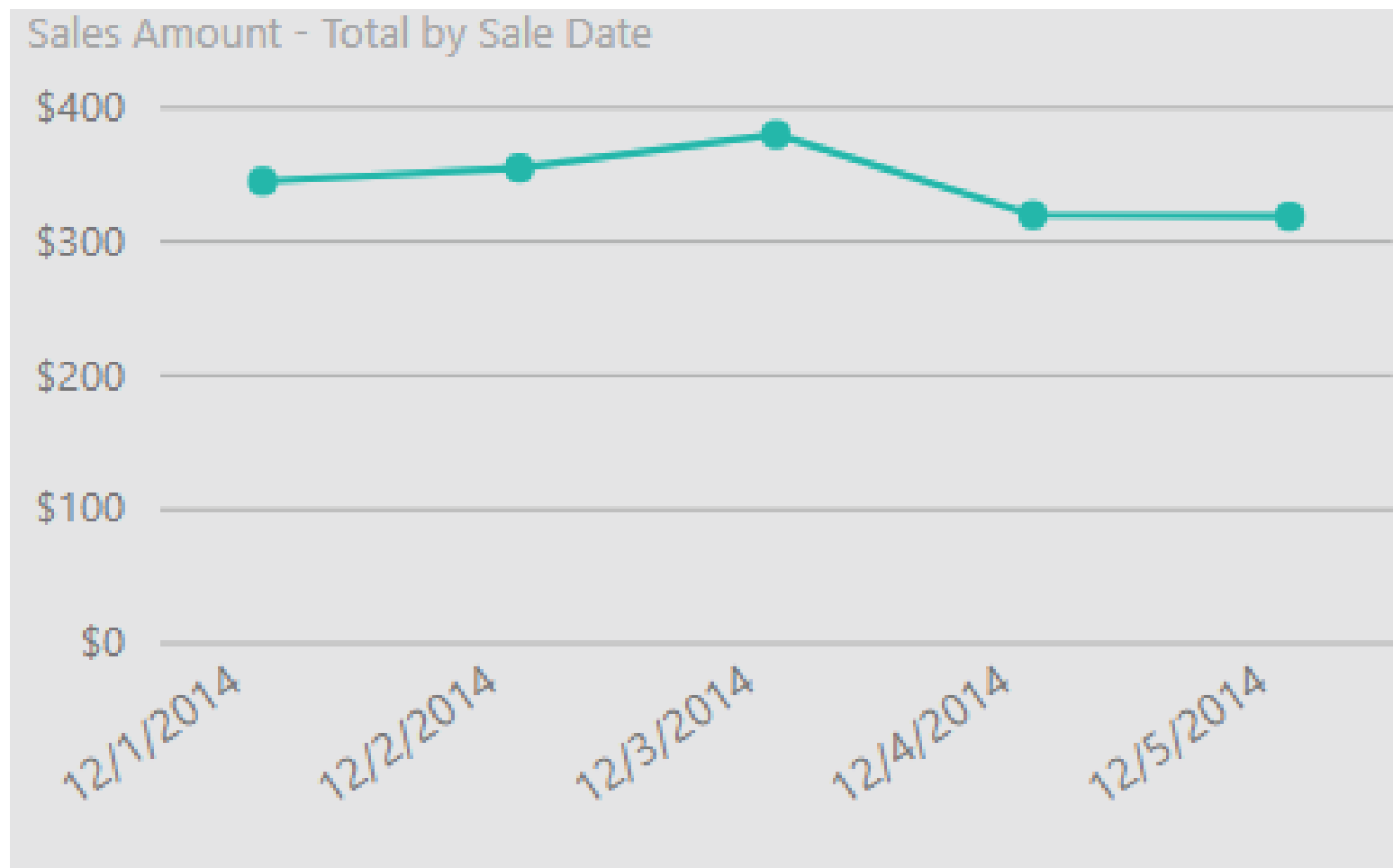
Enclosure

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Source: Stephen Few, *Show Me the Numbers*

VIDEO

The Power of Proximity

The Power of Proximity



Please, go to the end of the pulpit!

Jaws

<https://www.youtube.com/watch?v=CwdGYMM2bHM>

Audience Participation Time!

Which square is the lightest?

Which square is the lightest?



Source: Stephen Few, *Show Me the Numbers*

Which square is the lightest?



Return of the Jedi

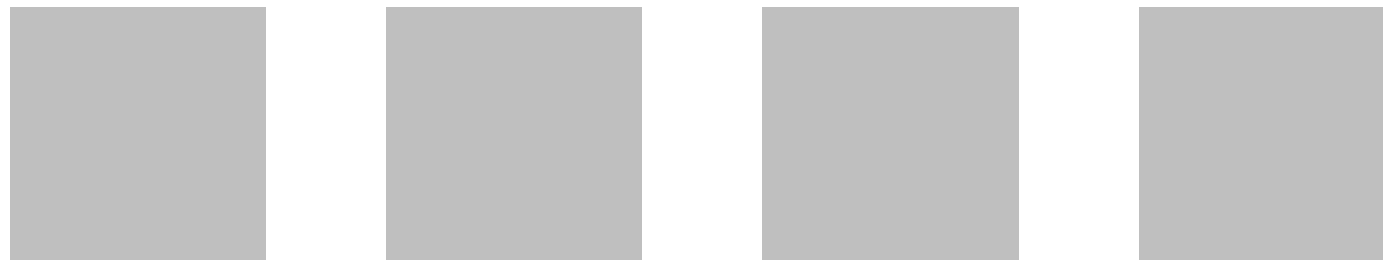
<https://www.youtube.com/watch?v=4F4qzPbcFiA>

Which square is the lightest?



Source: Stephen Few, *Show Me the Numbers*

Which square is the lightest?

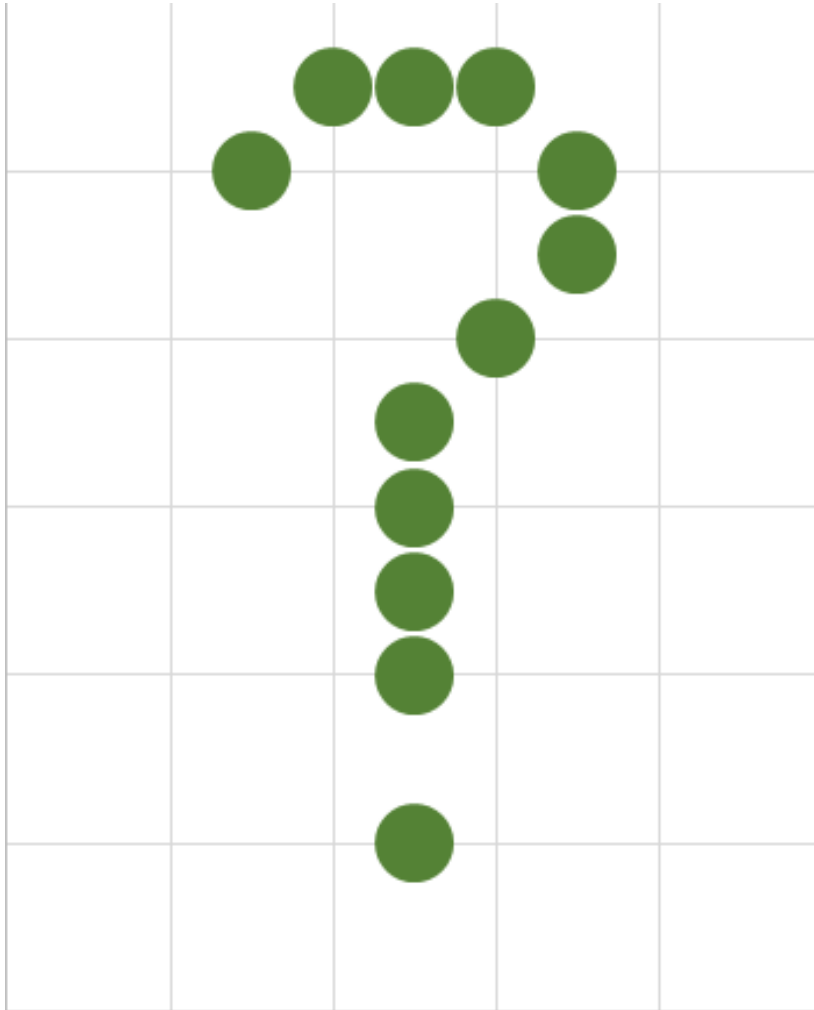


They are identical.

*“It is not how much information
there is, but rather how
effectively it is arranged.”*

~ Edward Tufte

Questions?



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Twitter: [@trishzv](https://twitter.com/trishzv)

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