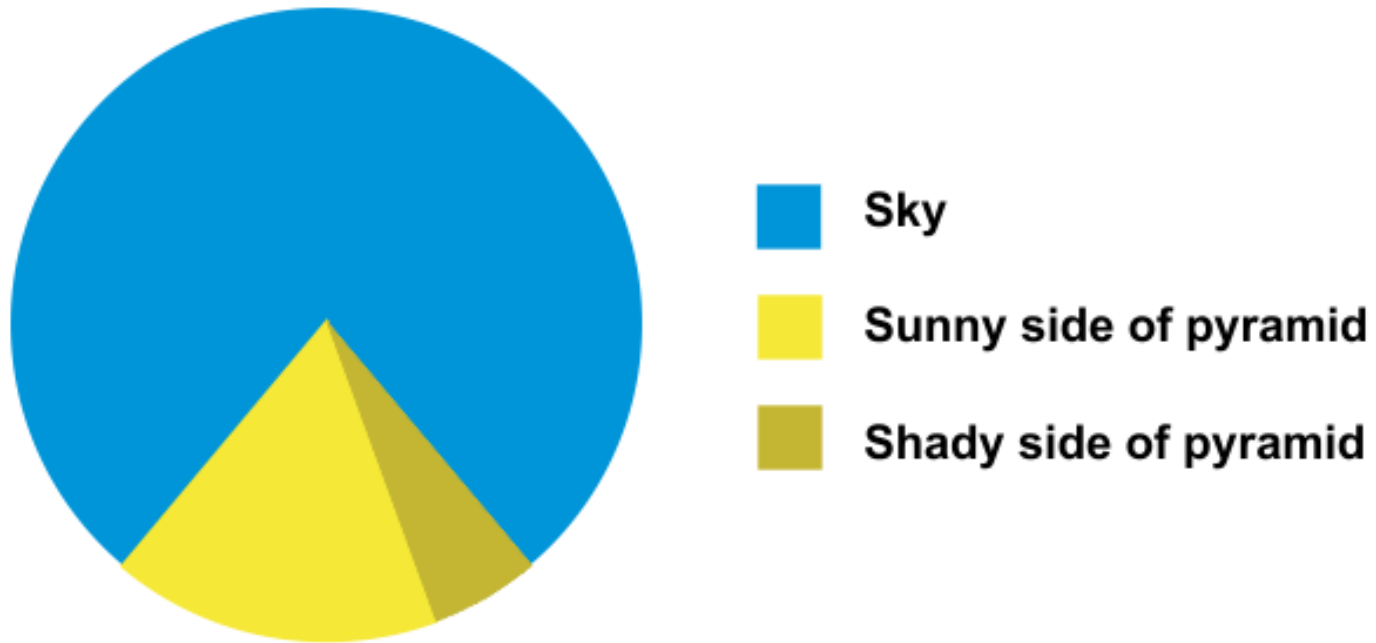


MPA 635: Data Visualization



What is truth?

Data visualization and truth

Course overview

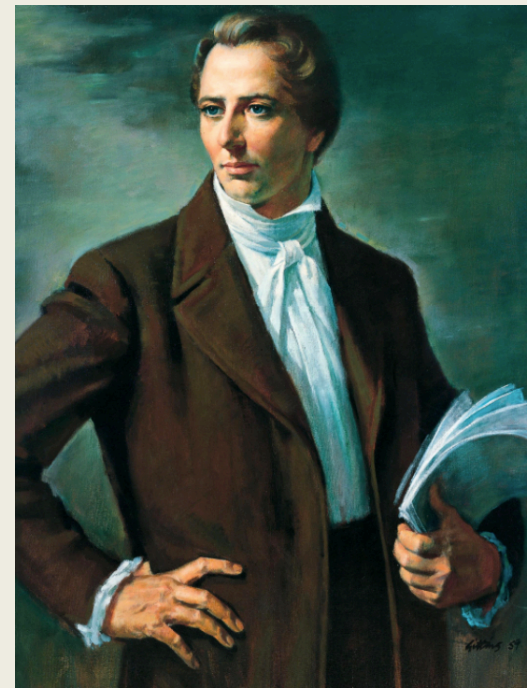
CRAP

Excel and R

What is truth?

What is truth?

“... Mormonism is truth, in other words the doctrine of the Latter-day Saints, is truth. ... The first and fundamental principle of our holy religion is, that we believe that we have a right to embrace all, and every item of truth, without limitation or without being circumscribed or prohibited by the creeds or superstitious notions of men, or by the dominations of one another, when that truth is clearly demonstrated to our minds, and we have the highest degree of evidence of the same.”⁵



How do we find truth?



Neil deGrasse Tyson 

@neiltyson

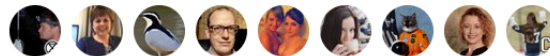
Following



The good thing about Science is that it's true whether or not you believe in it.

8:41 AM - 14 Jun 2013

15,148 Retweets 8,257 Likes



 822

 15K

 8.3K



Is there truth in fiction?



Facts \neq Truth



Facts ≠ Truth

“Just because something happened does not mean that it is morally instructive; just because it never happened does not mean that it is not true.”

—Michael Austin, *Re-reading Job: Understanding the Ancient World's Greatest Poem*, 20

Content + form = truth

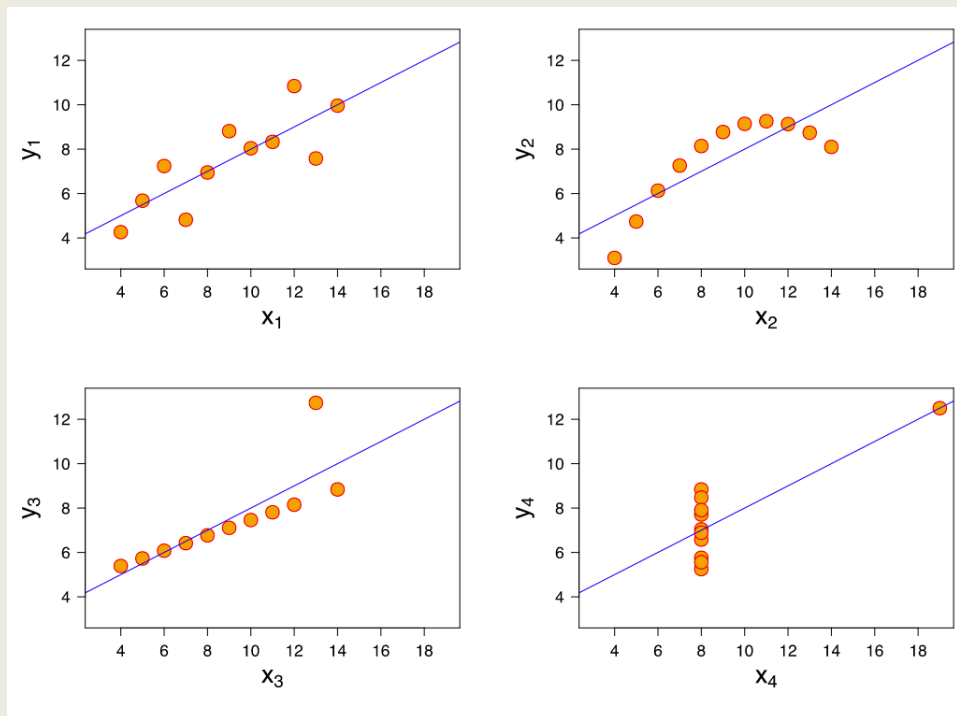
Data visualization and truth

Am I telling you all to lie and
create fictitious graphics?

Does beauty matter?

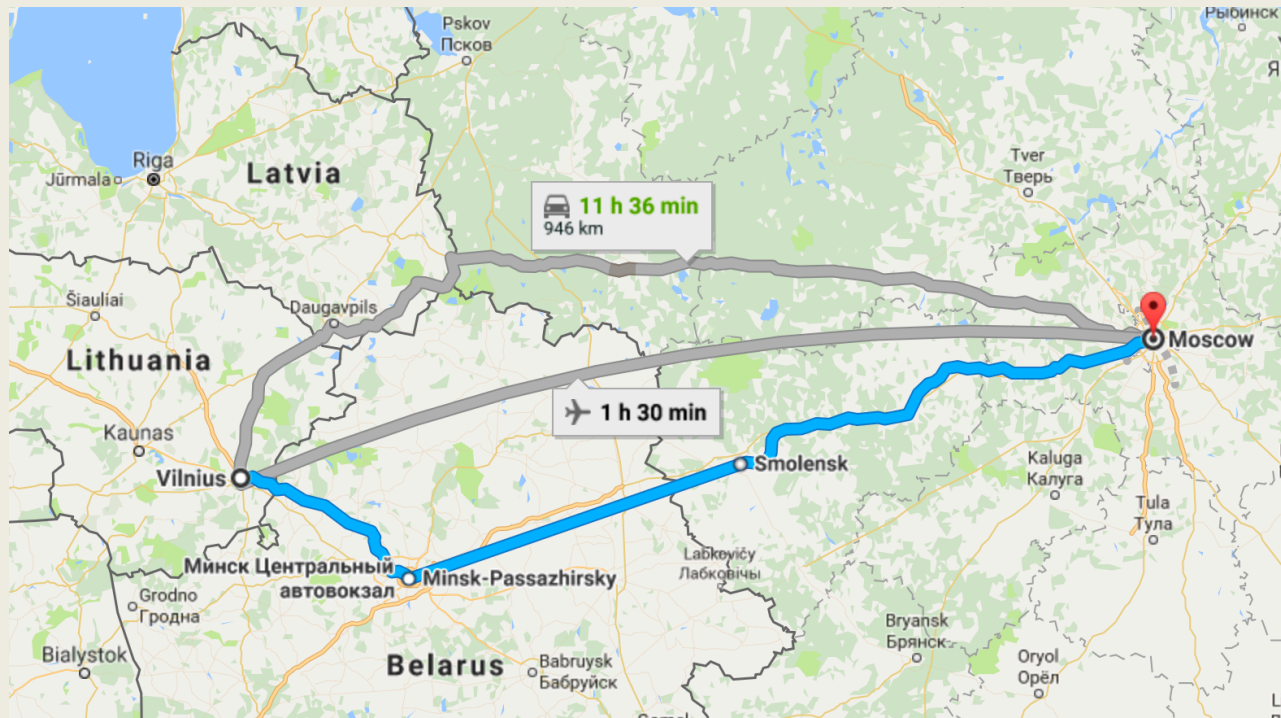
	I		II		III		IV	
	x	y	x	y	x	y	x	y
	10	8,04	10	9,14	10	7,46	8	6,58
	8	6,95	8	8,14	8	6,77	8	5,76
	13	7,58	13	8,74	13	12,74	8	7,71
	9	8,81	9	8,77	9	7,11	8	8,84
	11	8,33	11	9,26	11	7,81	8	8,47
	14	9,96	14	8,1	14	8,84	8	7,04
	6	7,24	6	6,13	6	6,08	8	5,25
	4	4,26	4	3,1	4	5,39	19	12,5
	12	10,84	12	9,13	12	8,15	8	5,56
	7	4,82	7	7,26	7	6,42	8	7,91
	5	5,68	5	4,74	5	5,73	8	6,89
SUM	99,00	82,51	99,00	82,51	99,00	82,50	99,00	82,51
AVG	9,00	7,50	9,00	7,50	9,00	7,50	9,00	7,50
STDEV	3,32	2,03	3,32	2,03	3,32	2,03	3,32	2,03

Does beauty matter?

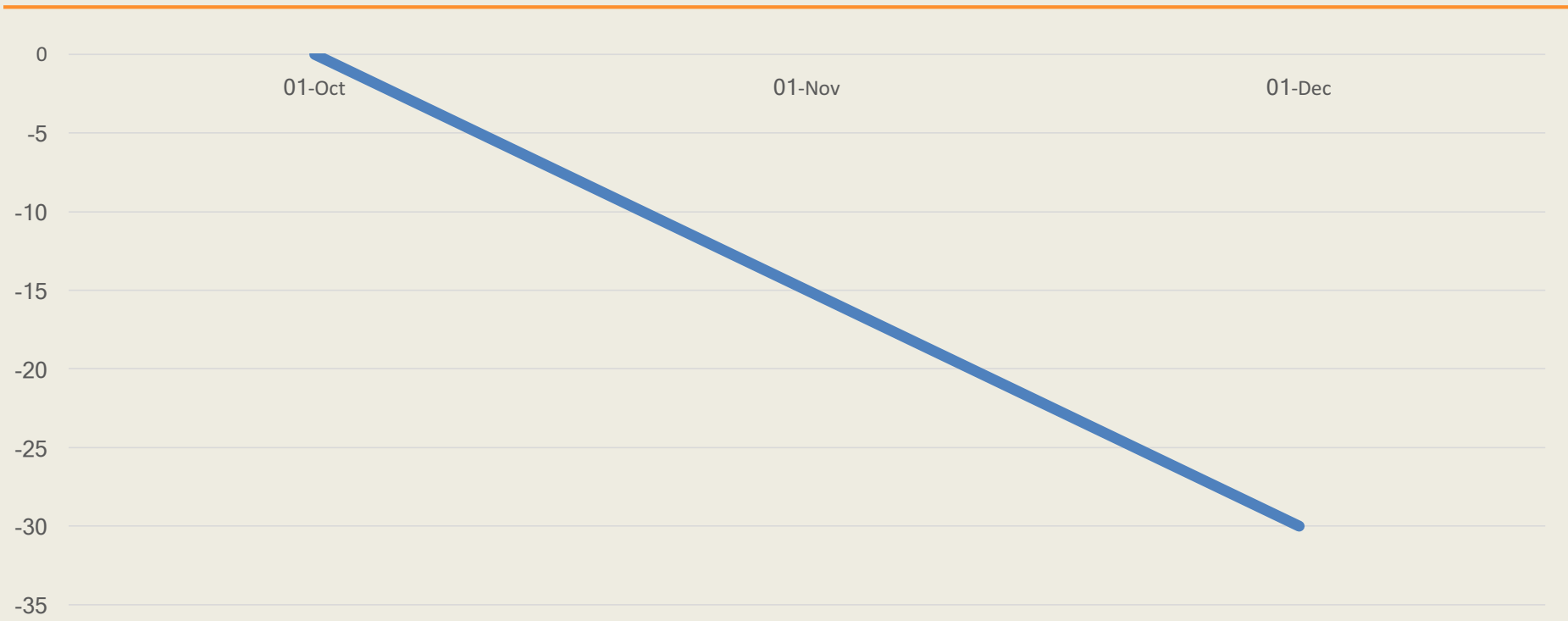




War of 1812

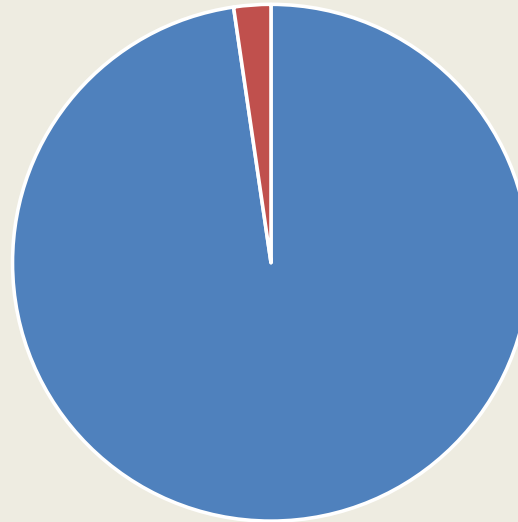


War of 1812



War of 1812

Napoleon's Grande Armée



■ Died ■ Survived

Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Dressée par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui ont été en Russie; le noir ceux qui en sont sortis. — Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Chiers, de Légar, de Fezensac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre. Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davout, qui avaient été détachés sur Minsk et Mohilow et ont rejoint vers Orscha et Witebsk, avaient toujours marché avec l'armée.

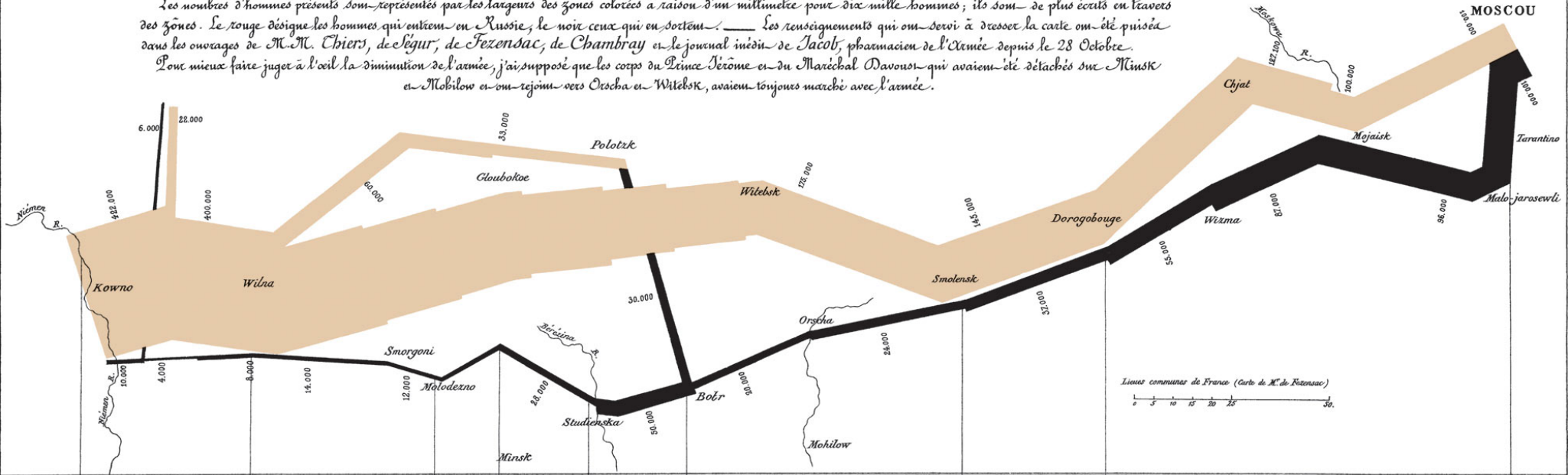
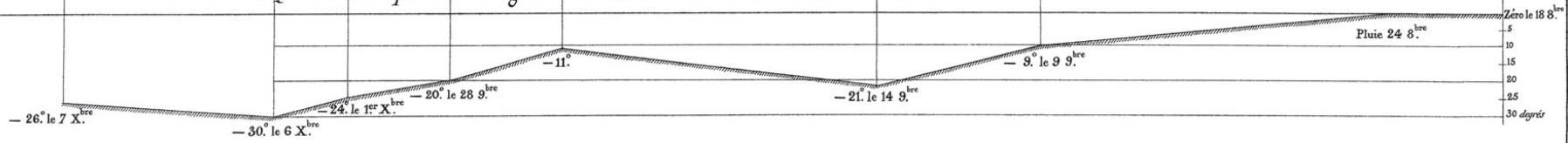


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.



Les Cosaques passent au galop le Niémer gelé.

Characteristics of graphical excellence

1. “... the well-designed presentation of interesting data- a matter of substance, statistics, and design.”
2. Complex ideas communicated with clarity, precision, and efficiency.
3. That which gives the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space.
4. Nearly always multivariate.
5. Requires telling the truth about the data.

Characteristics of graphical excellence

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4. Nearly always multivariate.
5. Requires telling the truth about the data.

What makes this figure so great?

$$d - i \text{ ratio} = \frac{\text{data ink}}{\text{total ink}}$$

Qualities of great visualizations

Truthful

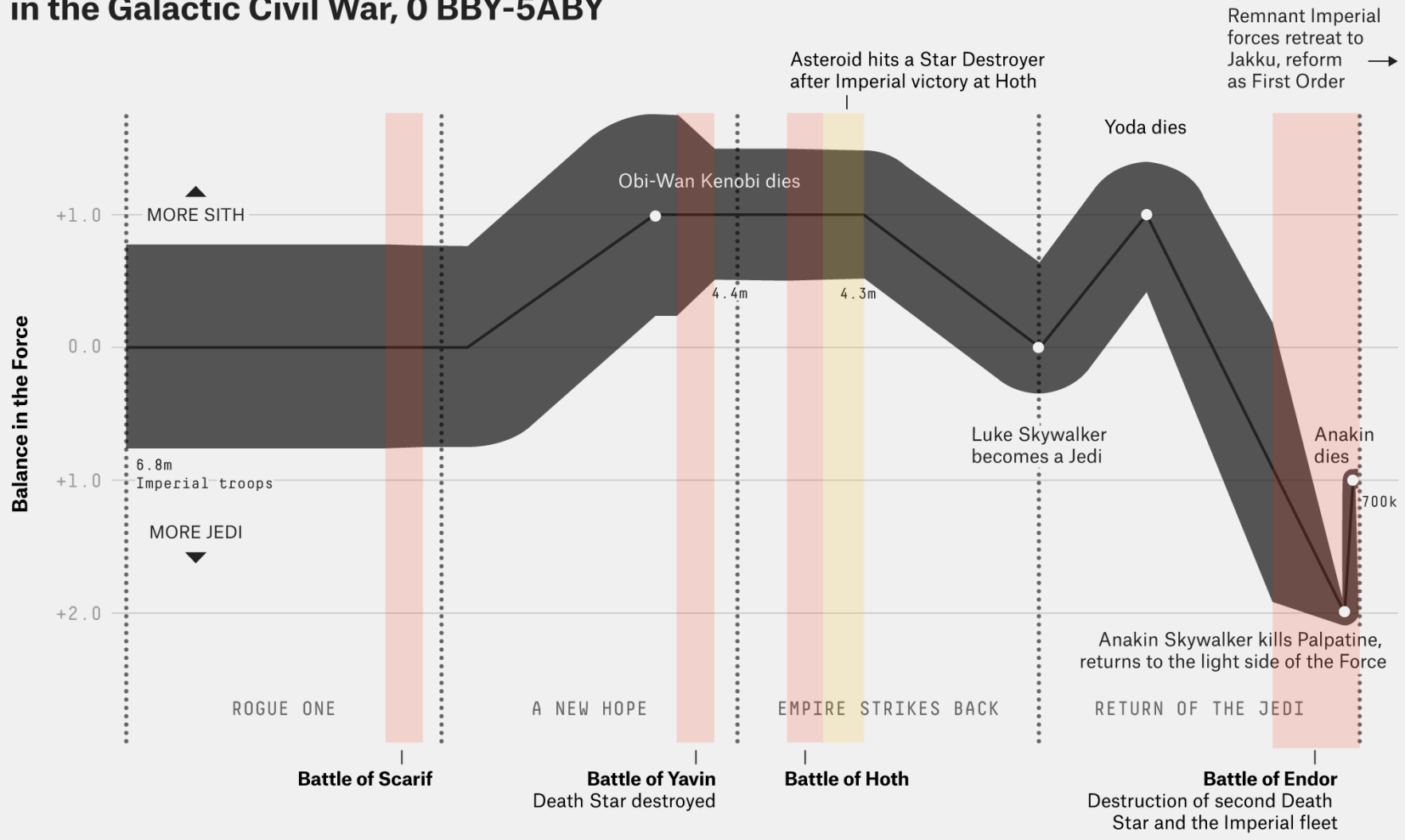
Functional

Beautiful

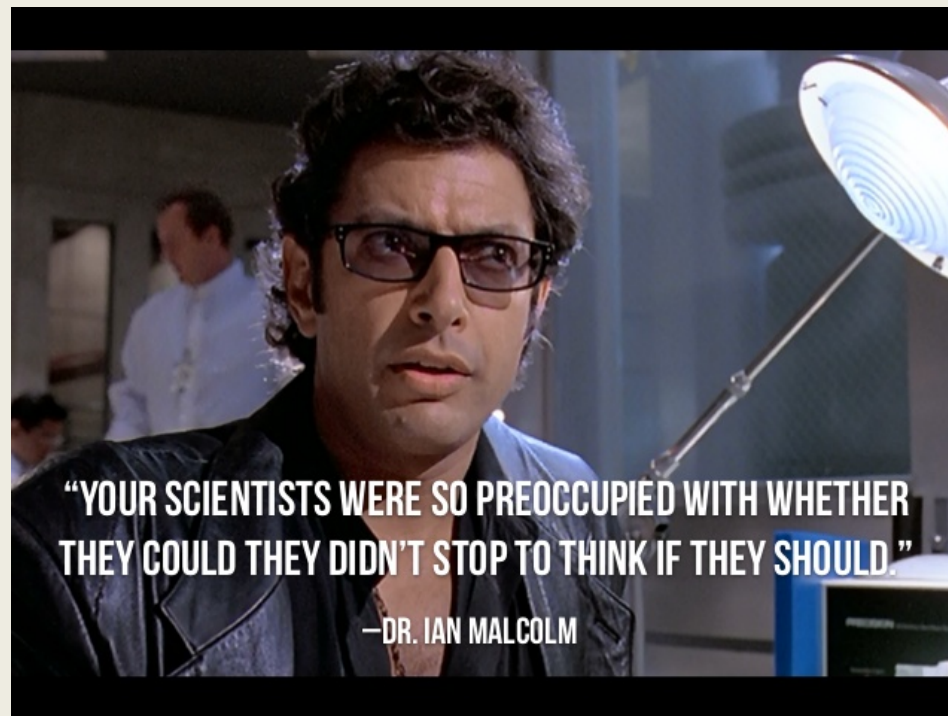
Insightful

Enlightening

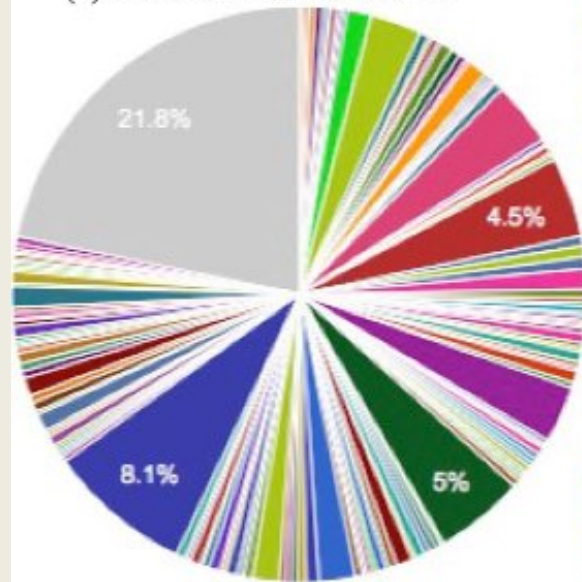
Figurative map of Imperial Navy troop losses in the Galactic Civil War, 0 BBY-5ABY



We forget this

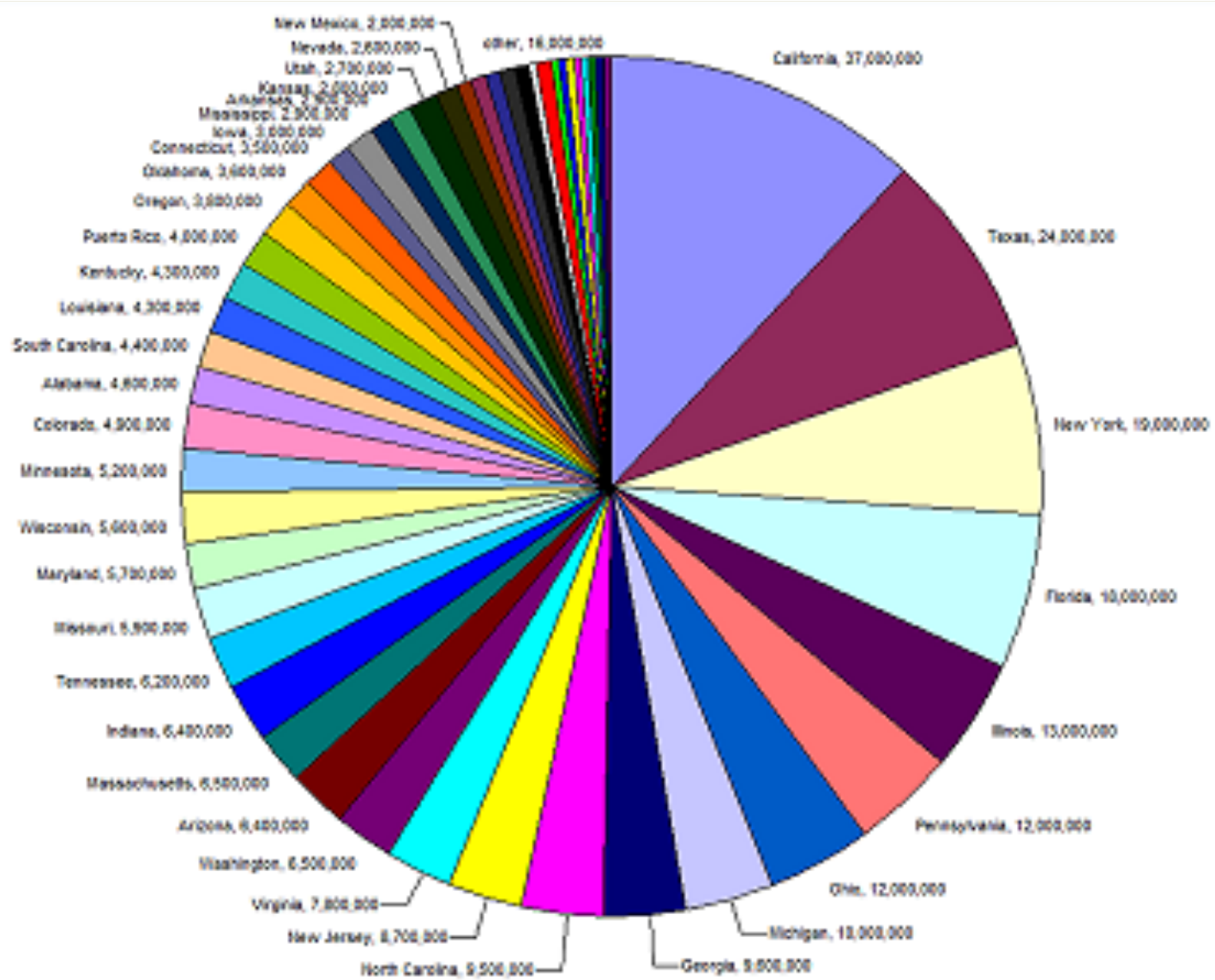


(f) Distribution of Genus



- | | | | |
|-------------------|-------------------------|-------------------|---------------------|
| ● Acaryochloris | ● Aromatoleum | ● Carboxydotherru | ● Desulfarculus |
| ● Achromobacter | ● Arthrospira | ● Caulobacter | ● Desulfatibacillum |
| ● Acidiphilium | ● Azoarcus | ● Chitinophaga | ● Desulfitobacteriu |
| ● Acidobacterium | ● Bacillus | ● Chlorobaculum | ● Desulfobacteriur |
| ● Acidovorax | ● Bacteroides | ● Chlorobium | ● Desulfococcus |
| ● Acinetobacter | ● Bordetella | ● Chloroflexus | ● Desulfotomaculu |
| ● Albidiferax | ● Bradyrhizobium | ● Chthoniobacter | ● Desulfovibrio |
| ● Algoriphagus | ● Burkholderia | ● Clostridium | ● Desulfuromonas |
| ● Alkalilimnicola | ● Caldanaerobacter | ● Cupriavidus | ● Dictyoglomus |
| ● Allochromatium | ● Caldicellulosiruptor | ● Cyanothece | ● Dyadobacter |
| ● Ammonifex | ● Candidatus Accumulib | ● Cytophaga | ● Flavobacterium |
| ● Anabaena | ● Candidatus Desulfuruc | ● Dechloromonas | ● Frankia |
| ● Anaerolinea | ● Candidatus Koribacter | ● Dehalococcoides | ● Gemmata |
| ● Anaeromyxobac | ● Candidatus Solibacter | ● Deinococcus | ● Geobacillus |

- | | | | | | |
|--------------------|--------------------|------------------|------------------|-------------------|---------------------------------|
| ● Geobacter | ● Methylophilum | ● Nodularia | ● Pseudomonas | ● Sphingomonas | ● Thermodesulfobivrio |
| ● Gloeobacter | ● Methylobium | ● Nostoc | ● Ralstonia | ● Spirochaeta | ● Thermomicrobium |
| ● Haliangium | ● Methylobacterium | ● Opatutus | ● Rhizobium | ● Spirosoma | ● Thermosinus |
| ● Heliobacterium | ● Methylococcus | ● Oscillatoria | ● Rhodopirellula | ● Stigmatella | ● Thermosynechococcus |
| ● Herpetosiphon | ● Microcoleus | ● Oscillochloris | ● Rhodopseudomc | ● Streptomyces | ● Thermotoga |
| ● Isosphaera | ● Microcystis | ● Paenibacillus | ● Rhodospirillum | ● Symbiobacterium | ● Thermus |
| ● Ktedonobacter | ● Microscilla | ● Pedobacter | ● Rhodothermus | ● Synechococcus | ● Thioalkalivibrio |
| ● Leadbetterella | ● Moorella | ● Pedosphaera | ● Roseiflexus | ● Synechocystis | ● Thiobacillus |
| ● Leptospira | ● Mycobacterium | ● Pelobacter | ● Roseomonas | ● Syntrophobacter | ● Trichodesmium |
| ● Leptothrix | ● Myxococcus | ● Pelotomaculum | ● Rubrobacter | ● Syntrophus | ● Truepera |
| ● Lyngbya | ● Nitrosococcus | ● Pirellula | ● Shewanella | ● Thermaerobacter | ● Variovorax |
| ● Magnetospirillum | ● Nitrosomonas | ● Planctomyces | ● Siderococcus | ● Thermincola | ● Vermineobacter |
| | | | | | ● Xanthomor |
| | | | | | ● unclassified from Bacte |
| | | | | | ● unclassified from Deltaprotec |
| | | | | | ● Other |



How Valued Do You Feel?

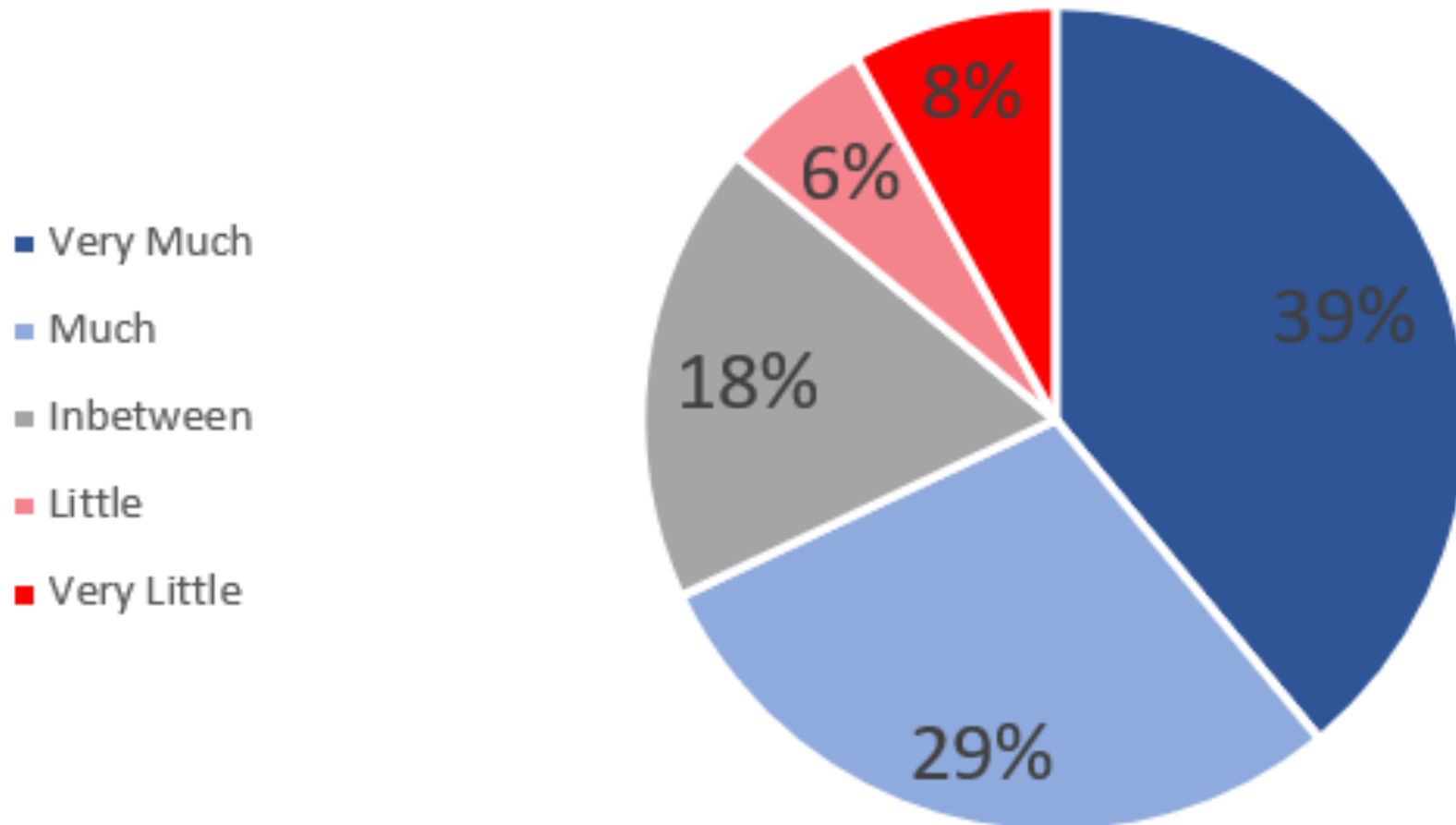
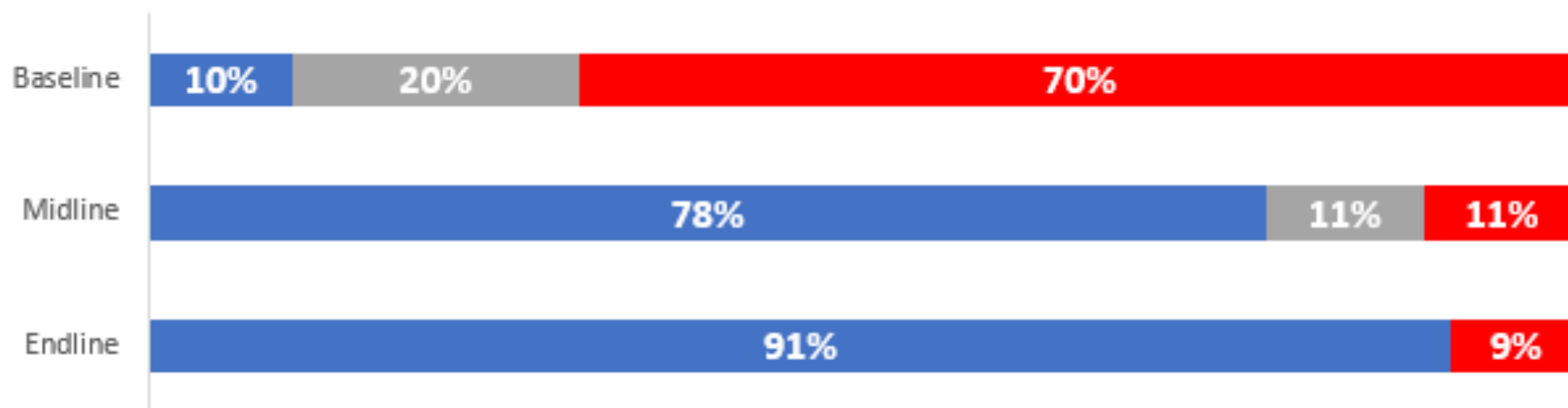


FIGURE 3.3. Time Taken to Complete Observation Form – Library Management Facilitator

Less than 60 minutes | 60-89 minutes | 90+ minutes



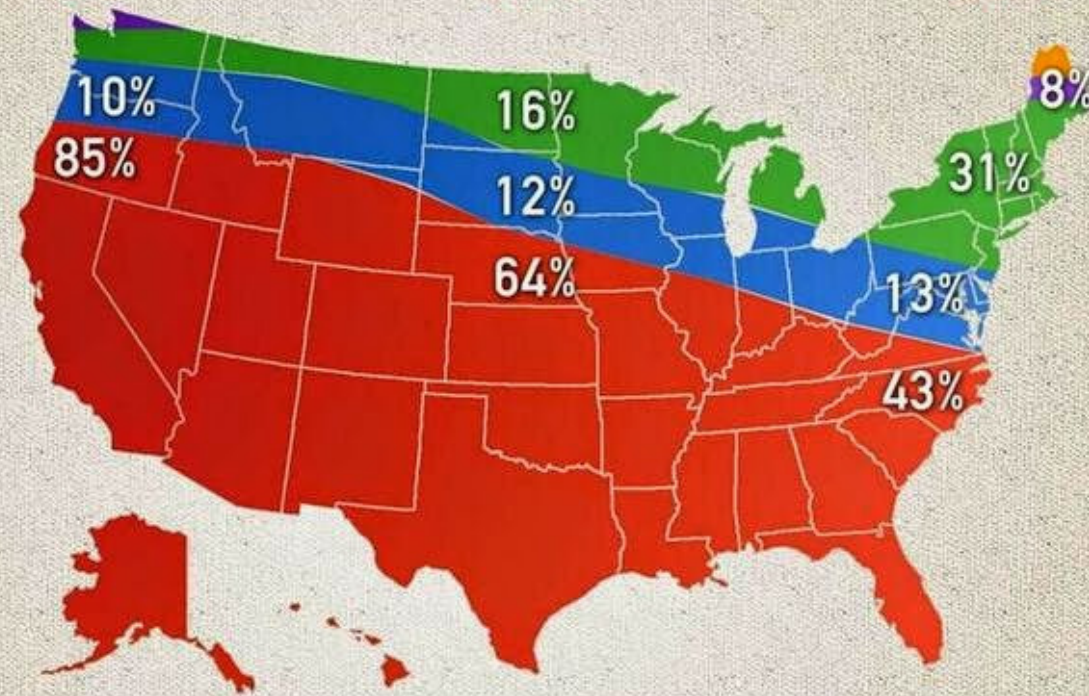
CHANGING FACE OF AMERICA

Percent of total U.S. population by race and ethnicity, 1960-2060

1960

2010

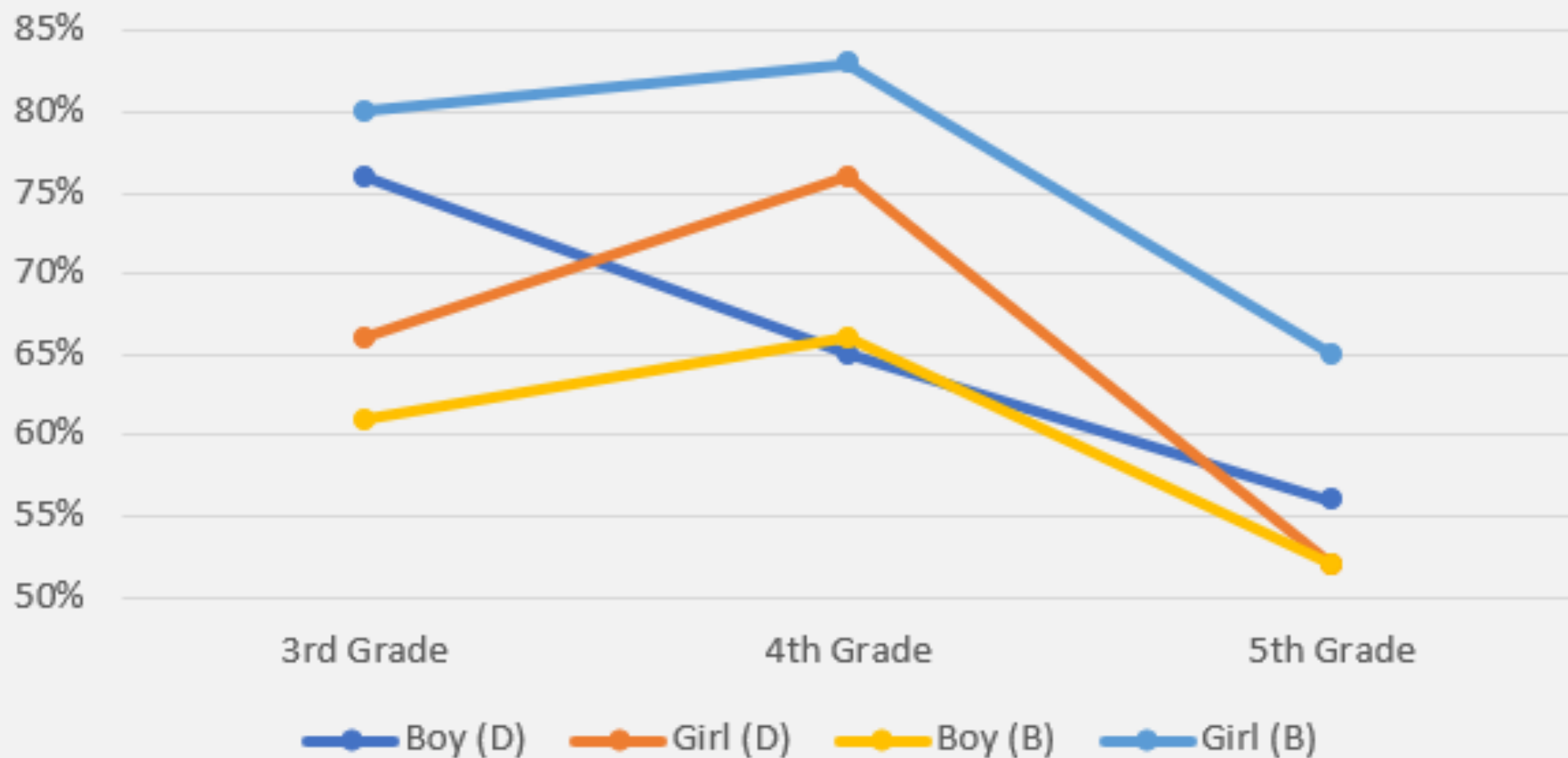
2060



SOURCE: PEW RESEARCH CENTER

NIGHTLY NEWS
with BRIAN WILLIAMS

Net Much Value Amongst 3rd - 5th Grade



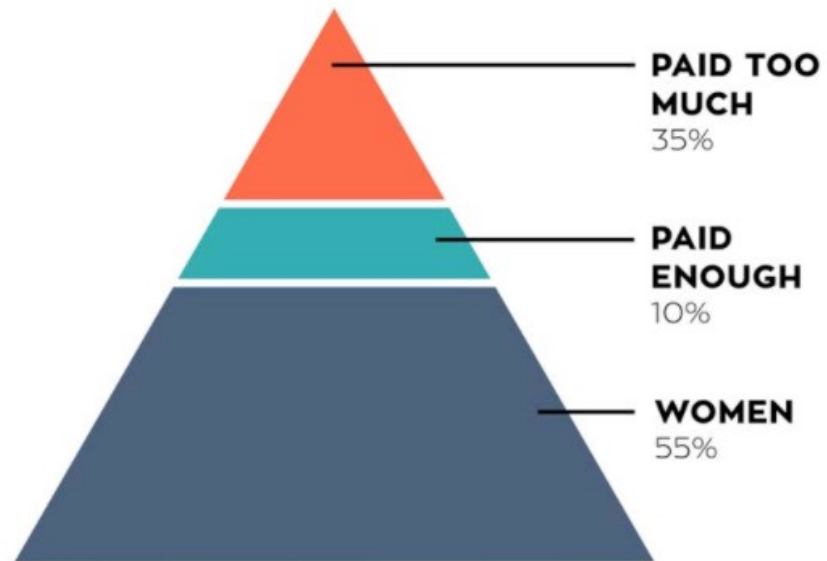
7. Salaries

Salaries are also diverse.

DIVERSITY IN TECH REPORT

Salaries

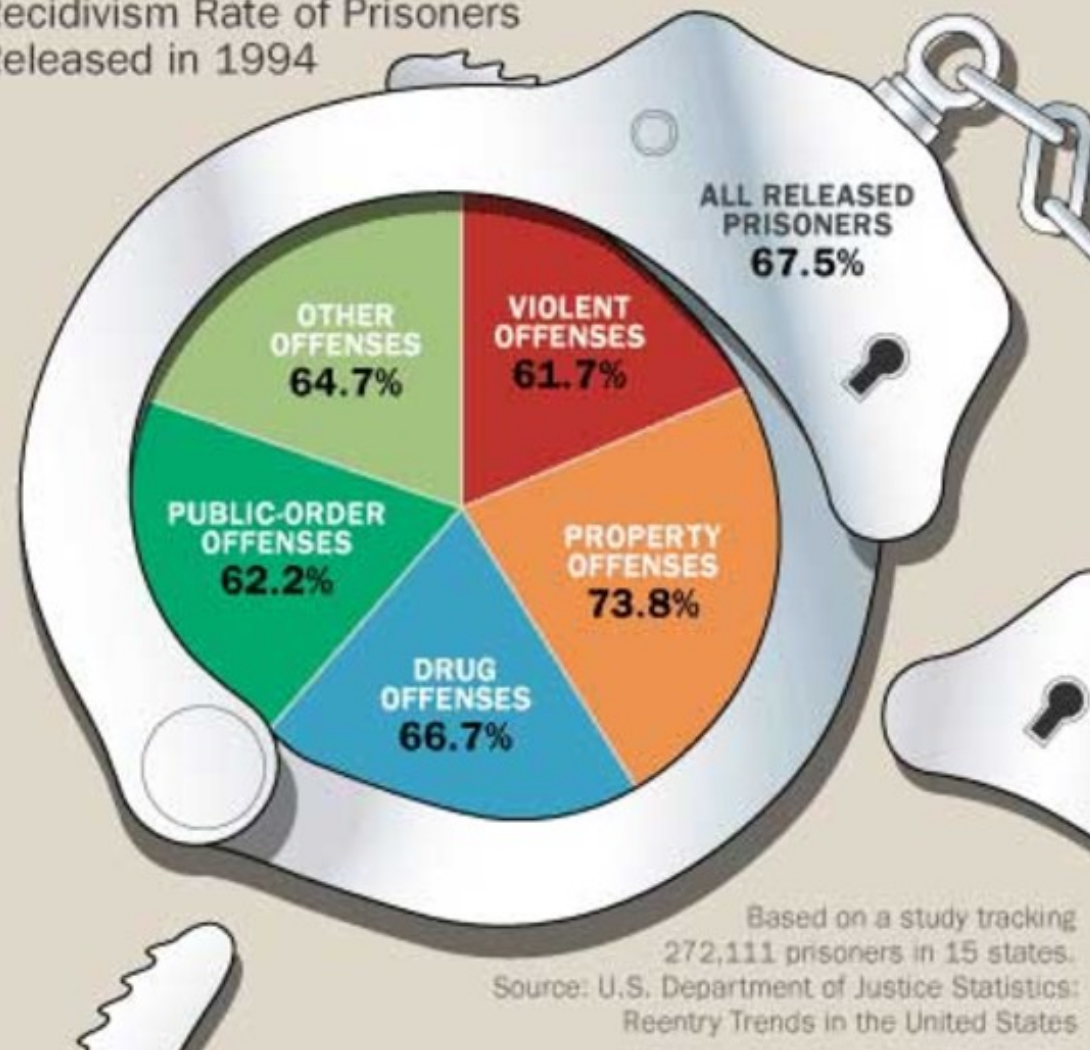
TheCooperReview.com



How Prison Works

©2007 HowStuffWorks

Recidivism Rate of Prisoners
Released in 1994



Email ROI

Email marketing has an ROI of

3800%



DMA

OPEN RATE

is highest when companies send two emails per month.



Database Marketing Institute

75% of Gmail's

900M users

access their accounts via mobile devices.

TechCrunch



A message is

5x

more likely to be seen in email than via Facebook.



Radicati

92%

of online adults use email, with



61%

using it on an average day.

Pew Research

Marketers have noted a

760%

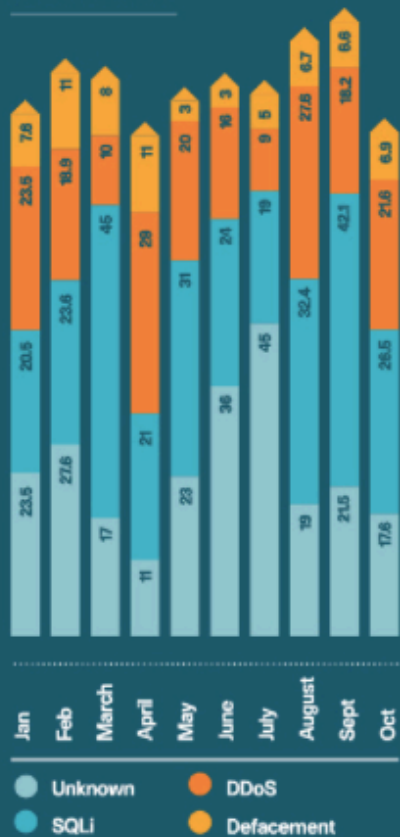
increase in revenue from segmented campaigns.



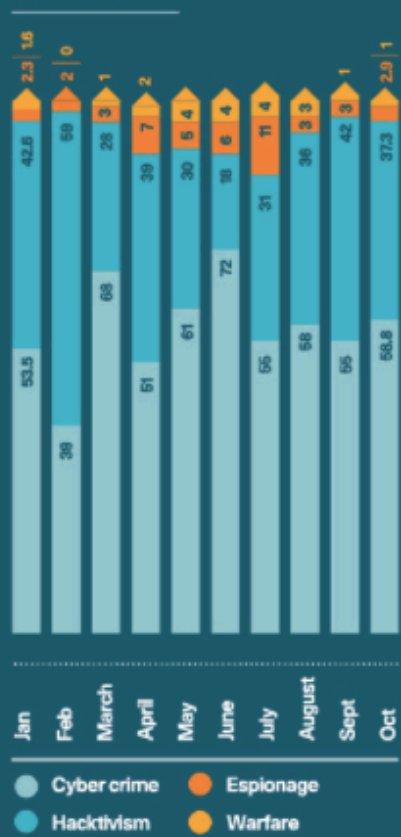
Cyber attacks by month, method, motivation and target worldwide, 2012 (%)

Source: Targeted Cyber Attacks 2012

Method of attack



Motivation



Targets

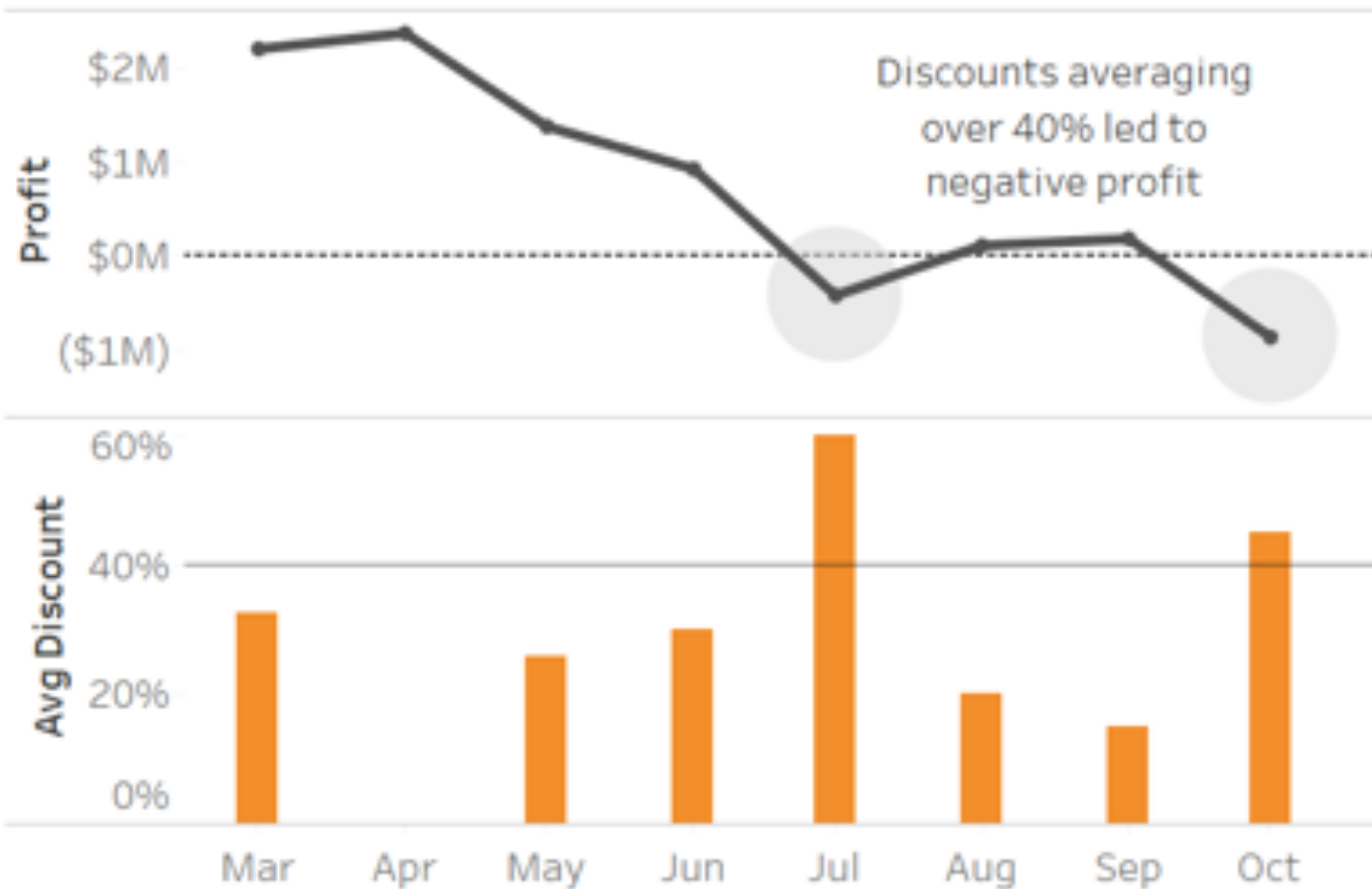
- A NGOs
- B Military
- C News
- D E-commerce
- E Online services
- F Education
- G Industry
- H Law enforcement
- I Government

- Jan
- Feb
- March
- April
- May
- June
- July
- August
- Sept
- Oct



Discount policy needs review

2016 Profits down in East region with higher Discounts



BARRIERS TO BIG DATA ADOPTION IN HEALTH CARE

WHO European Region states considered the following to be the biggest barriers to using big data in health care:

Privacy and security: 71.7%



Lack of intergration: 63%



Information sharing: 50%



SOURCE: World Health Organization survey of member countries

[Share](#)

POLITICO

Independent workers span all demographic groups

Responses from MGI Survey

Total independent workers Million

- Primary
- Supplemental

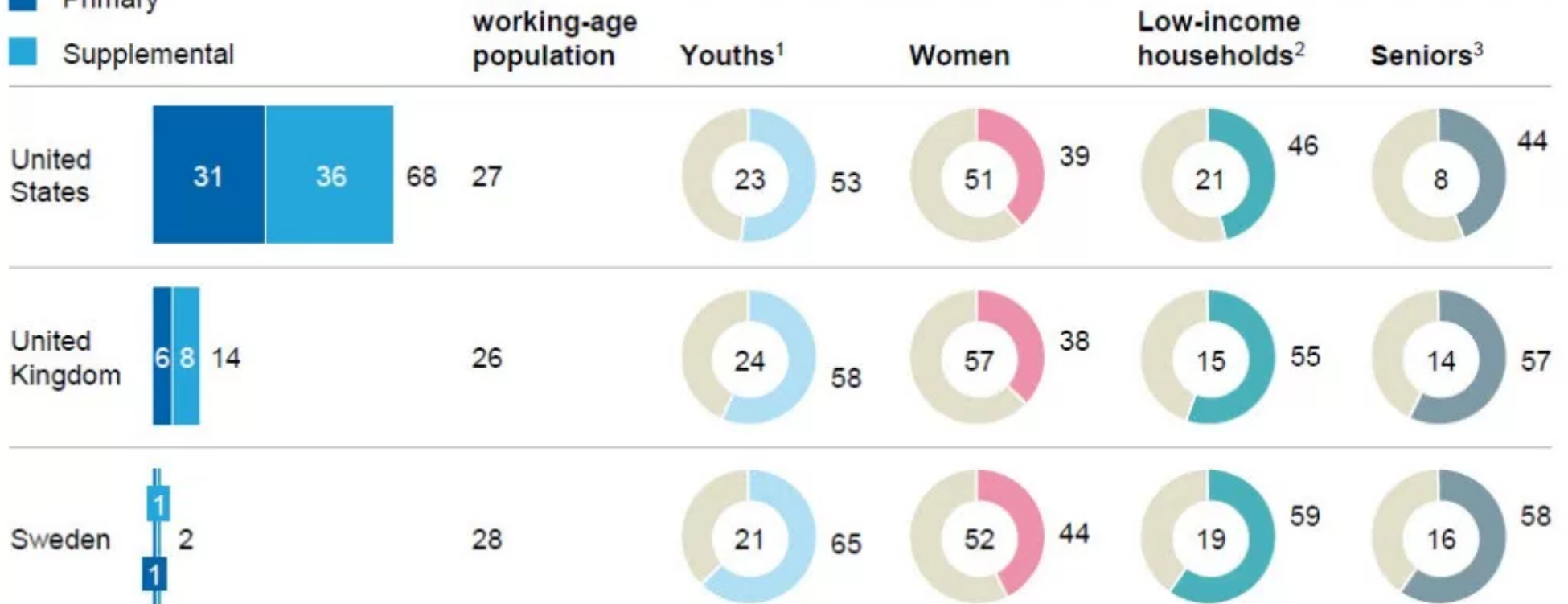
% of
working-age
population

Participation in independent work

% of independent workforce



% of earners in each category who participate in independent work



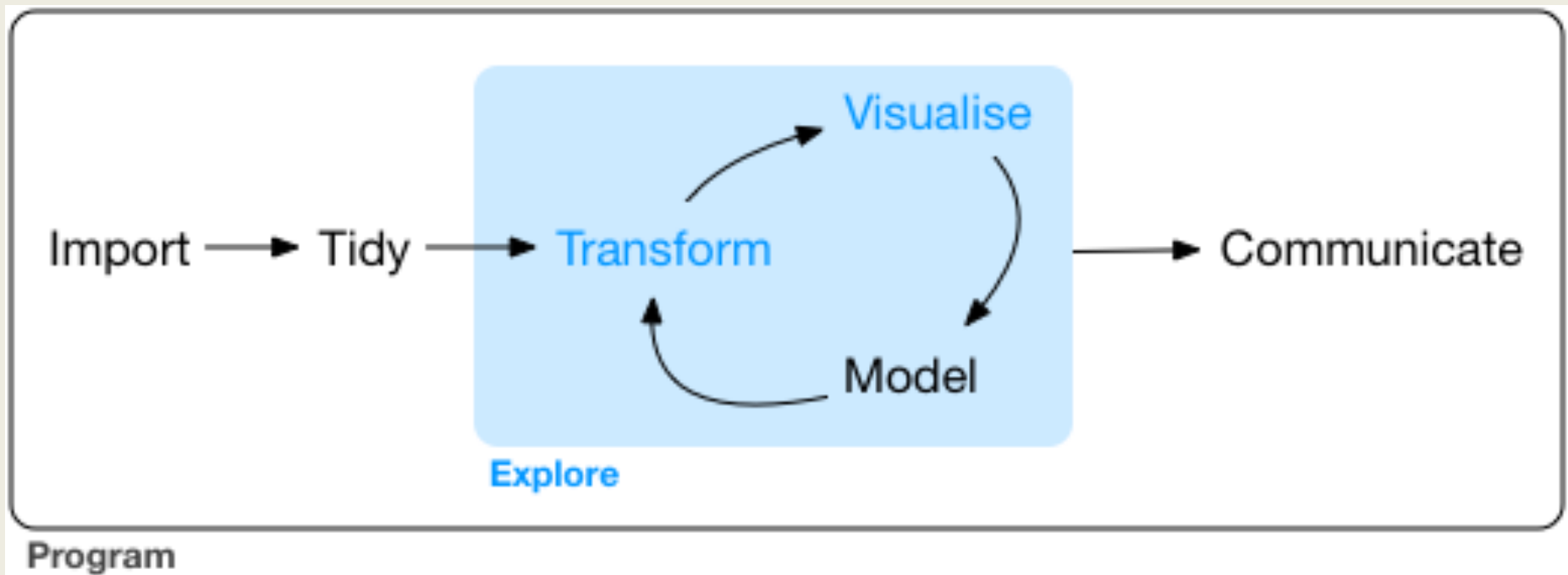
Course overview

Course purpose

Find truth and beauty in data

**Know and evaluate why something
is truthful and beautiful**

The Data Science Workflow



Syllabus

dataviz.andrewheiss.com

Break

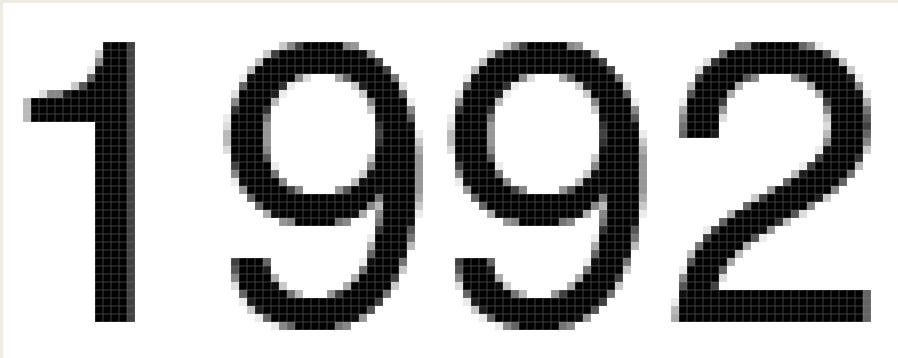
⚡ Overview of Graphic Design ⚡

CRAP

Image types

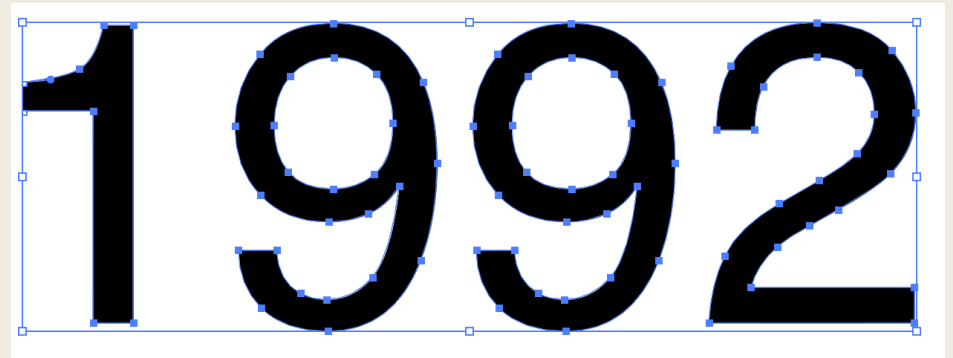
Bitmap

jpeg, png, gif



Vector

pdf, svg



Which format do I use?

Bitmaps

JPEG: Photographs

PNG/GIF: Figures with limited colors

Anything you put in Word

Vectors

PDF: Anything vector based

SVG: Vectors online

Which programs do I use?

Photoshop



Illustrator



InDesign



Photos



GIMP

Vectors



Inkscape

Documents



Scribus



Basic principles of visual design

Contrast

Repetition

Alignment

Proximity

Contrast

“If two items are not exactly the same, make them different. Really different.”

Don't be a wimp.

Contrast: Type

Serif

Lorem ipsum dolor sit amet

Sans Serif

Lorem ipsum dolor sit amet

Slab Serif

Lorem ipsum dolor sit amet

Script

Lorem ipsum dolor sit amet

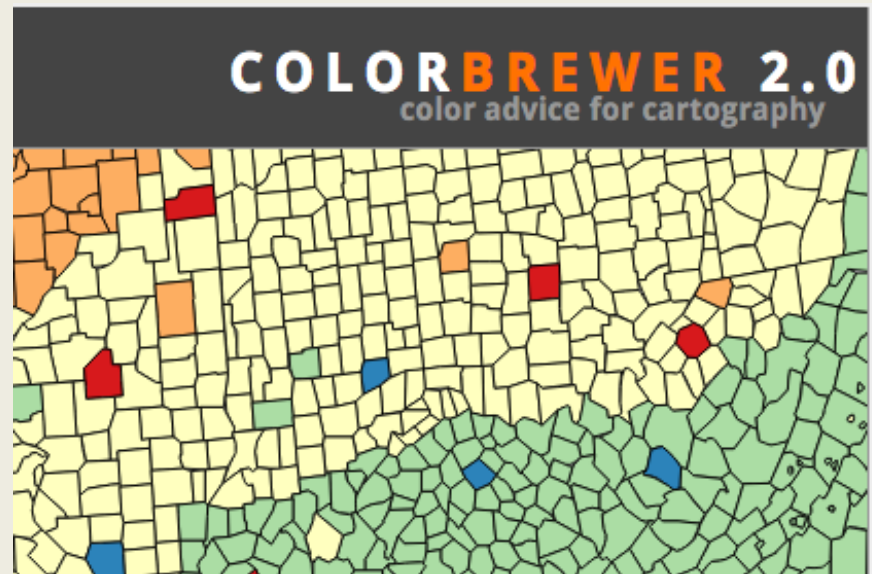
Decorative

Lorem ipsum dolor sit amet

Contrast: Color



<http://color.adobe.com> |
<http://www.colourlovers.com/>



<http://colorbrewer2.org/>

James Clifton Thomas
123 Penny Lane
Portland, OR 97211
(888) 555-1212



PROFILE:

A multi-talented, hard-working young man, easy to get along with, dependable, and joyful.

ACCOMPLISHMENTS:

January 2006-present Web designer and developer, working with a professional team of creatives in Portland.

May 2000-January 2006 Pocket Full of Posies Day Care Center. Changed diapers, taught magic and painting, wiped noses, read books to and danced with babies and toddlers. Also coordinated schedules, hired other teachers, and developed programs for children.

Summer 2006 Updated the best-selling book, *The Non-Designer's Web Book* with my mom (Robin Williams) and John Tollett.

1997-2000 Developed and led a ska band called Lead Veins. Designed the web site and coordinated a national tour.

EDUCATION:

2002-2005 Pacific Northwest College of Art, Portland, Oregon: B.A. in Printmaking

1999-2000 Santa Rosa High School, Santa Rosa, California

1997-1998 Santa Fe High School, Santa Fe, New Mexico

1982-1986 Poppy Creek Daycare Center, Santa Rosa, California

PROFESSIONAL AFFILIATIONS:

Grand National Monotype Club, Executive Secretary, 2000-2002

Jerks of Invention, Musicians of Portland, President, 1999-present

Local Organization of Children of Robin Williams, 1982-present

HOBBIES:

Snowboarding, skateboarding, tap dancing, cooking, magic, music (trumpet, drums, vocals, bass guitar), portrait drawing

References available on request.

James Clifton Thomas



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Good or bad?



We the People of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility...

Article I.

Section 1.

All legislative Powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

We the People of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility...

Article I.

Section 1.

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Repetition

“Repeat some aspect of the design throughout the entire piece.”

FALL 2004

Jamba Whirl

DISCOVER MORE

FRESH SQUEEZED

Start The Day

Bored with breakfast? Skipping it altogether? Wake up to a new way to start your day: **Jamba Juice!**

Delicious!

Jamba is the perfect place to pick up that all-important morning meal. First, our fruit-filled products are overflowing with vital vitamins and minerals to give your body the breakfast boost it needs. Even better, you can grab them on the go—and they taste great, too!

New Fantastic Functional Smoothies. Still sleepy? **Get Up & Mango™**—this new energy smoothie blends brilliant mangos and perky peaches with soy milk, nonfat frozen yogurt and our special Energy Boost™—a potent combination of ginseng, ginkgo biloba, and other fatigue-fighting herbs, as well as four energy-essential B vitamins. **Get Up & Mango™** will get you moving—and give you plenty of potassium, calcium and vitamins C and A, as well as 15 grams of protein*.

Want more protein? Our **Blue Banana Blast™** smoothie is bursting with blueberries and bananas, plus soy milk, nonfat plain yogurt, non-fat frozen yogurt, and Jamba's Protein Boost™. You get 22 grams of protein, plus lots of dietary fiber, calcium and vitamin D. Drink up!

New Yummy Yogurt Blends. These sweet and creamy creations blend nonfat plain yogurt and soy milk with your favorite fresh fruits and fruit juices. These drinkable yogurts are a good source of protein and an excellent source of calcium and vitamins C and D. Yogurt's "friendly bacteria" helps aid in digestion, too. Choose from **Sunrise Strawberry™**, **Bright Eyed & Blueberry™** and **Pick-Me-Up Peach™**.

Tomorrow morning, don't let the first meal of the day put you to sleep! Go to Jamba—and give yourself a fresh start!

* Nutritional information based on Original size smoothie.

FUEL FACTS

Rise and Shine With Breakfast

Your mother was right. You shouldn't skip breakfast. But eating any old morning meal won't do. To start the day right, you need to feed your body the vitamins and nutrients it craves. "You don't want to waste calories," explains Suzanne Havala Hobbs, a registered dietitian and member of Jamba's Wellness Advisory Board. "If you load up on empty calories for breakfast, by the end of the day, you're more likely to have missed some important nutrients."

A nutritious breakfast offers a bounty of benefits. For one, you'll have more energy and will probably perform better at work or school. Why? When you wake up in the morning, your body's energy stores are low. After all, you haven't eaten anything in eight to 12 hours. If you don't refuel with breakfast, you'll probably be starved by lunch—and more likely to overeat and make impulsive food choices.

(Continued on back page)

Visit jambajuice.com for a complete list of store locations!

BEHIND THE BLENDER

The Secret To Jamba Smoothies

Ever wonder why Jamba smoothies taste so terrific? The secret is in the fruit—and how we pick it.

It starts in the fields. Jamba's suppliers pick produce at the peak of perfection, and within hours, that fruit is "individually quick frozen" to lock in its fresh flavor, juices and nutrients. Soon, it's on its way to Jamba stores, ready to be mixed into one of our splendid smoothies!

Of course, not all fruits are created equal. And when Jamba searches the globe for the best bananas, berries, peaches and more, we're pretty hard to please. We're not only picky about the fruit itself—we insist on a specific variety of strawberry, and each one must adhere to our strict standards for color and flavor—we're also choosy about the people who supply it.

Our suppliers must meet a long list of stringent standards for ensuring quality and food safety. We require vendors to detail all of their quality and safety processes and pass a rigorous third-party audit before we'll even agree to taste-test their fruit. In addition, Jamba officials visit supplier facilities and continue reviewing processes even after a contract is signed. Many of our vendors have been our trusted partners for years.

Why all the fuss? Jamba is committed to providing only the highest quality products to our customers. After all, the better the fruit, the better the smoothie!

FRESH CROP Opening This Fall!

- Rancho Cucamonga, California
- Fl. Lauderdale, Florida
- Charlotte, North Carolina
- Honolulu, Hawaii
- Fifth Avenue, New York
- Orland Park, Illinois

JAMBATUDE

Spreading The Jamba Spirit

Jamba General Manager Ray Sterling is a big believer in supporting the local community. So when Ray, who manages the Jamba store at 9th and Irving streets in San Francisco, saw that the 2004 AIDS Walk San Francisco fundraising event was approaching, he sprang into action.

Ray volunteered to captain a team of walkers and, with the help of the Jamba's Northern California marketing department, quickly spread the word about the event to all the stores in Northern California. His goal: Raise \$10,000 for AIDS Walk, which benefits the San Francisco AIDS Foundation and other organizations that provide services, support and education to AIDS patients.

His enthusiasm turned out to be contagious. On July 18, the day of the walk, he found himself leading a team of more than 40 people, including Jamba team members, customers and friends and family. Two team members donned BananaMan costumes, and the rest of the team sported bright yellow Jamba t-shirts as they walked 6.2 miles through Golden Gate Park. Total money raised: \$16,019.

"I think it's so important to support the local community," Ray explains. "This is a big event in San Francisco, and the money goes to help people and children right here. I felt it was essential for Jamba to be a part of it."

The AIDS Walk isn't the only community project Ray has been involved with since joining Jamba two-and-a-half years ago. He also works with a local chapter of The Arc, an organization that helps people with developmental disabilities. Through The Arc, Ray has hired several people with disabilities to work for him at Jamba. For his efforts, he was recognized as an "Employer of the Year" last year by the San Francisco Mayor's Committee for Employment of Persons with Disabilities.

"Ray exemplifies everything that Jamba stands for," says Gail DiSantis, a Jamba District Manager for San Francisco and Ray's boss. "He's friendly, fun and energetic, and when it comes to helping the community, he doesn't just talk. He's a doer."



HUMANITIES

AT BRIGHAM YOUNG UNIVERSITY

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Student Scholars Present their Research



Rachel Korten speaks at the College Symposium on "Thomas's Wilden Pond as a Cultural Text"

"If you have knowledge," says Margaret Fuller, "let others light their candles in it." Through sharing their ideas and discoveries at conferences and symposia, our students are learning to light others' candles. They also learn to communicate with precision in a professional setting. Whether they plan academic careers or not, the benefits are just as great: confidence, ability to express complex ideas with grace and clarity, and intellectual maturity and independence.

During the last academic year, dozens of our students took part in academic conferences and workshops. Here are some examples:

Anna Siebach, a senior studying French and Comparative Literature, presented a paper at the International Congress on

Medieval Studies in Kalamazoo, Michigan, at the beginning of May. Anna spent this winter semester doing research in Paris on the Bibles Moralises, a collection of illuminated Bibles produced for the French royalty between the 13th and 15th centuries. Her paper addressed the political and religious implications of the Bibles, focusing particularly on the Christological representations of kings. Anna was one of three undergraduates to give papers at the conference, one of the largest medieval conferences in North America.

English/Psychology double-major Kristy Mosey received a university grant to present at a conference in Weimar, Germany, on June 22. Kristy's paper addresses Arthurian literature in the context of Jungian analysis, and in particular the *continued on page 3*

To Think About: Can You Step in the Same River Twice?

Philosophy Professor Dan Graham lectured recently on Heraclitus, the Greek philosopher famous for observing that one cannot step into the same river twice. Did he mean that the person, or the river, changed? Both versions are supportable. However, that does not mean, said Graham, that there is no stability, no continuity to life. What Heraclitus may have seen is that in a life of flux and change, we define ourselves in relation to what is changing around us.

Said professor Graham:

People finding a river encounter ever-changing waters, but in the process they also encounter the river. In missing the force of the flowing waters . . . the travelers get to their destinations, identifying themselves as independent agents instead of pieces of flotsam. They define themselves by the responses they make to changing situations and a

changing environment.

Graham continues:

And perhaps the changing environment is just as important to the creation the traveler's character as the changing water is to the existence of the river. If we did not constantly meet with sensory stimulation, differing situations, judgments to be made, and decisions to be postponed, we would be mere vegetables. Studies in sensory deprivation show that without constant stimulation, humans quickly become disoriented. The deeper ethical consequence is that without challenges and oppositions we cannot build character. "For it must work by," says Levi to his son Jacob, "that there is an opposition in all things. If not so, my first-born in the wilderness, righteousness could not be brought to pass, neither wickedness, neither holiness nor misery, neither good nor

bad" (2 Ne. 2: 11). We make our character, for good or ill, by confronting changing situations, evaluating, choosing, and acting in accordance with choices.

This interpretation coincides with another of Heraclitus' maxims: "The character of a man is his destiny."

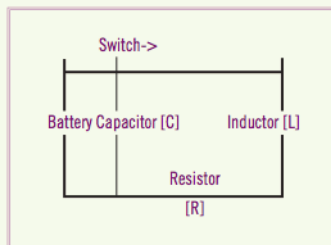
Dean Van Gessel comments: "All of us are in the process of defining ourselves in relation to change. Our students are doing this with a special intensity; they are young, and they learn new things every day. This edition of the newsletter highlights their activities in practicing scholarship and communicating their work to audiences outside the classroom. We are proud of the ways in which they are defining themselves, and we approach with reverence our mission to help them in the process."

Alignment

“Every item should have a visual connection with something else on the page.”

Example 6: Value of a resistor in an electrical circuit.

Find the value of a resistor in an electrical circuit which will dissipate the charge to 1 percent of its original value within one twentieth of a second after the switch is closed.



q0= 9 volts
 q(t)= 0.09 volts
 t= 0.05 seconds
 L= 8 henrys
 C= 0.0001 farads

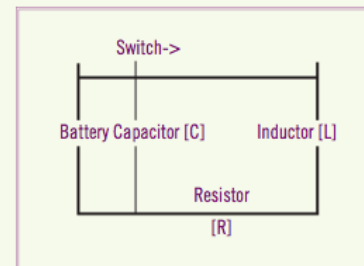
R= ohms

q(t)=

1/[L*C_]	1250
[R_/(2*L)]^2	351.5625
SQRT(B15-B16)	29.973947
COS(T*B17)	0.07203653
-R_*(T/(2*L))	-0.9375
Q0+EXP(B 19)	3.52445064

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Fewer/Less

The Controversy: Some usage dictionaries state that fewer and less can be used synonymously while others say that there is a distinct difference in the usage between the two. Fewer cannot be used in place of less, but can less be used in place of fewer?

The Traditional Rule: Fewer refers to number among things that are counted, or readily distinguishable units (fewer people, ships, houses.) Less refers to quantity or amount among things that are measured (less sugar, time, energy).

History: The rule first originated in 1770 as a rule on less, "this word is commonly used in speaking of a number; where fewer would do better. Essentially less has been used of countables in English just about as long as there has been a written English language. After about 900 years Robert Baker opined that fewer might be more elegant and proper. Almost every usage writer since Baker has followed Baker's lead, and generations of English teachers have swelled the chorus. "No fewer than a hundred appears to me not only more elegant than no less than a hundred, but strictly more proper." - Baker 1770

Consensus: A substantial majority of panel members advocates retaining this distinction between less and fewer. The general consensus favors the traditional rule that fewer refers to countable things while less refers to things measured, though strong forces are pushing against it.

Examples:

"However fewer and fewer writers observe it, so the distinction is becoming less and less." -Vermont Royster

"...Dudek's car has fewer than 600 miles on the odometer." - Rick Reilly

"...has never gained fewer than 1,222 yards in a season." -Rick Telander

"The odometer showed less than ten thousand miles." - E.L. Doctorow

"I was never in Europe for less than fourteen months at a time." - James Thurber

not very important history

CONJUNCTIVE ADVERBS

Conjunctive adverbs are adverbs that are used to connect two phrases or clauses. They can be used after a semicolon to connect two independent clauses or after a period to introduce a new sentence.

accordingly	furthermore	moreover
also	hence	nevertheless
anyhow	however	otherwise
anyway (informal)	incidentally	still
besides	indeed	then
consequently	likewise	therefore

The above words become conjunctive adverbs when they join two phrases or clauses together, providing a connection.

ADVERB: Though the danger was great, the policy was *nevertheless* adopted.

CONJUNCTIVE ADVERB: The action proposed by the government meant risking military action; *nevertheless*, public opinion supported it.

Style

- Formal Writing: conjunctive adverbs with three or four syllables are usually used in sentences of length and complexity.
- Informal Writing: shorter adverbs are more appropriate. They are better used as transitional devices between sentences than to connect clauses within a sentence.

Position

- Place the conjunctive adverb according to the word, phrase, or clause you want to emphasize. Place it at the beginning to emphasize what follows; place it in the middle (refer to example below) to emphasize what was previously mentioned.

EXAMPLE: The action proposed by the government meant risking military action; public opinion, however, supported it.

Punctuation

- Whether a conjunctive adverb introduces or comes inside of the second independent clause of a compound sentence, the two independent clauses are separated by a semicolon. In either position, it is sometimes but not always set off by a comma or commas.

Examples (of however)

- Susie is only one of five admitted last night. Two of these, however, are on medical wards.
- The man himself, however, was not greatly put out by the experience.
- (mid-sentence, after a clause) As time passed, however, I slowly began to see the originality of the resistance you offered.
- (at end of sentence) Lanzmann's tone over-generalized, however.

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Contents



<i>General Editor's Note</i>	vii
<i>Publisher's Note</i>	ix
<i>Introduction: "Very like a Whale"</i> DAVID SCOTT KASTAN	1

ARTICLES

Shakespeare in the Bush LAURA BOHANNAN	9
On the Value of <i>Hamlet</i> STEPHEN BOOTH	19
Hamlet and Our Problems MICHAEL GOLDMAN	43
<i>Hamlet</i> and the Power of Words INGA-STINA EWBANK	56
Hendiadys and <i>Hamlet</i> GEORGE T. WRIGHT	79
Hieronimo, Hamlet and Remembrance JOHN KERRIGAN	110
"Maimed Rites": Violated Ceremony in <i>Hamlet</i> DAVID BEVINGTON	126
<i>Hamlet</i> : letters and spirits MARGARET W. FERGUSON	139
<i>Hamlet</i> —the "Mona Lisa" of Literature JACQUELINE ROSE	156

CONTENTS

CHAPTER ONE	Thistle and Rose : The Paradoxical Vision	9
TWO	'Trembling Sunbeams' : The Vision and the Poetry	23
THREE	'Chitterin' Licht' : <i>Annals of the Five Senses, Sangschaw and Penny Wheep</i>	41
FOUR	'A Routh o' Contraries' : <i>A Drunk Man Looks at the Thistle</i>	80
FIVE	'Shadows that Feed on the Light' : <i>To Circumjack Cencrastus</i>	155
SIX	'Labradorite Crystals' : <i>Scots Unbound and Stony Limits</i>	174
SEVEN	'Politics is Bairns' Play' : <i>First Hymn to Lenin and Second Hymn to Lenin</i>	196
EIGHT	'Different Birds in Different Places' : Poetry since 1935	211
	<i>Postscript</i>	229
	<i>Notes</i>	233
	<i>Glossary</i>	240
	<i>Works Consulted</i>	246
	<i>Indexes</i>	253

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