

Misleading Charts and Graphs

Charts and Graphs are sometimes intentionally created to mislead the “reader” into believing an untruth... but sometimes they are created without fully considering all aspects of the data display.

Things to consider:

- * **What makes this graph misleading?**
- * **What could be changed to make the graph more accurate?**
- * **Why might someone want this data to be misleading?**

Bar Graphs

The Terri Schiavo Court Case

In February of 1990 at the age of 26, Terri Schiavo collapsed at home and oxygen was cut off to her brain for several minutes. The cause of the collapse is disputed. Michael Schiavo, Terri's husband, blames a cardiac arrest induced by a potassium imbalance associated with bulimia. The Schindlers suspect he tried to strangle her, based on court testimony by a neurologist.

No one was aware Terri Schiavo had an eating disorder. The Schindlers told that Terri was very conscious of her weight because she had been heavy in high school and her husband put pressure on her to stay thin, reportedly making comments like "If you ever get that fat again, I'll divorce you."

Michael Schiavo denies having made such comments to his wife.

Though severely brain-damaged, Terri Schiavo breathes and maintains a heart beat and blood pressure on her own. While her vision is impaired, she can see and move her limbs. But she needs a feeding tube connected to her stomach to sustain her life.

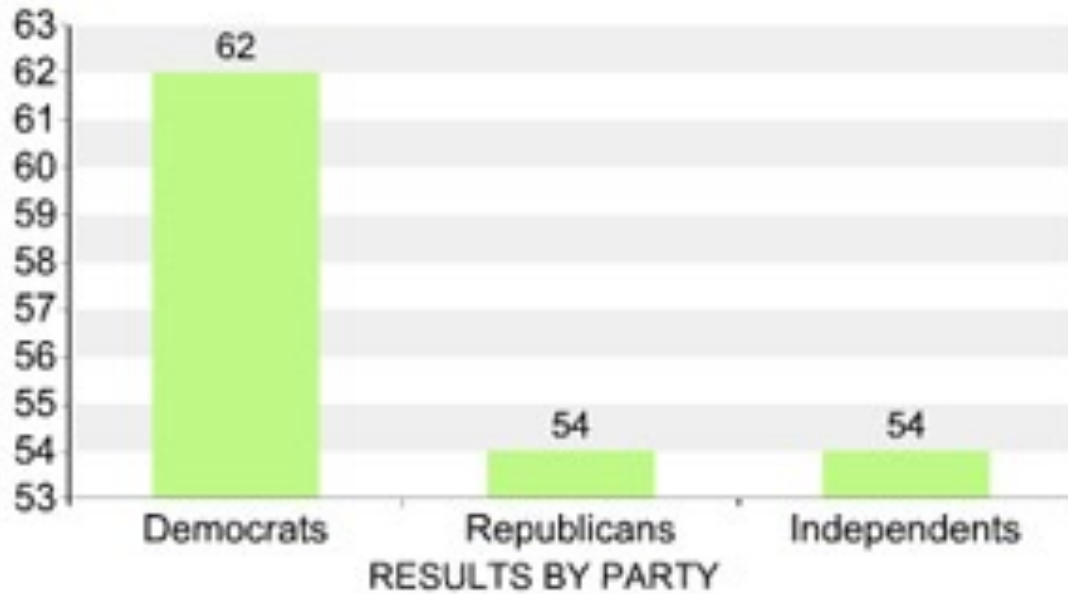
Her husband went to court to get permission to remove her feeding tube.

Results by party

← PREVIOUS

NEXT →

■ Agree



Question 2: Based on what you have heard or read about the case, do you agree with the court's decision to have the feeding tube removed?

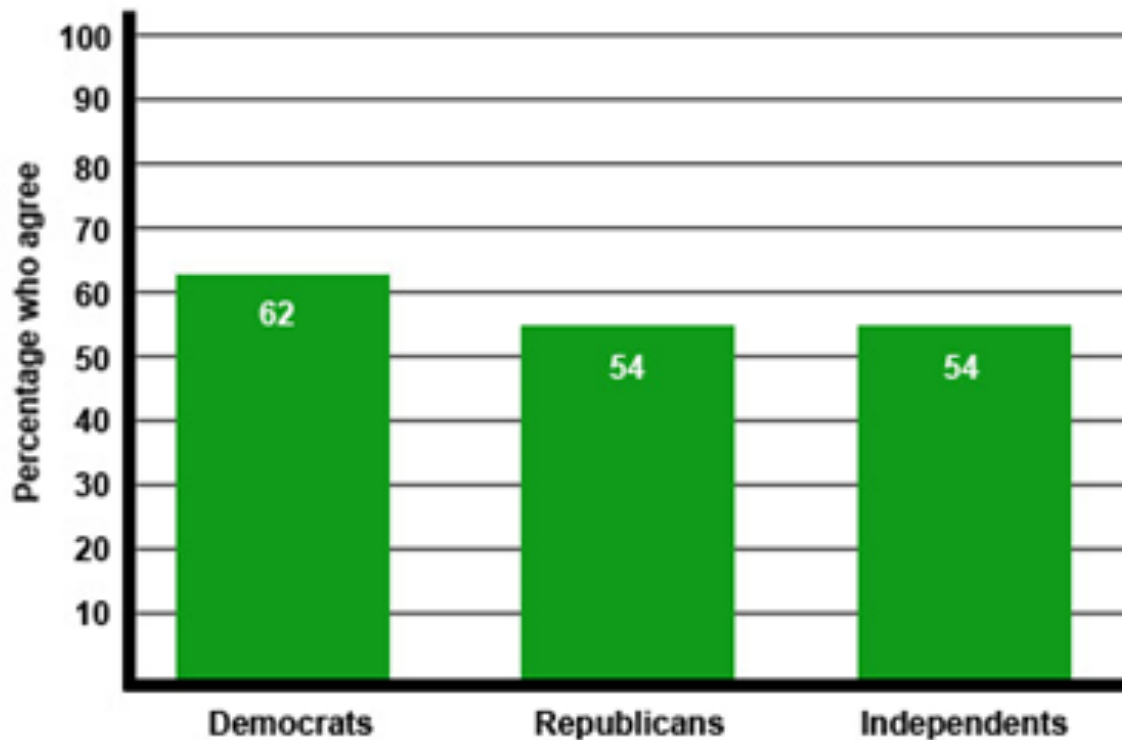
SAMPLE: Interviews conducted by telephone March 18-20, 2005, with 909 adults in the United States.

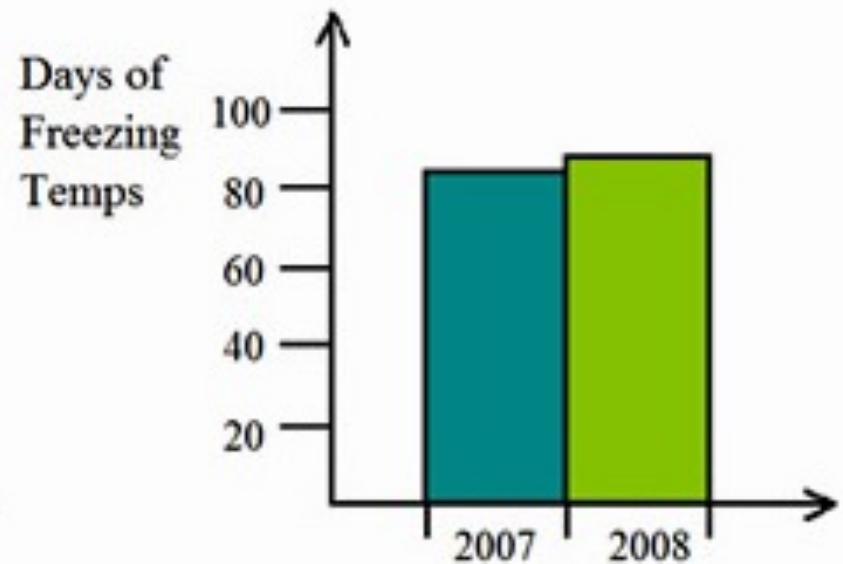
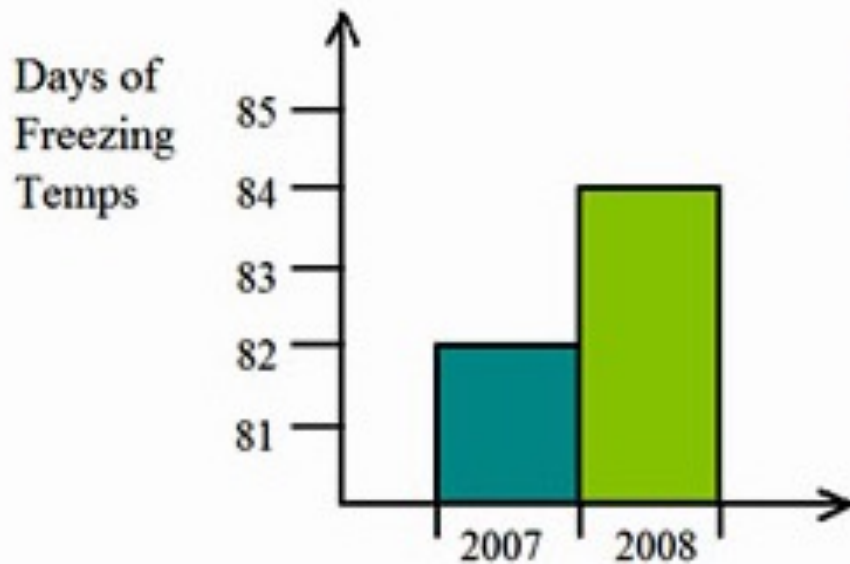
SAMPLIING ERROR: +/- 7% pts

The same data:

RESULTS BY PARTY: CNN/USA Today/Gallup Poll
Margin of error: +/- 7%

Question 2: Based on what you have heard or read about the case, do you agree with the court's decision to have the feeding tube removed?

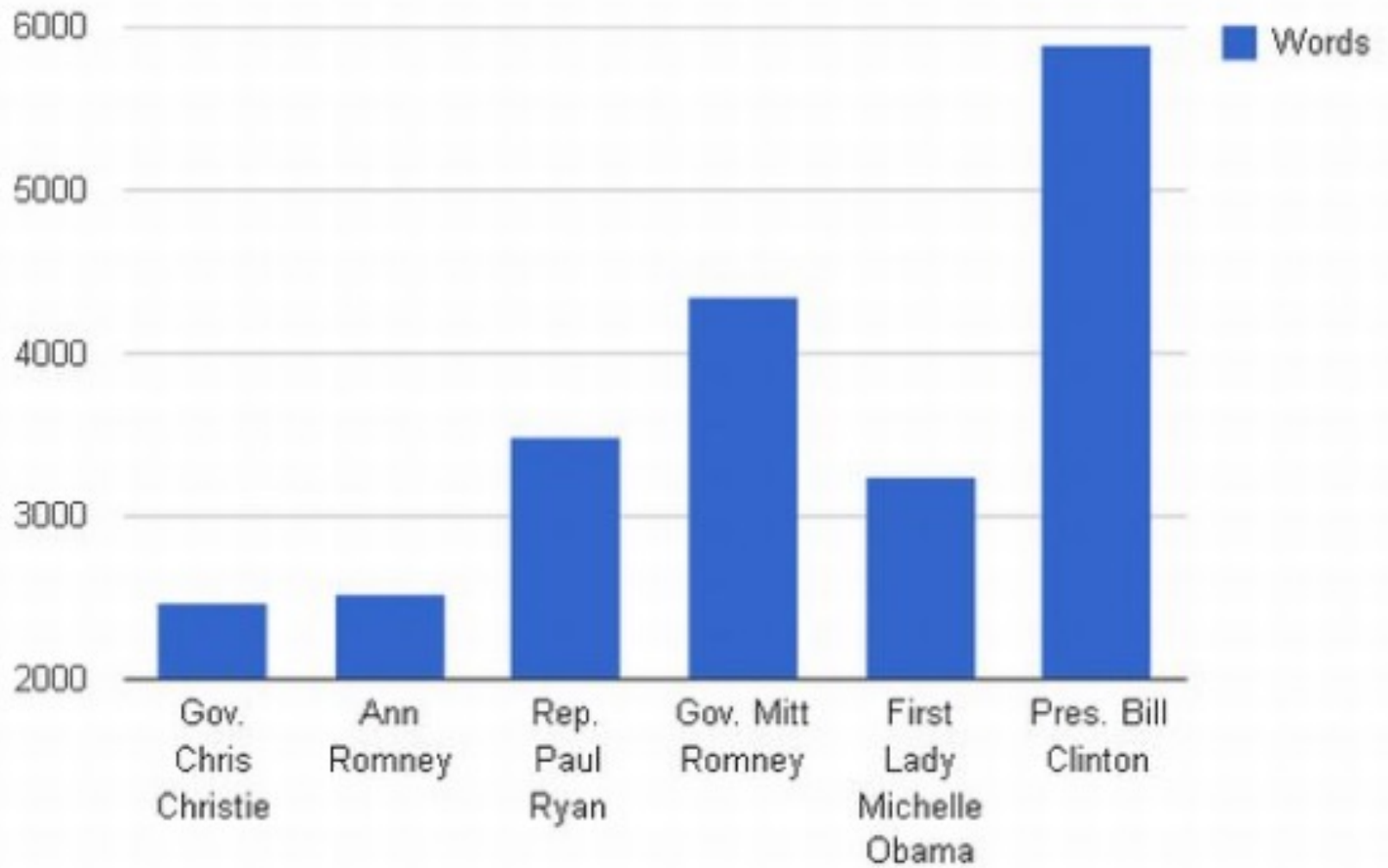




Both show exactly the same data. However, the graph on the left makes the change appear to be much larger than it really is because the numbers on the vertical axis do not start at 0. Each vertical mark on the left graph represents 1 and each mark on the right represents 20 (the scale changes).

Image Source: <http://www.his.washk12.org/>

Length of remarks at the Republican and Democratic National Conventions, as delivered

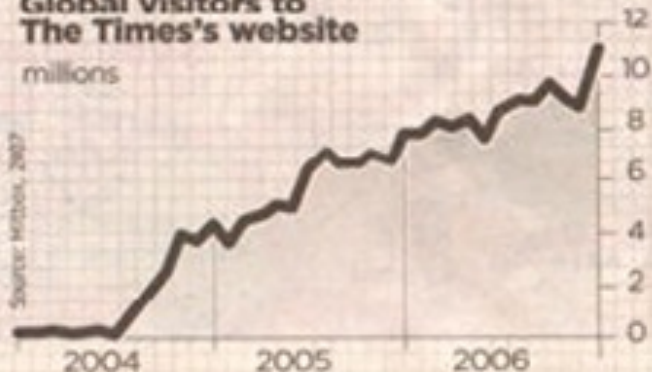


GRAPH 4

The Times leaves the rest behind - in print and online

Global visitors to The Times's website

millions



Full-price sales

485,720



Full-price sales

485,720



Full-price sales

485,720

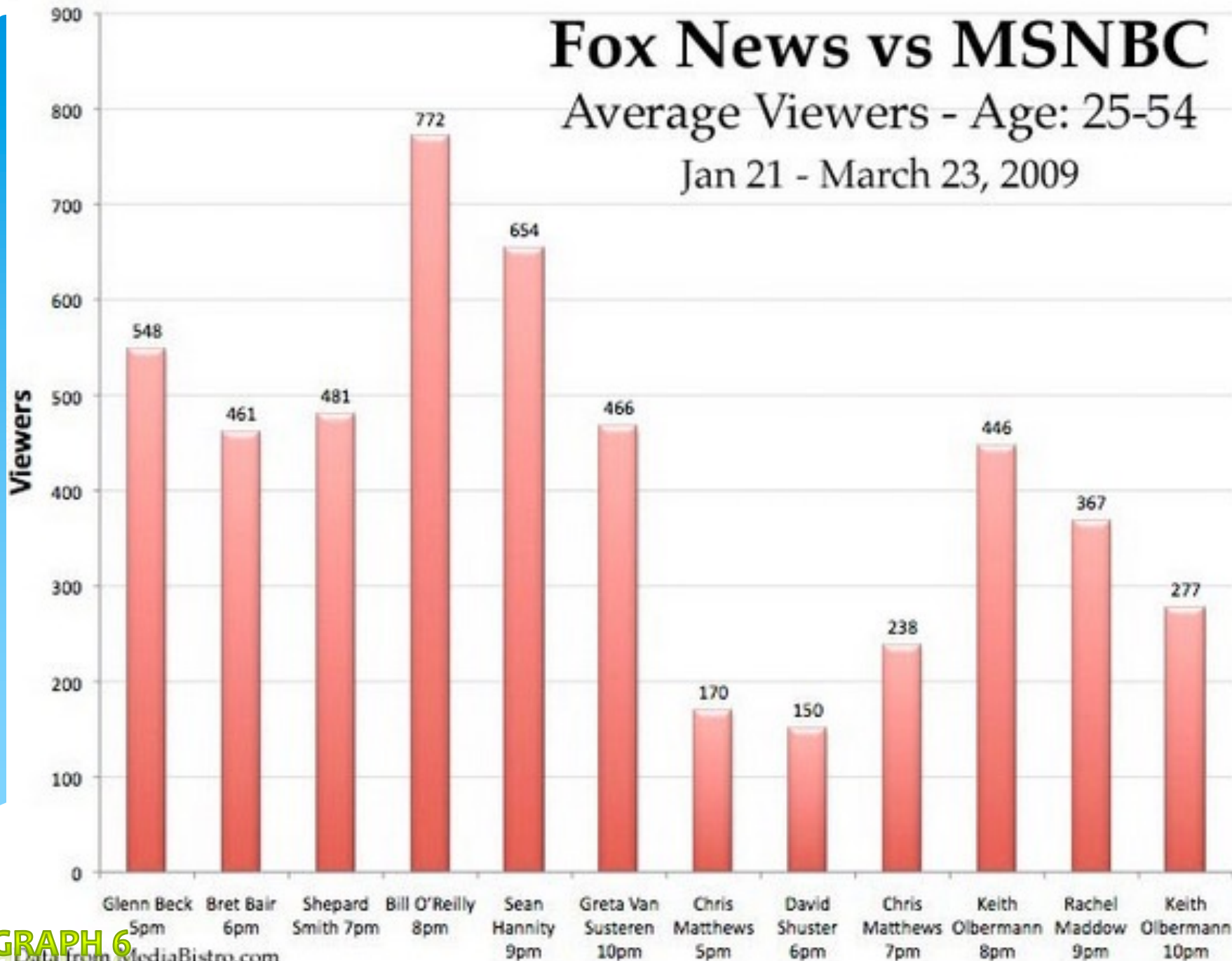


The Times continues to lead the UK quality newspaper market in full-rate sales. According to the latest January figures from the Audit Bureau of Circulations (ABC), *The Times* was ahead of *The Daily Telegraph* for the 27th consecutive month. January was also a record month for Times Online with more than 10.9 million unique monthly users visiting the website.

Fox News vs MSNBC

Average Viewers - Age: 25-54

Jan 21 - March 23, 2009



GRAPH 6

Data from MediaBistro.com

SOUTHWEST BORDER APPREHENSIONS

OCTOBER - APRIL



Source: U.S. Border Patrol

Happening
now


\$43 BIL IN FEB, DOWN 3.4% FROM JAN'S REVISED

NAS



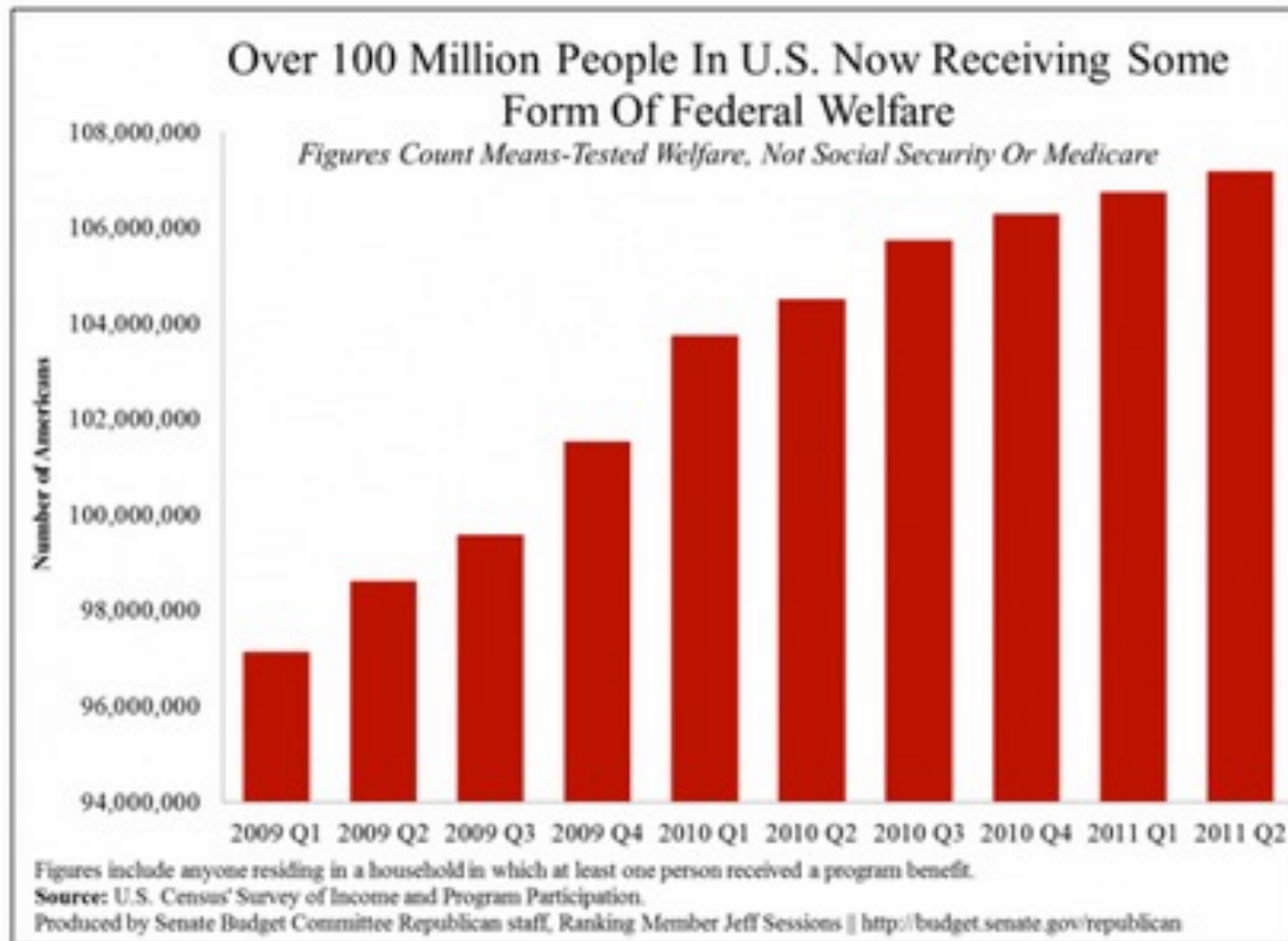
35.18

Over 100 Million Now Receiving Federal Welfare

2:40 PM, AUG 8, 2012 • BY DANIEL HALPER 



A new chart set to be released later today by the Republican side of the Senate Budget Committee details a startling statistic: "Over 100 Million People in U.S. Now Receiving Some Form Of Federal Welfare."



Circle Graphs

ARENA FUNDING

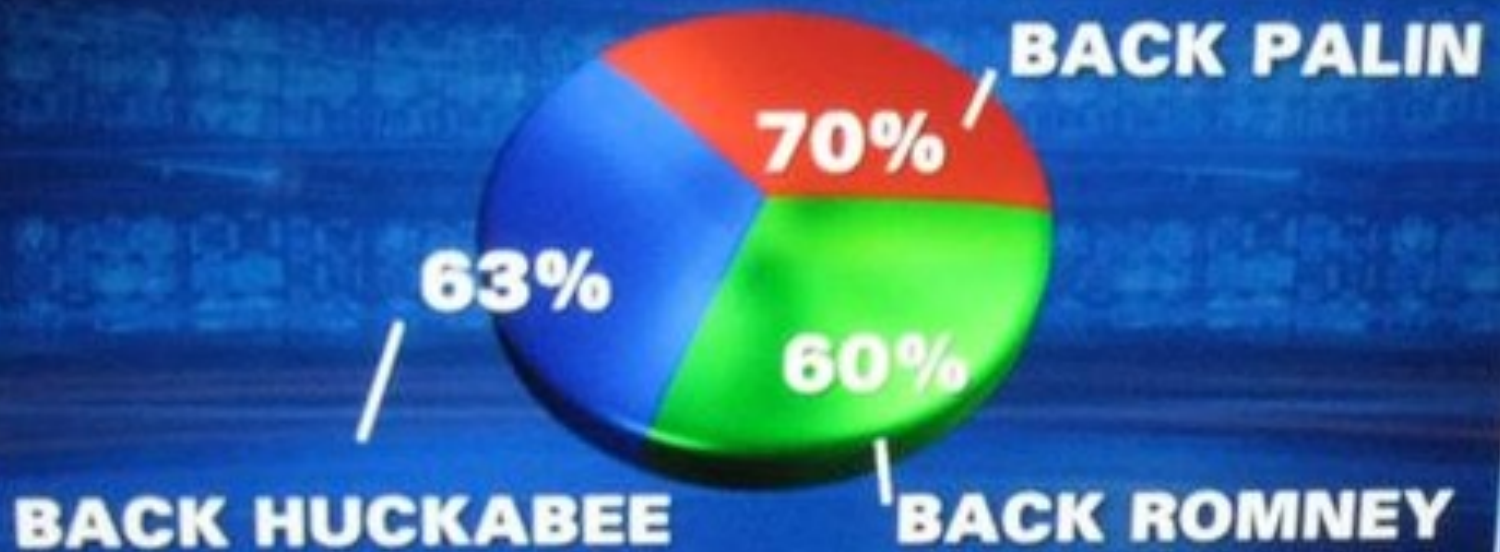


FOX40
NEWS

GRAPH 9

2012 PRESIDENTIAL RUN

GOP CANDIDATES



FOX

47'

SOURCE: OPINIONS

DYNAMIC

GRAPH 10

RASMUSSEN REPORTS POLL

Did scientists falsify research to support their own theories on Global Warming?

59%

SOMEWHAT LIKELY

35%

VERY LIKELY

26%

NOT VERY LIKELY



LIMATE CHANGE RESEARCH / FOX NEWS \ GOP § NHL TOR 6 COB 3

Line Graphs

COST OF GAS

NATIONAL AVERAGE



SOURCE: AAA FUEL GAUGE REPORT

PAY... THE STRIKE, WHICH BEGAN LAST WEEK, IS

DOW ▲ 45.79

Mathematics 101

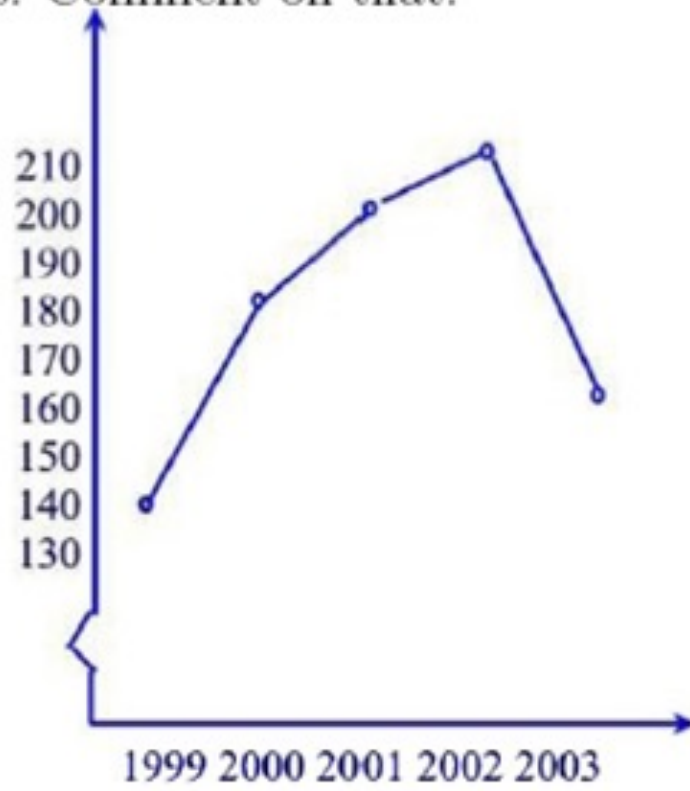


GRAPH 13

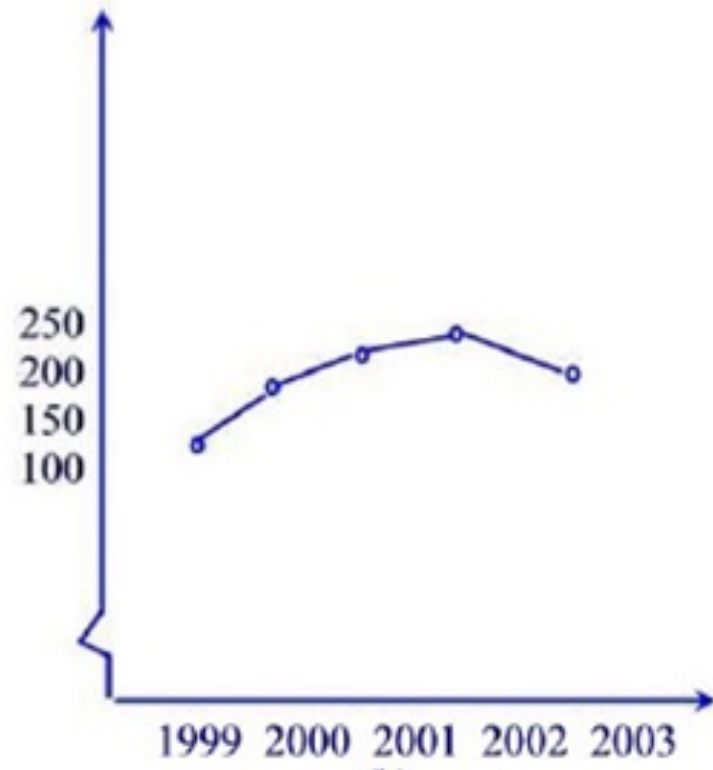
The number of graduates from a community college for the years 1999 through 2003 is given in the following table:

Year	1999	2000	2001	2002	2003
# of Graduates	140	180	200	210	160

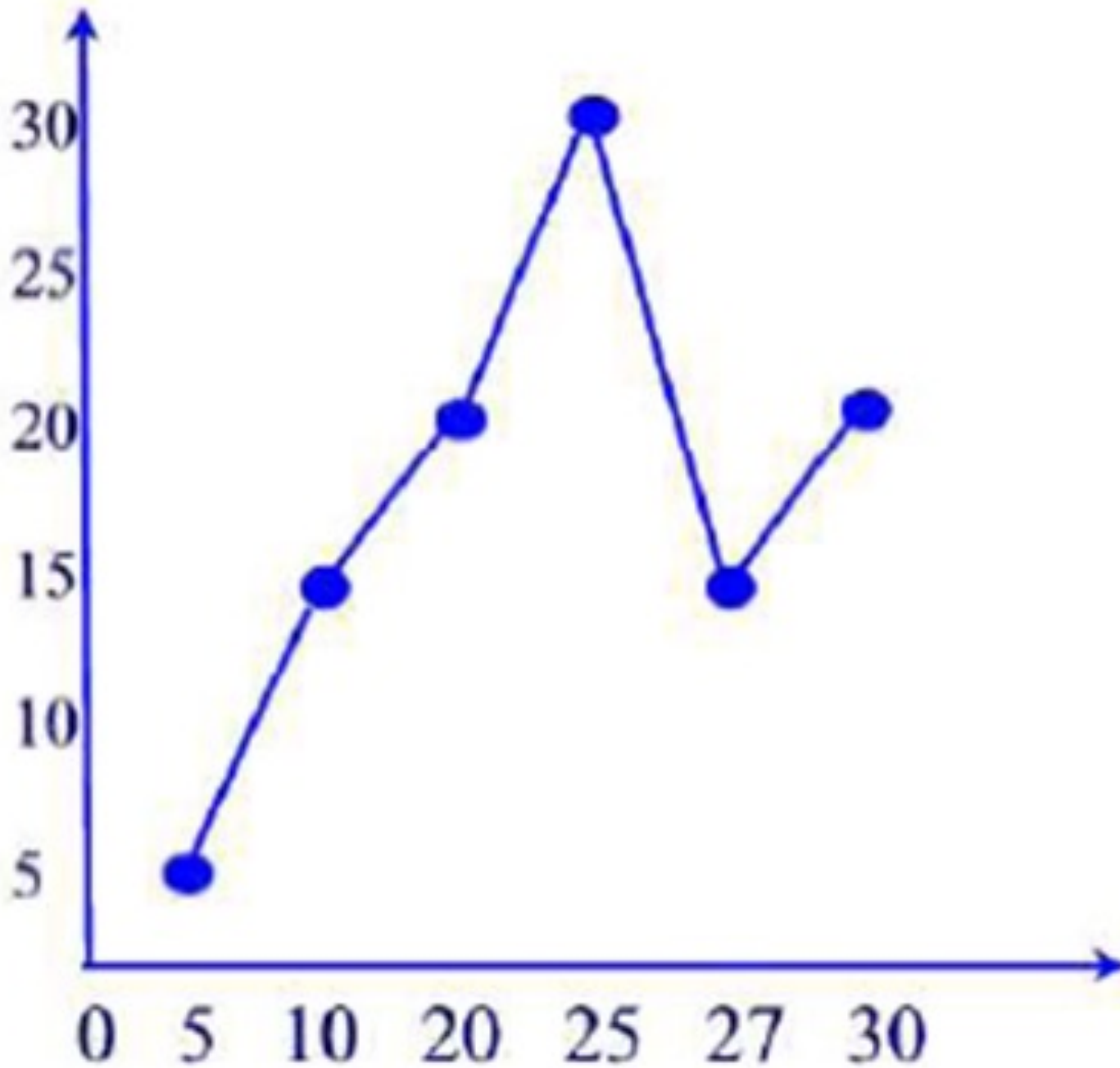
The figure below shows the line graphs of the same data but with different scales. Comment on that.



(a)



(b)



GRAPH 15

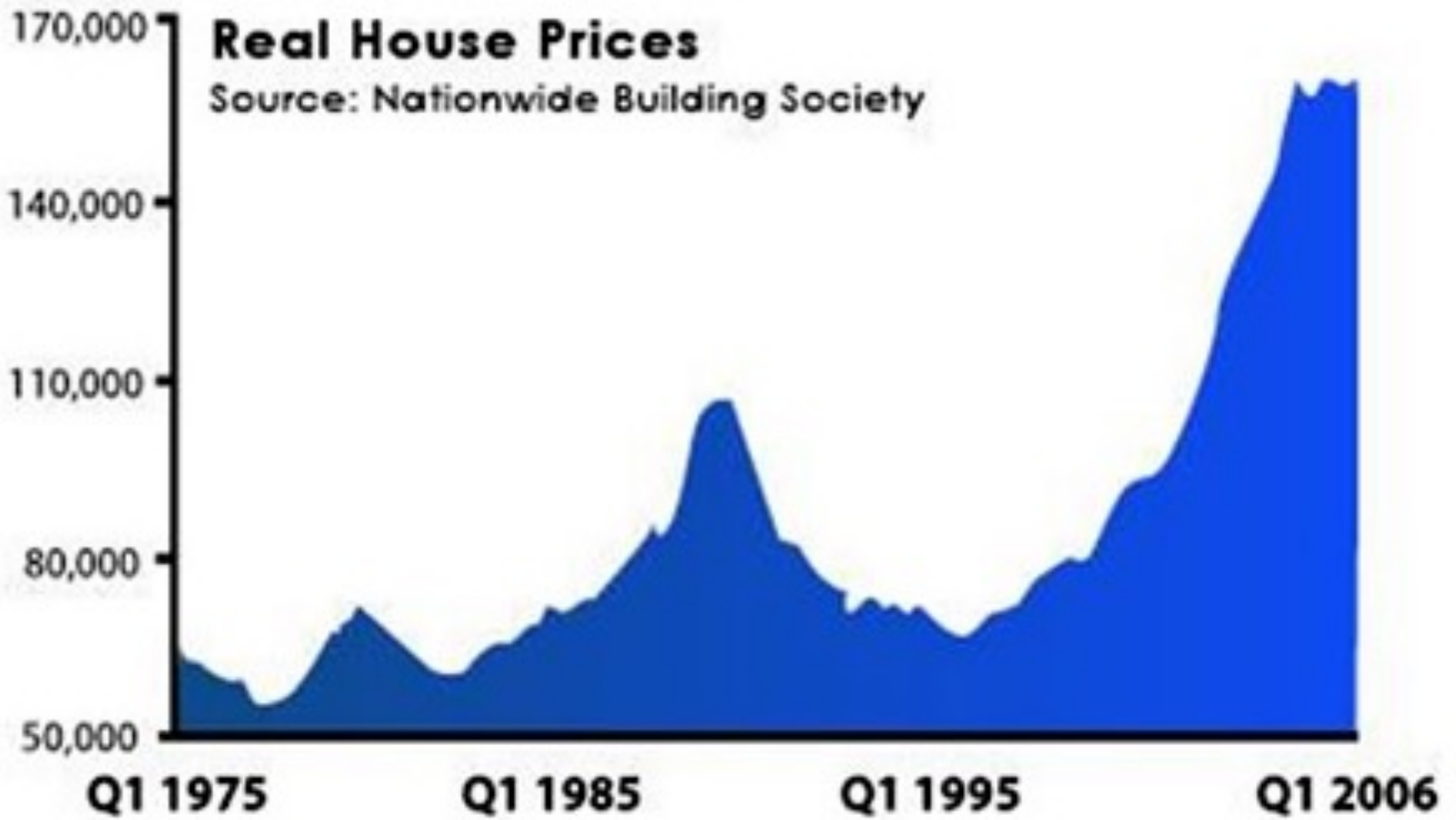
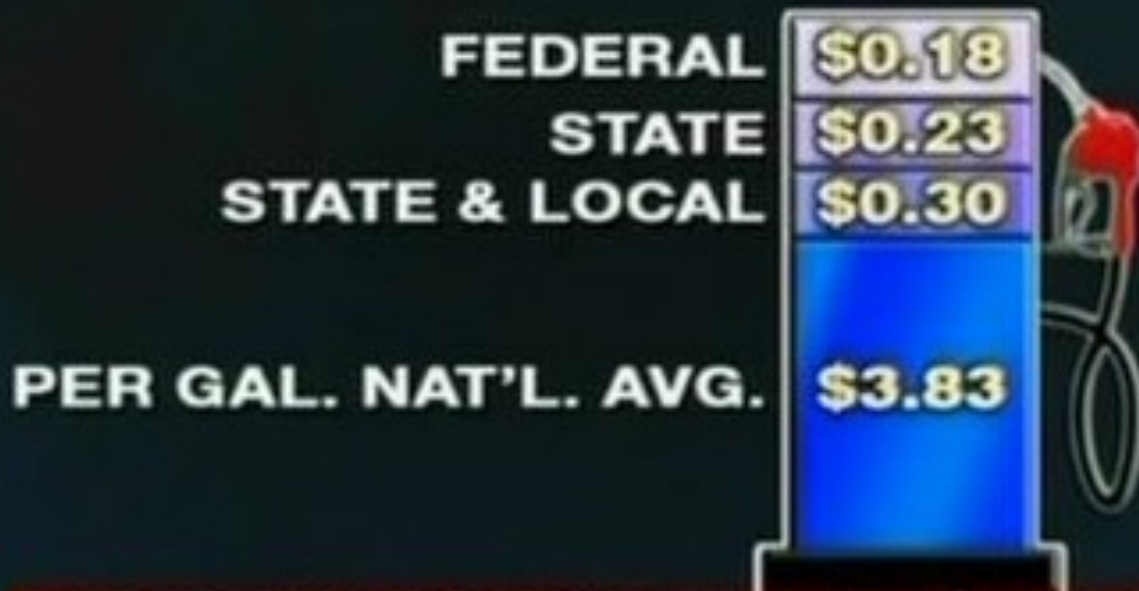


Image Source: <http://www.brickonomist.net>

PictoGraphs

TAXES AT THE PUMP



LIVE
FOX NEWS
9:23 MT

REPORT: UP TO 20% PER GALLON IS FOR TAXES

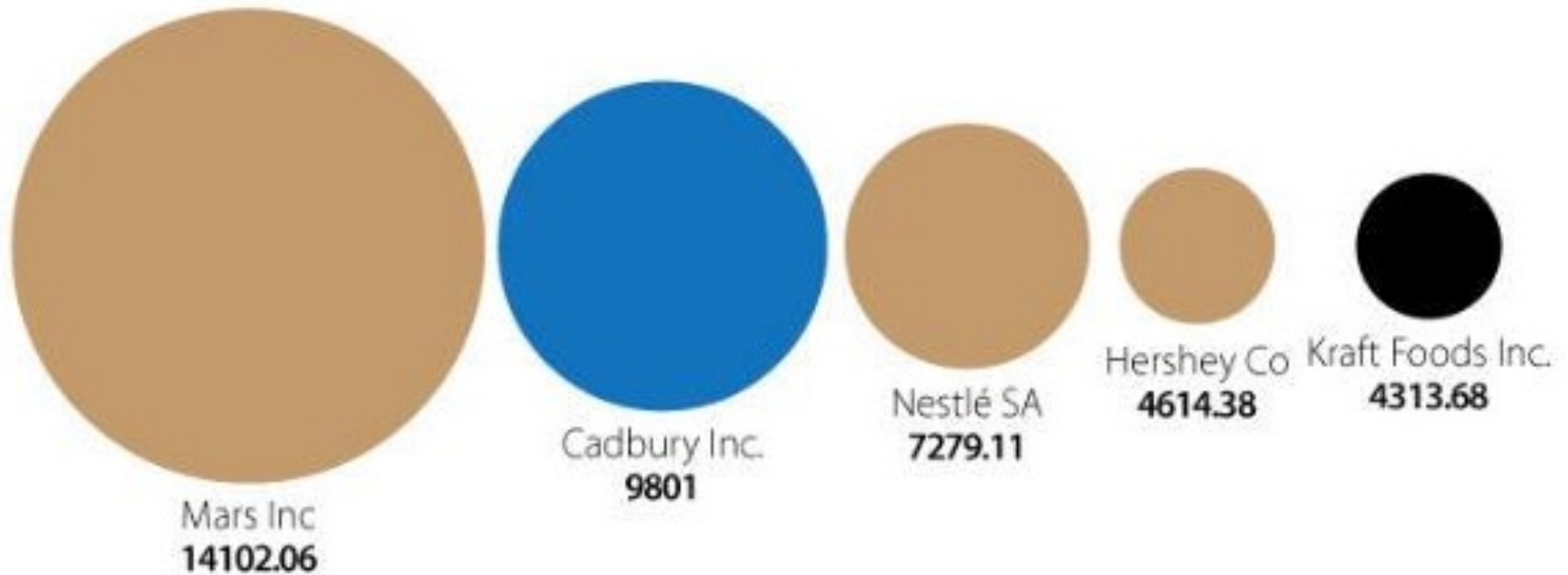
FOX BU

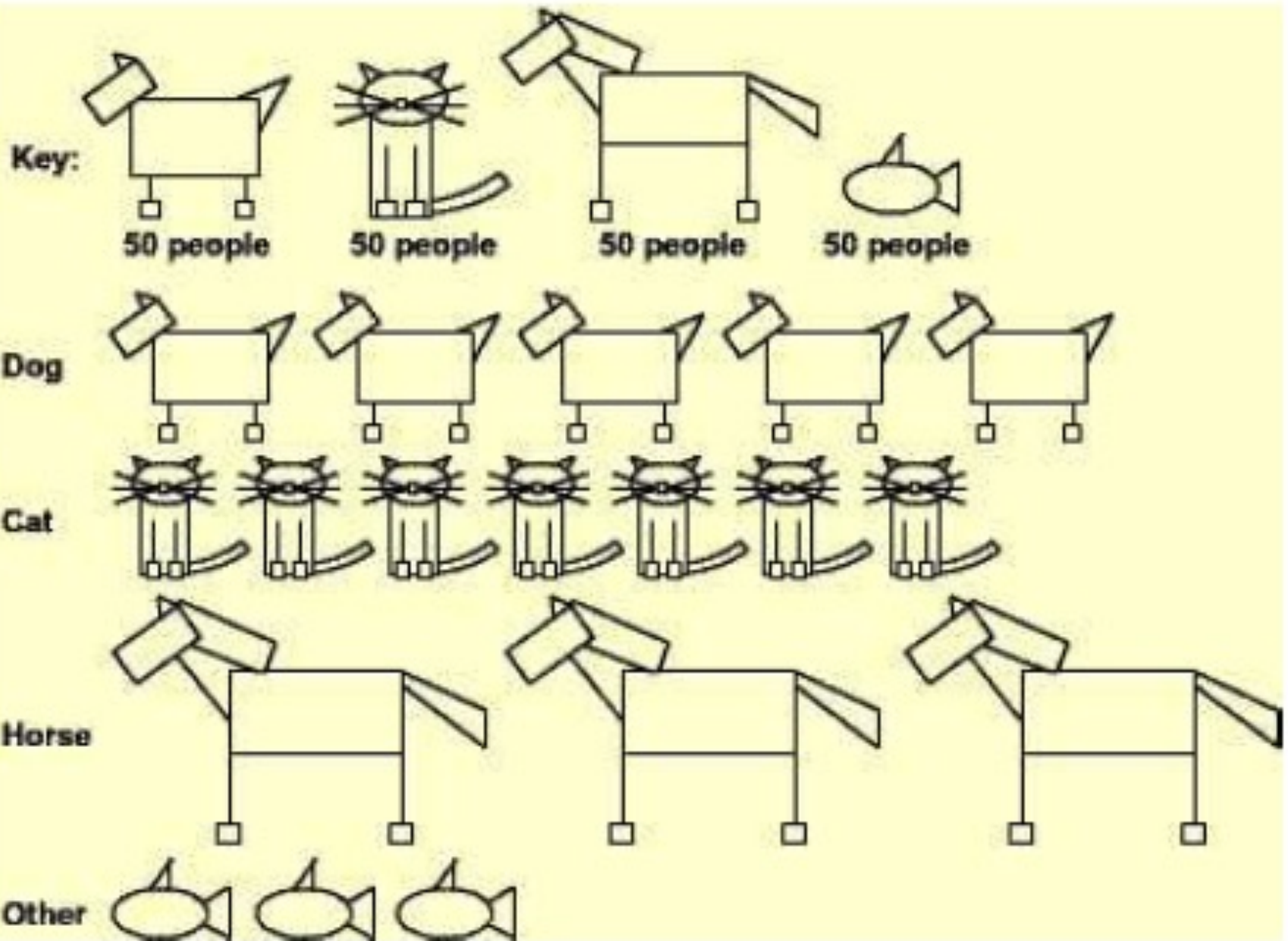
... U.S. OFFICIAL SAYS THE SOLDIER COULD RETI

NAS ▼ 0.14

Cadbury vs Kraft

World confectionary sales (£m 2008)

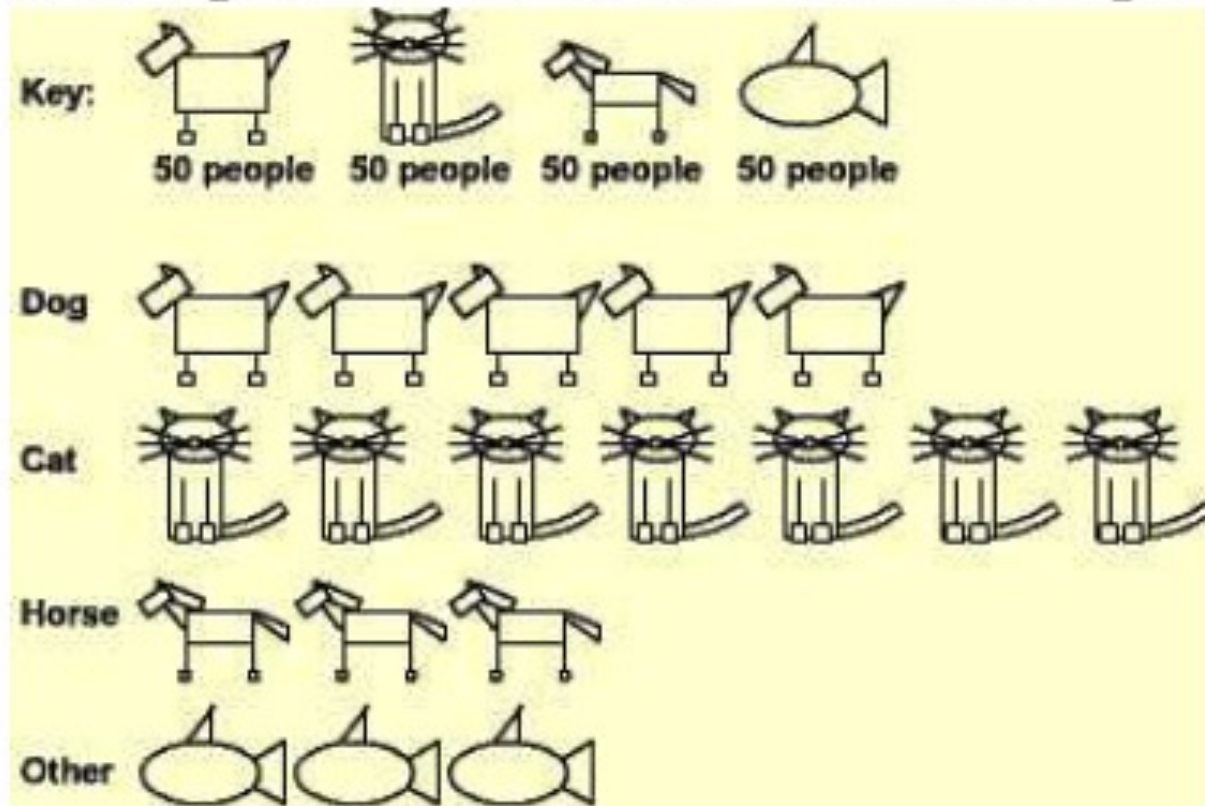




GRAPH 19

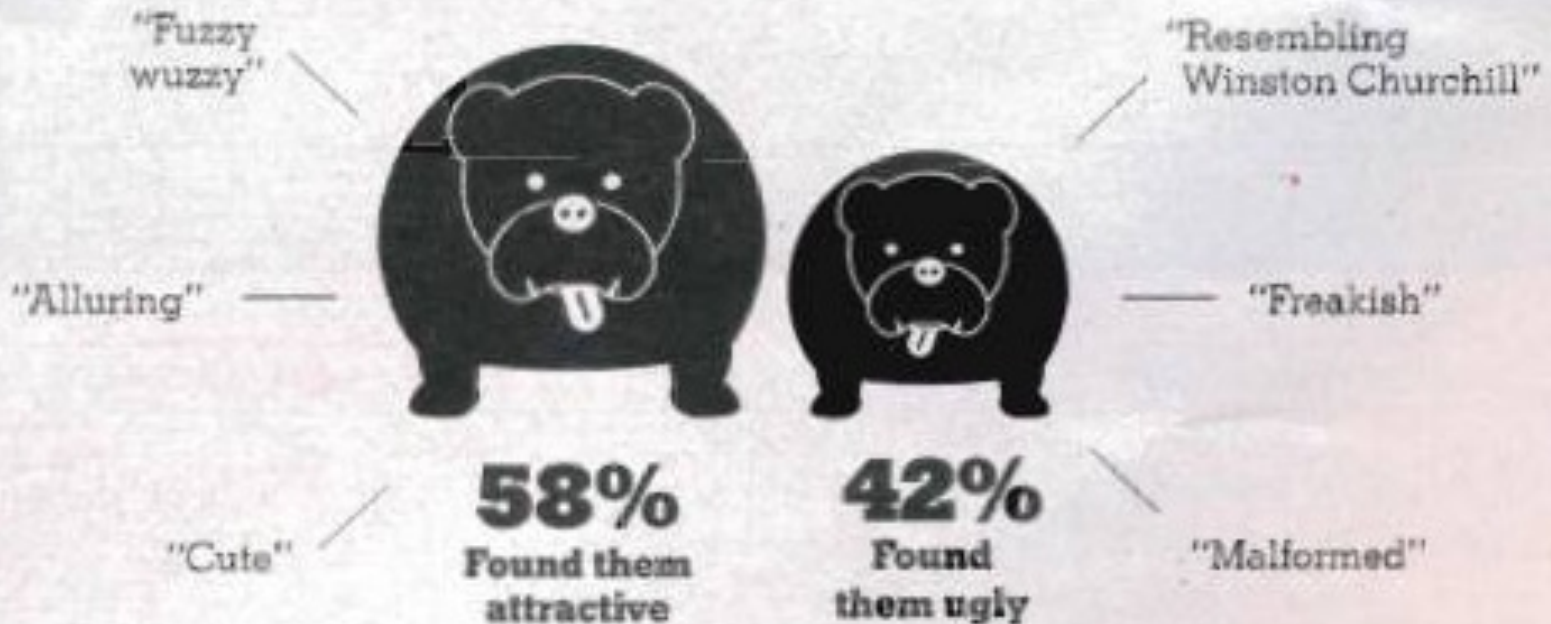
On this pictogram there isn't a category for those people who do not own a pet. The pictures are different sizes and it appears that more people own a horse than any other animal.

An improvement would be to redraw the pictogram with each of the animals the same size and aligned with one another as shown in Figure 31.4.

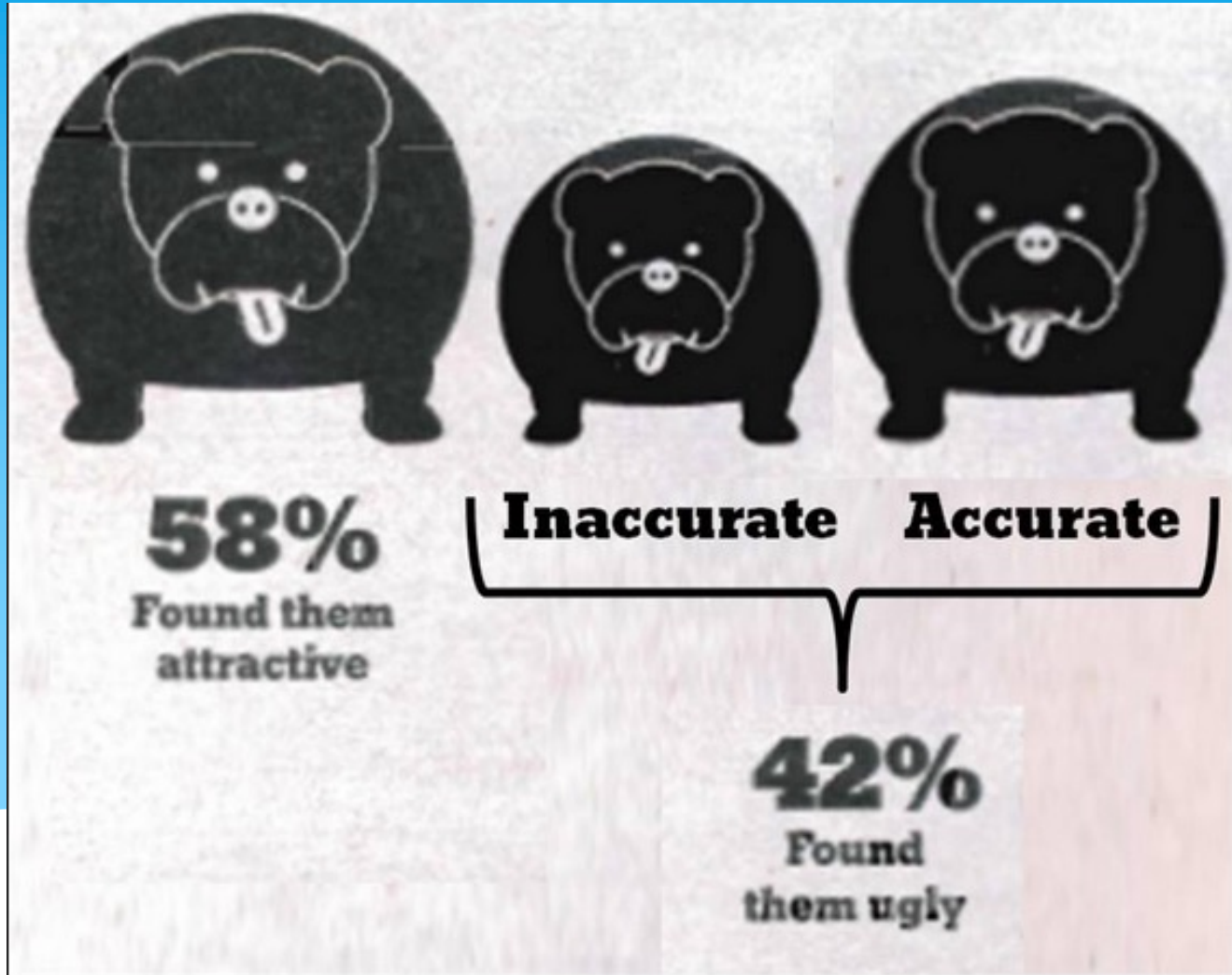


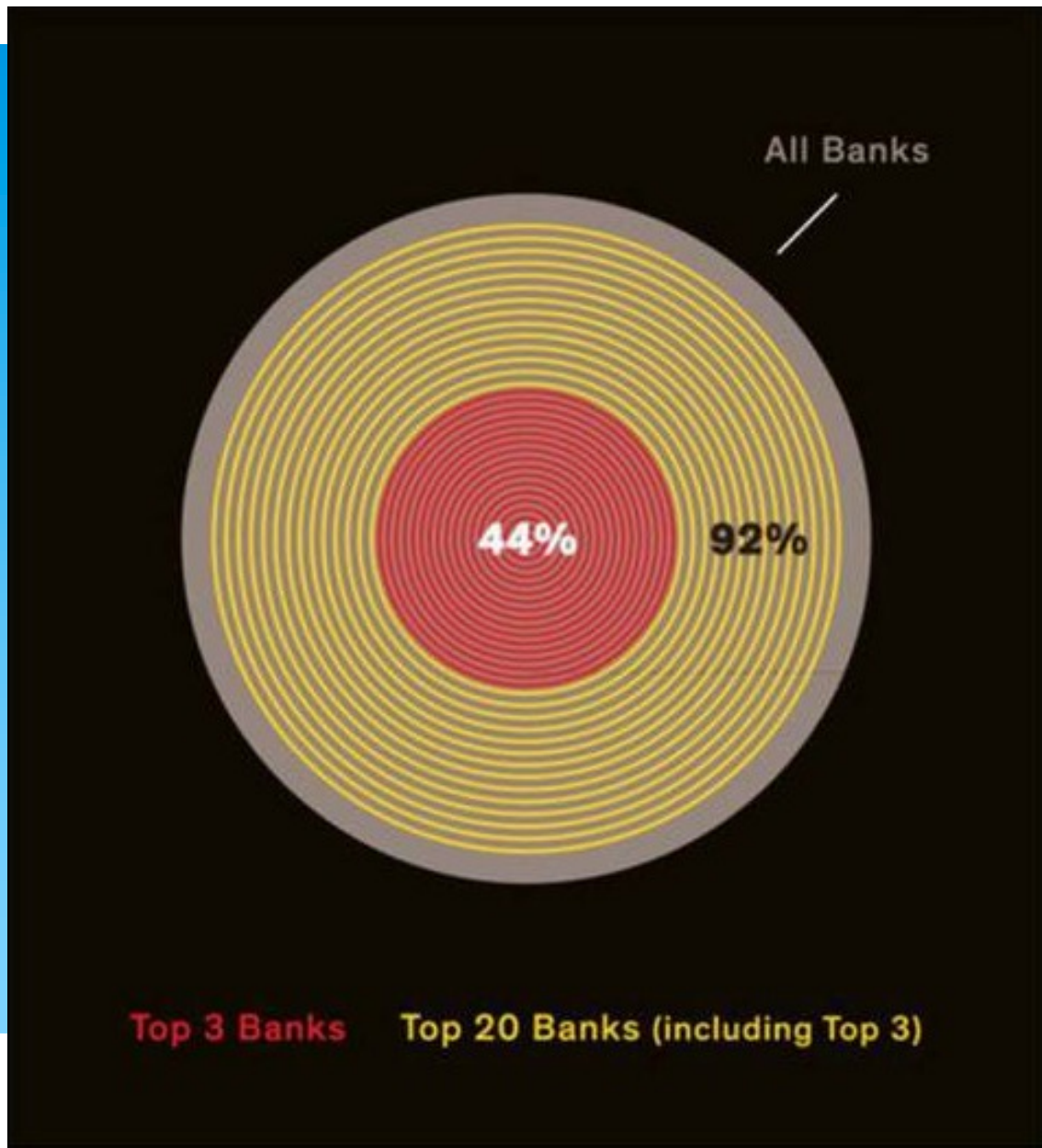
ANALYTICS: Hey, Bulldog

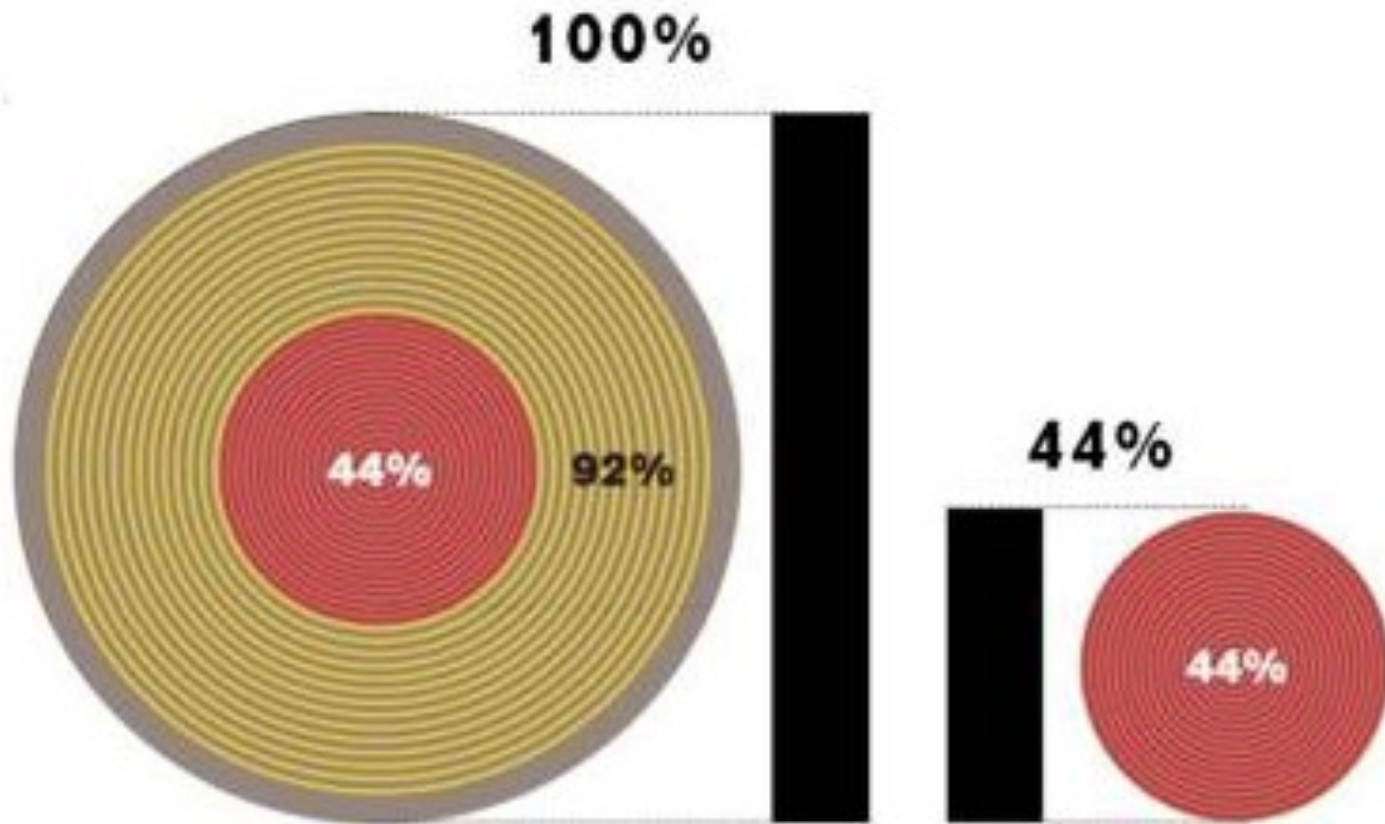
A large chunk of the 367 comments on Benoit Denizet-Lewis's article expressed strong opinions about the attractiveness of the breed. Some comments included the words:



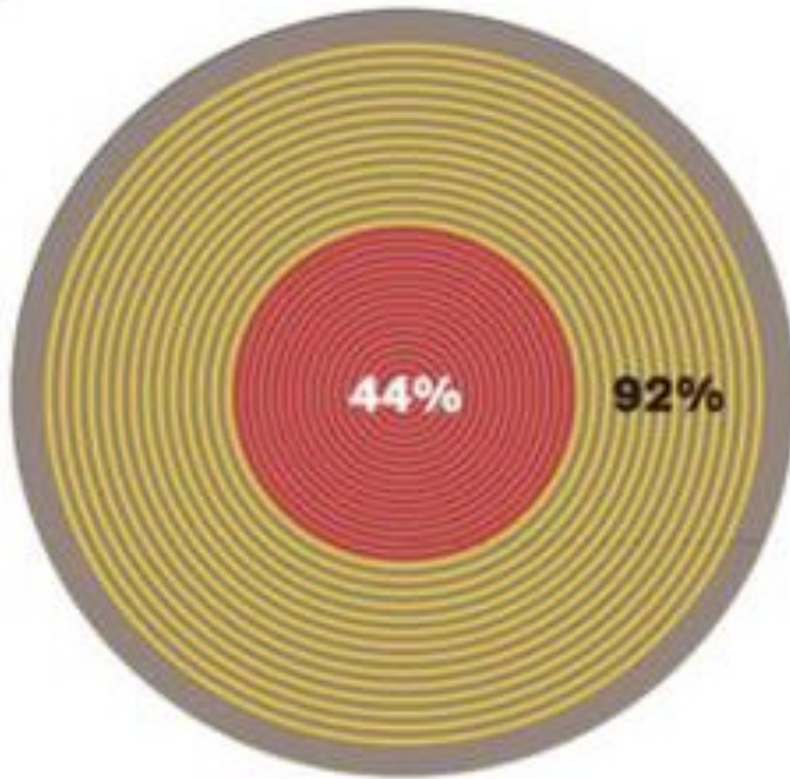
If the bulldog on the left represents 58% of responses, then the bulldog on the right represents only about 30%. Oops.



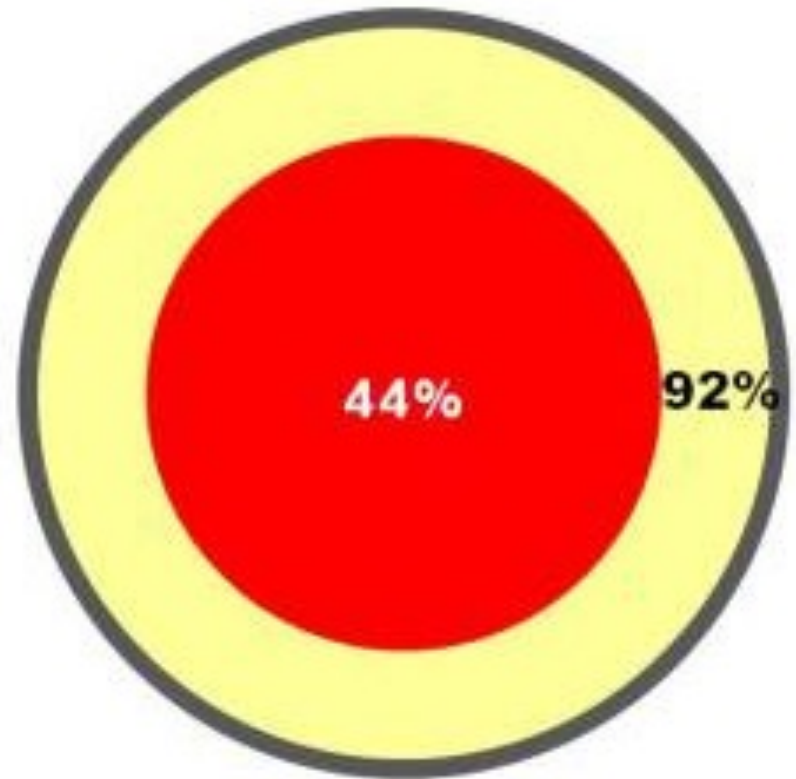




**The black bars accurately represent 100% and 44%.
The areas of the circles do not.**



**Inaccurate representation
of market shares from the
*New York Times Magazine***



**Accurate
representation of
market shares**

SUMMARY – CHARACTERISTICS OF MISLEADING GRAPHS

X or Y-axis scale is too big or too small

X or Y-axis has no scale

X or Y-axis skips numbers, or does not start at zero

Axes are not labeled

Data is left out

If the intervals on the graph are not equal, but are depicted as equal.

SUMMARY – CHARACTERISTICS OF MISLEADING GRAPHS cont.

Information is missing (Title, etc.)

In a circle graph (pie chart) percentages do not add to 100

If a pictogram, all of the pictured items are not the same size.

Displays only the “top” portion of data sets

3-D charts that allow for the perspective to distort graph

The use of biased words in the titles or labels (“huge” “tiny” etc.)

Using a graph when it is not needed; sometimes a table or written explanation of information is BETTER than a graph! This can be identified where graphs require a great deal of explanation to allow for understanding.

Notes for each slide – these are just simple suggestions for things you might discuss in your classroom... the number shown is the SLIDE NUMBER.

1. Read the title
2. Read the slide
3. For every graph we examine in this presentation, we need to ask these three questions
4. First we will look at bar graphs, which is probably the most common kind
5. This is the story that goes along with the next slide. It might take a minute but should be read to the class.
6. Let the students look at the graph a minute and comment on it. Hopefully someone will notice that the x-axis starts at 53, not at zero. This makes them look much farther apart than they really are. WHY would someone want to make it look different? (I'm not sure I know the answer to that, it's just good to discuss)
7. slide 7 shows the same data with an x-axis that starts at zero
8. slide 8 is another example of the exact same thing where the x-axis is skewed and then correct
9. slide 9 is another example of an x-axis that doesn't start at zero. Looks like someone was trying to make president clinton look like he talks too much - ha
10. slide 10 this is very interesting one. Notice the scales are different on the different graphs(ignore the top left graph, look at the bottom left and the ones on the right).
11. Slide 11 shows a graph that has a good x-axis and a good y-axis
12. Slide 12 also shows a graph that has a good x-axis and a good y-axis. You might show this graph and ask for input from the kids and let them try to decide whether they see anything wrong with it or not.
13. Slide 13 is also a well made graph, let kids try to find something wrong with it
14. slide 14 starts circle graphs and pie charts You might ask students to guess what they think the most common error made with circle graphs and pie charts is... let them guess and then tell them - they have to equal 100 percent. Sometimes the numbers given add up to more or less than 100 percent.
15. $10 + 85 + 50 = \$145$ million, yet it is shown to be equal to half, which would make it equal to \$265.... they aren't fooling us!
16. Add those percentages up... definitely over 100! (but interestingly, the graph is drawn appropriately correct... makes me wonder if they typed the percentages wrong...)
17. ask the students if they see a problem... those add to over 100%
18. slide 18 is the first graph for line graphs
19. look at that y-axis... what a distaster!
20. And now the x-axis is a mess... and we don't have any idea what this graph is about...
21. graph 21 just shows how changing the axis can make a graph look different
22. ask students to see if they see a problem... notice the y-axis is messed up. also no title or labels of the axis
23. slide 23 skips one extra year on the y-axis to get to 2006, but in the graph scheme of things that doesn't make a huge difference in this graph since you are talking about such a long time period... this is actually still an ok legitimate graph...
24. start of pictographs - these are notorious for having all sorts of issues
25. this is a pictograph, and is not drawn to scale
26. If you found the area represented by each circle, it would be far larger than the size represented.
27. how many total horse owners? 150! how many total cat people? 350!
28. same graph drawn to scale
29. Another example of out of control picto graph
30. Same one drawn to scale
- 31-32-33 - all the same graph shown incorrect then corrected

Some graphs have notes on the pages indicating their sources. Other sources used include:
academic.evergreen.edu/curricular/mit2008/Wintero6handouts/Math/DanielLeah/MISLEADING%20GRAPHS.ppt

Graphic from: e New York Times Magazine (12/11/11).

article <http://evalblog.com/2012/01/06/tragic-graphic-the-new-york-times-checks-facts-not-math/>

Article <http://passyworldofmathematics.com/misleading-graphs/>



D3bbi3's Lemonade Stand

Legal-Shmegal Jargon:

I am dedicated to making teaching resources that are
Standards Based
Strategically Paced
with fun encased
that make classroom minutes "count."

THANK YOU for making a purchase. I am both awed and grateful that you would find something I created useful in your classroom.

My Teacher's Pay Teacher's Store was started during a period of time in my life that SHOULD have been tragic: Stage IIb Breast Cancer, a year of chemotherapy, mastectomy and reconstruction AND a compound broken ankle fracture... all within 12 months! But God took lemons and made lemonade! In my downtime I had plenty of time to take all the resources I had created in nine years of teaching and make my Teacher's Pay Teacher's store: Debbie's Lemonade Stand!

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Feedback of any kind is always welcomed and appreciated! Please feel free to e-mail me at: DebbiesLemonadeStand@Charter.NET.

Happy Teaching!
Romans 12:6-7
Debbie Sudduth

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