Graphing, Doubling Behavior Asymptotic Complexities, and You

The cs2420 Story

Your graphs need work

It’s a circus out there!

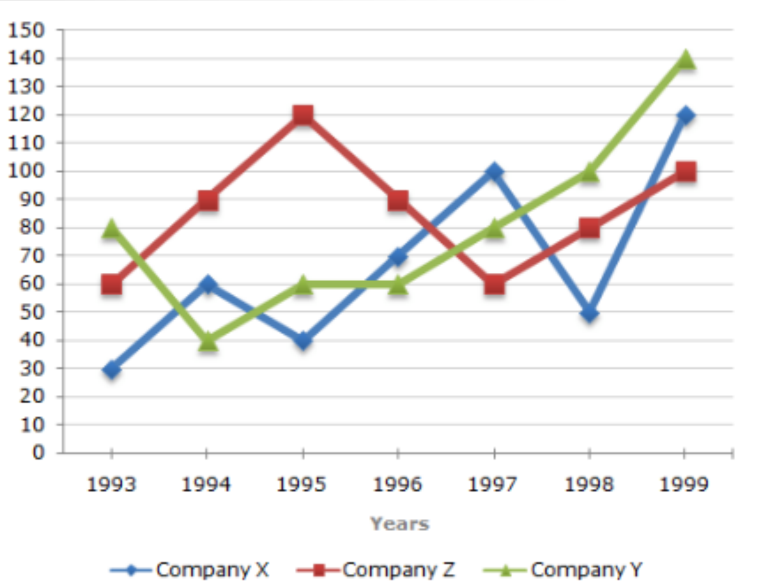
- Unprofessional appearance
- Poor representation choices
    - Line graph or bar graph or scatter plots or bears oh my!
- Inadequate/over-abundant data points
- Reasonable values to graph

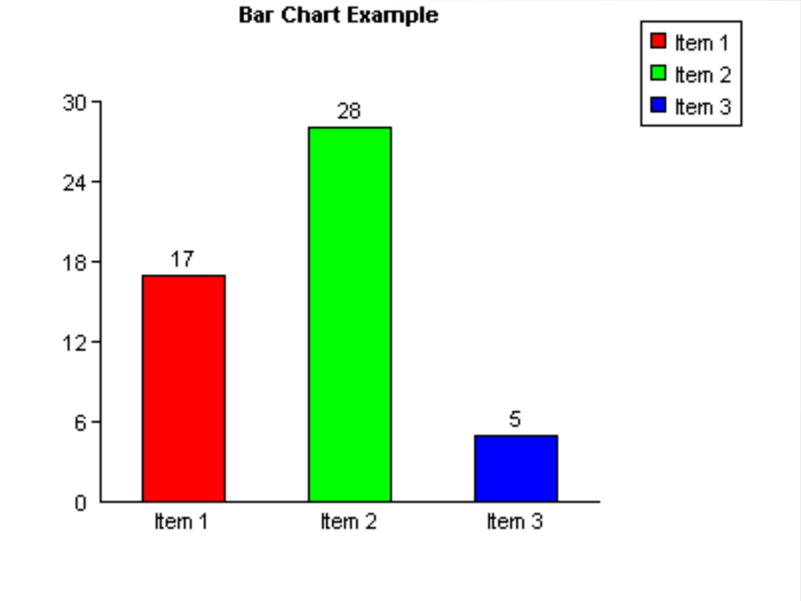
Make graphs professional!

- They should be context free.
- Well labeled
- In focus
- Without clutter
- Scaled properly
- In-lined
- Graphs only!

What are we graphing?

- Comparing growth rates





Too Much Noise!

- We don’t want super squiggly lines
- What Causes this?
- How do we fix it?

Great suggestions!

Back to basics...

- Big-Oh notation a measure of asymptotic complexity.
- This means you need to THINK BIG.

BIG

Example

$$n^6 + 465\,n^5 + 783\,n^3 + 9847\,n^2 + n$$

$$n^6 + 10^{34}\,n^5 + 7939!\,n^4 + ((3^3)^3)^3\,n^3 + 9\,283\,476\,n^2 + n$$

Side note: Doubling behavior

n	2	4	8	16	32	64
nlog(n)	2	8	24	64	160	384
n^2	4	16	64	256	1024	4096

This gets out of hand before you can sneeze.

Put ‘em together!

- Let’s combine the power of doubling behavior with what we know about Big-Oh
- 2^10 → 2^20
- What does this give us?
    - 10 data points
    - 10 orders of magnitude
    - Decent coverage for what we’re looking for

BE WARNED

- The x-axis is now a logarithmic scale.
- This makes linear look quadratic.
    - Gee, thanks Excel.
- Make sure both X and Y scales are the same!

Polish it up

- “Make it professional”
- Don’t let one line dominate the graph.
- Customize the graph’s bounds
- Customize the graph’s scale.
- Clean and clear.

Let your code work for you!

- You're programmers for cryin' out loud!
  - "Wield great power" - Prof. Meyers
- Not just Excel out there
  - Native to some languages like R, Matlab
  - Python's matplotlib & pyplot
  - CADE has gnuplot
  - Java -> JFreeCharts
- Let's try it out!