IE 440

PROCESS IMPROVEMENT THROUGH PLANNED EXPERIMENTATION

IE 406
Simulation

Presenting Data in Tables and Charts

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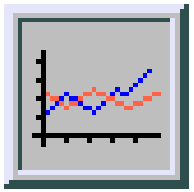
University of Tennessee

Chapter Topics

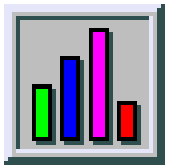
- Organizing Numerical Data
  - The Ordered Array and Stem-Leaf Display
- Tabulating and Graphing Univariate Numerical Data
  - Frequency Distributions: Tables, Histograms, Polygons
  - Cumulative Distributions: Tables, the Ogive
- Graphing Bivariate Numerical Data



Chapter Topics

(continued)

- Tabulating and Graphing Univariate Categorical Data
  - The Summary Table
  - Bar and Pie Charts, the Pareto Diagram
- Tabulating and Graphing Bivariate Categorical Data
  - Contingency Tables
  - Side by Side Bar Charts
- Graphical Excellence and Common Errors in Presenting Data



Organizing Numerical Data

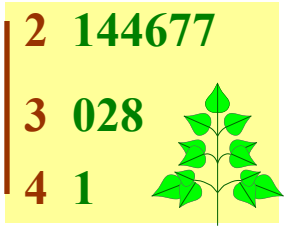
Numerical Data

41, 24, 32, 26, 27, 27, 30, 24, 38, 21

Ordered Array

21, 24, 24, 26, 27, 27, 30, 32, 38, 41

Stem and Leaf Display



Frequency Distributions
Cumulative Distributions

Tables

Histograms

Polygons

Ogive

Organizing Numerical Data

(continued)

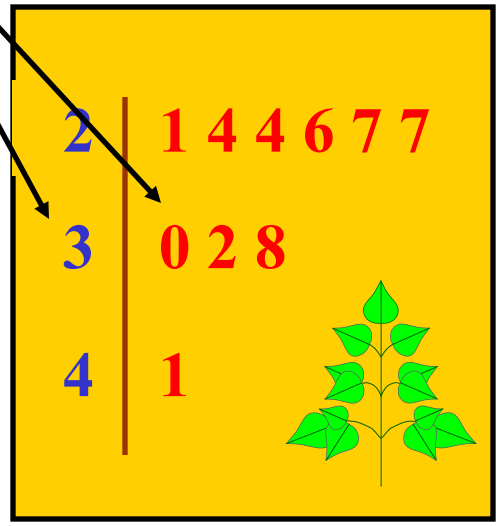
- Data in *Raw* Form (as Collected):

  24, 26, 24, 21, 27, 27, 30, 41, 32, 38

- Data in ***Ordered Array* from *Smallest to Largest*:**

  21, 24, 24, 26, 27, 27, 30, 32, 38, 41

- Stem-and-Leaf Display:



Tabulating and Graphing Numerical Data

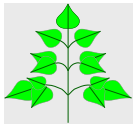
Numerical Data 41, 24, 32, 26, 27, 27, 30, 24, 38, 21

Ordered Array

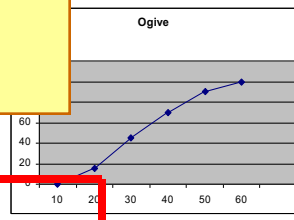
21, 24, 24, 26, 27, 27, 30, 32, 38, 41

Stem and Leaf Display

2	144677
3	028
4	1

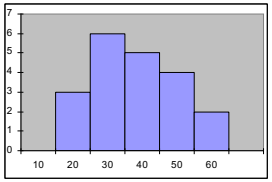


Frequency Distributions
Cumulative Distributions



Ogive

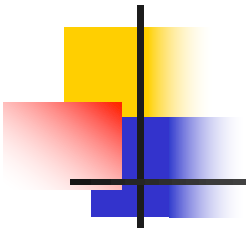
Histograms



Tables

Polygons

Tabulating Numerical Data: Frequency Distributions



- Sort Raw Data in Ascending Order

  12, 13, 17, 21, 24, 24, 26, 27, 27, 30, 32, 35, 37, 38, 41, 43, 44, 46, 53, 58

- Find Range: **58 - 12 = 46**
- Select Number of Classes: **5 (usually between 5 and 15)**
- Compute Class Interval (Width): **10 (46/5 then round up)**
- Determine Class Boundaries (Limits): **10, 20, 30, 40, 50, 60**
- Compute Class Midpoints: **15, 25, 35, 45, 55**
- Count Observations & Assign to Classes

Frequency Distributions, Relative Frequency Distributions and Percentage Distributions

Data in Ordered Array:

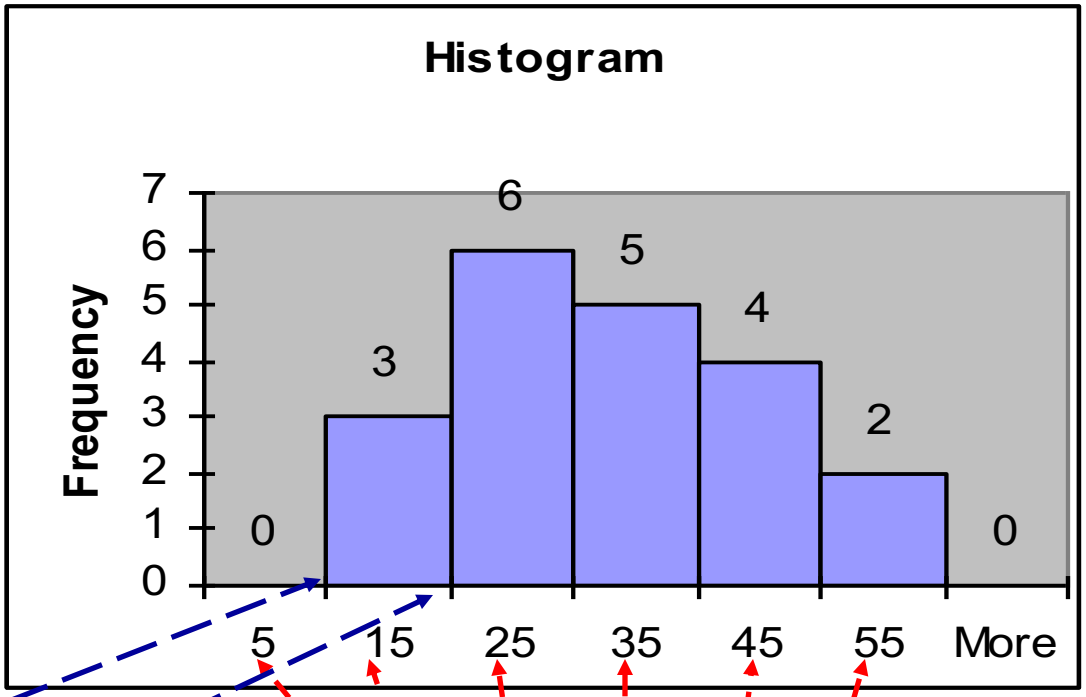
12, 13, 17, 21, 24, 24, 26, 27, 27, 30, 32, 35, 37, 38, 41, 43, 44, 46, 53, 58

Class	Frequency	Relative Frequency	Percentage
10 but under 20	3	.15	15
20 but under 30	6	.30	30
30 but under 40	5	.25	25
40 but under 50	4	.20	20
50 but under 60	2	.10	10
Total	20	1	100

Graphing Numerical Data: The Histogram

Data in Ordered Array:

12, 13, 17, 21, 24, 24, 26, 27, 27, 30, 32, 35, 37, 38, 41, 43, 44, 46, 53, 58



No Gaps Between Bars

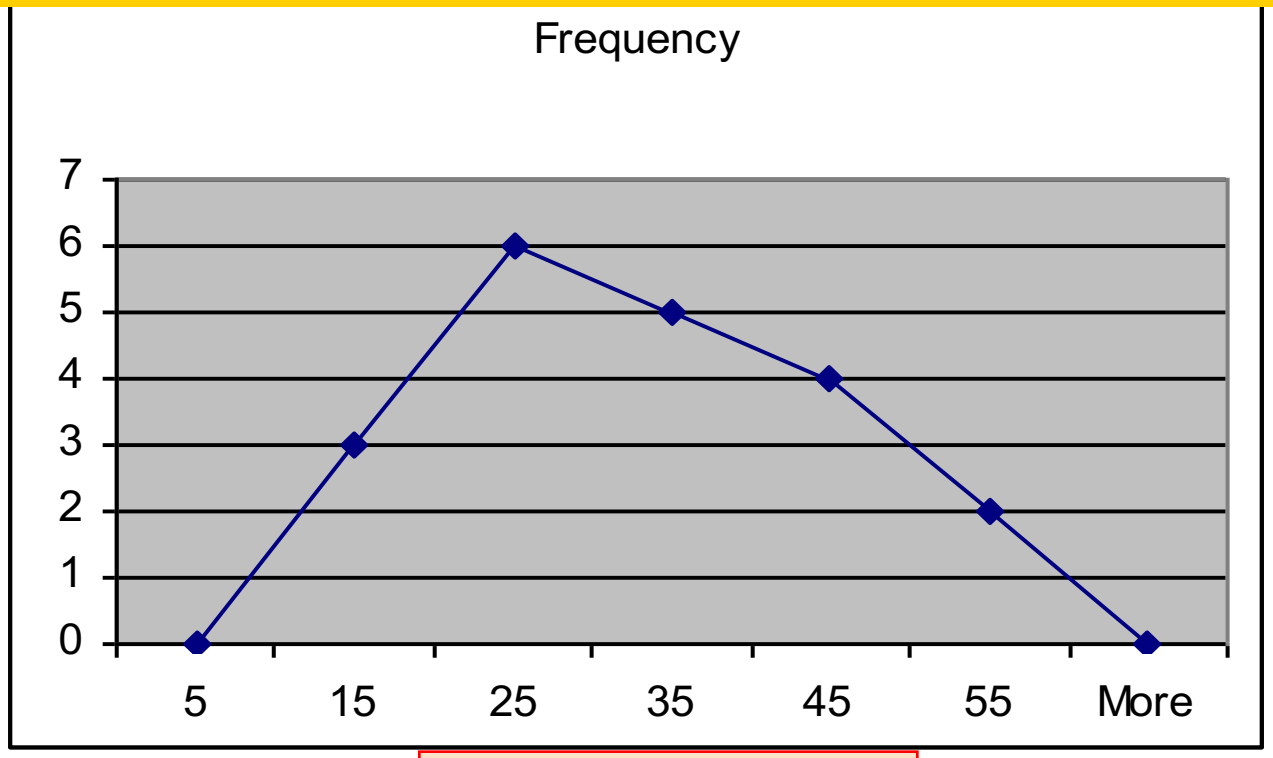
Class Boundaries

Class Midpoints

Graphing Numerical Data: The Frequency Polygon

Data in Ordered Array:

12, 13, 17, 21, 24, 24, 26, 27, 27, 30, 32, 35, 37, 38, 41, 43, 44, 46, 53, 58



Tabulating Numerical Data: Cumulative Frequency

Data in Ordered Array:

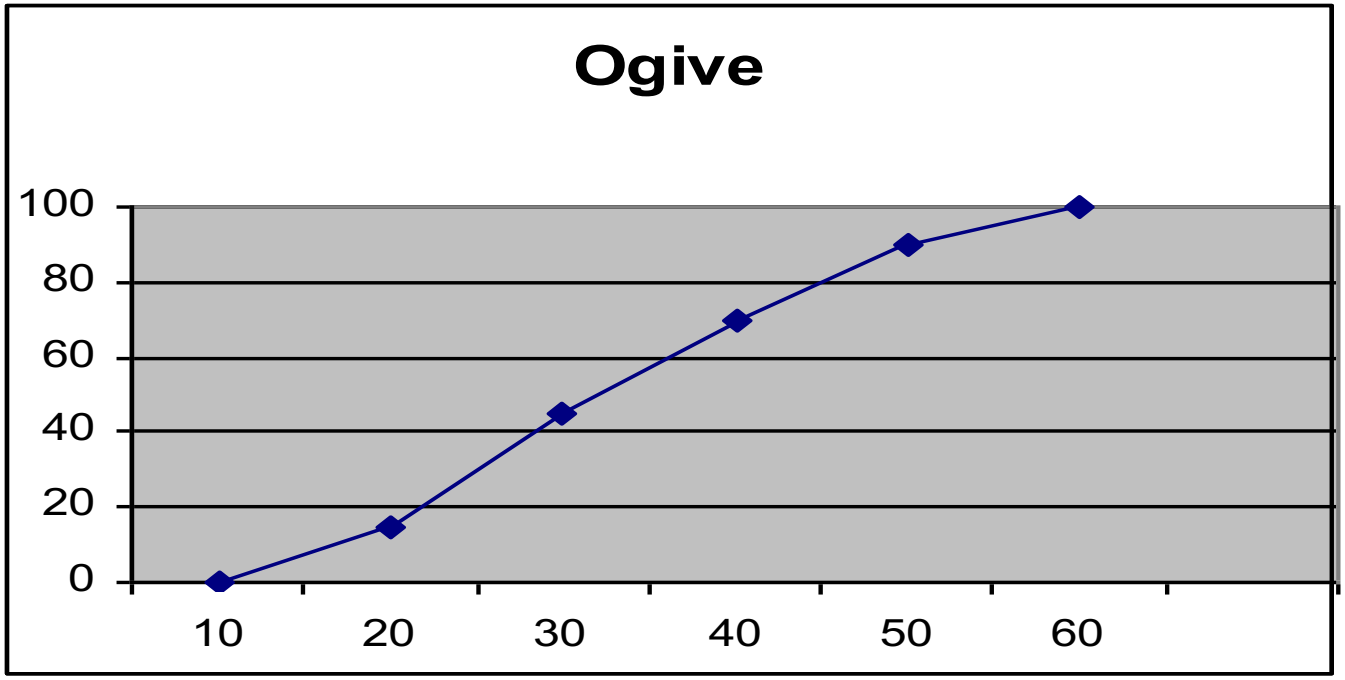
12, 13, 17, 21, 24, 24, 26, 27, 27, 30, 32, 35, 37, 38, 41, 43, 44, 46, 53, 58

Lower Limit	Cumulative Frequency	Cumulative % Frequency
10	0	0
20	3	15
30	9	45
40	14	70
50	18	90
60	20	100

Graphing Numerical Data: The Ogive (Cumulative % Polygon)

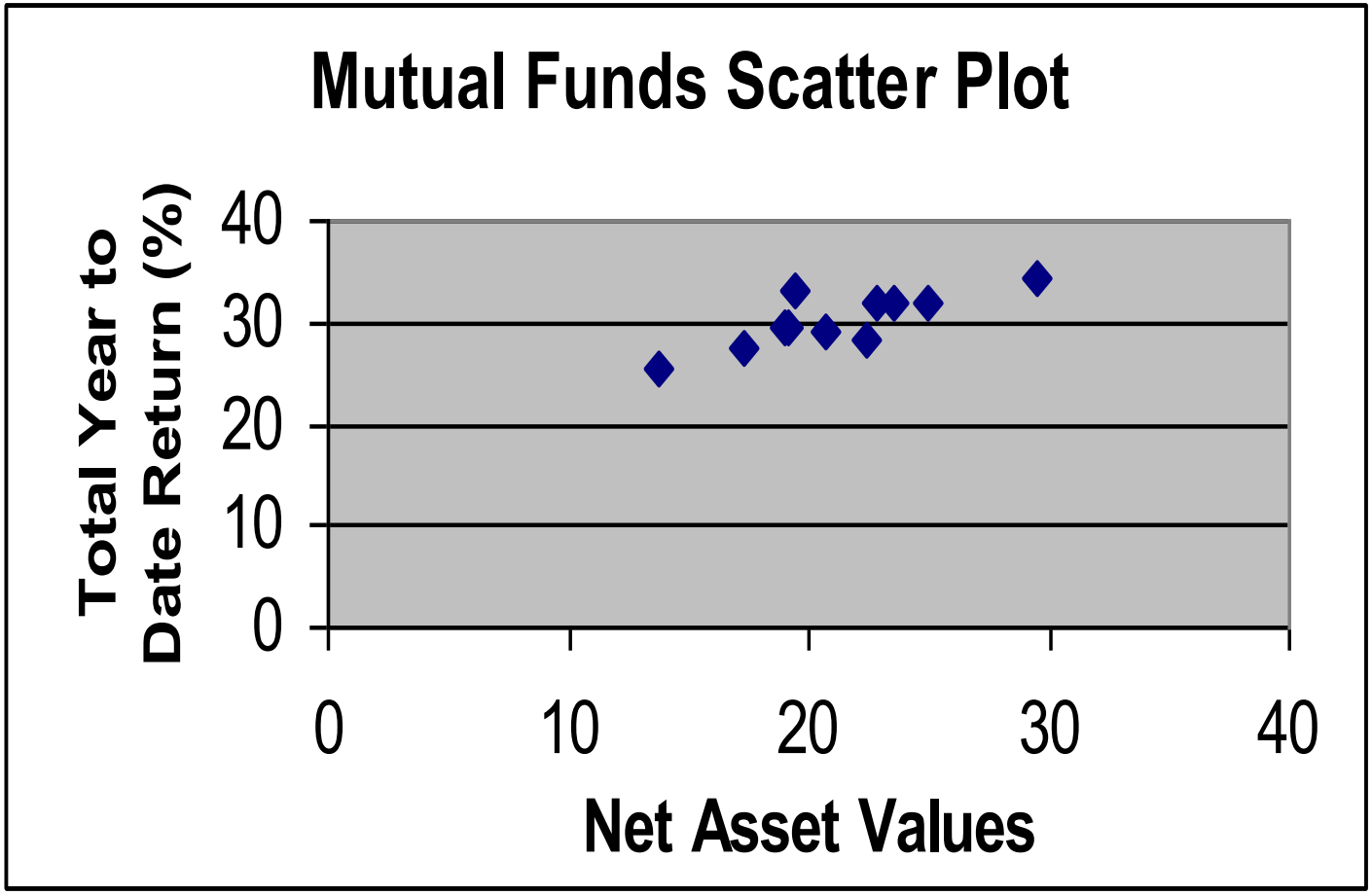
Data in Ordered Array :

12, 13, 17, 21, 24, 24, 26, 27, 27, 30, 32, 35, 37, 38, 41, 43, 44, 46, 53, 58

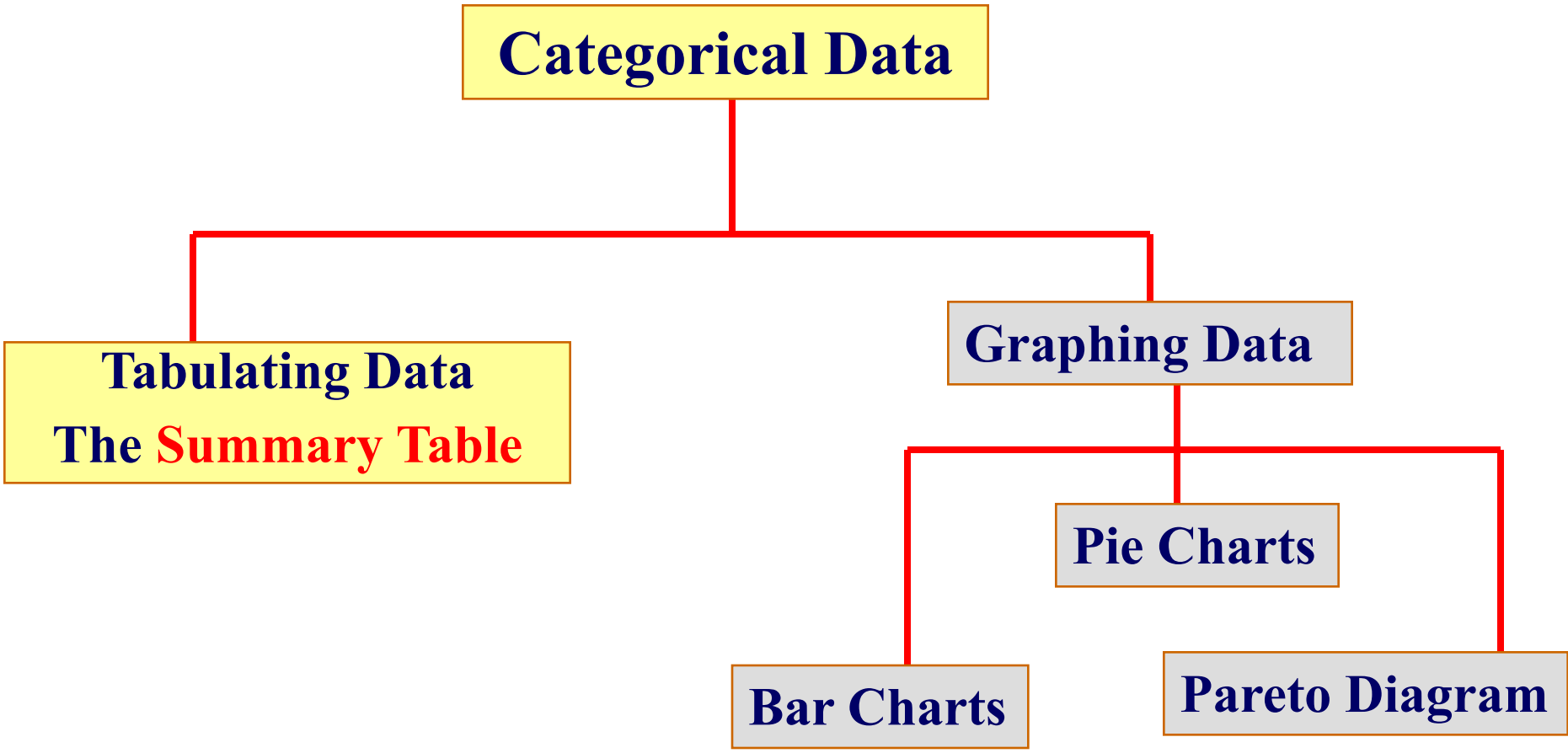


Class Boundaries (*Not Midpoints*)

Graphing Bivariate Numerical Data (Scatter Plot)

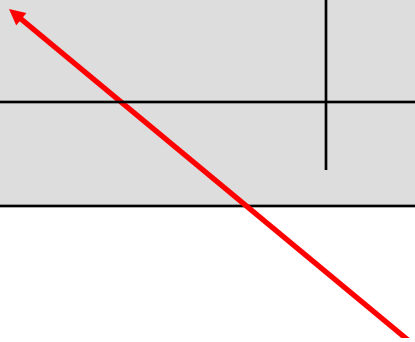


Tabulating and Graphing Univariate Categorical Data



Summary Table
(for an Investor's Portfolio)

Investment Category	Amount (in thousands $)	Percentage
Stocks	46.5	42.27
Bonds	32	29.09
CD	15.5	14.09
Savings	16	14.55
Total	**110**	**100**



Variables are Categorical

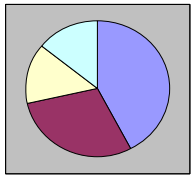
Graphing Univariate Categorical Data

Categorical Data

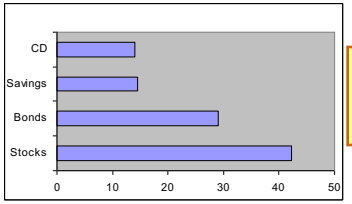
Tabulating Data

The Summary Table

Graphing Data

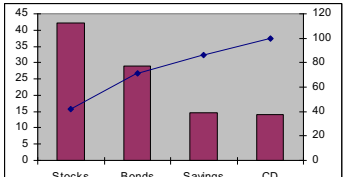


Pie Charts

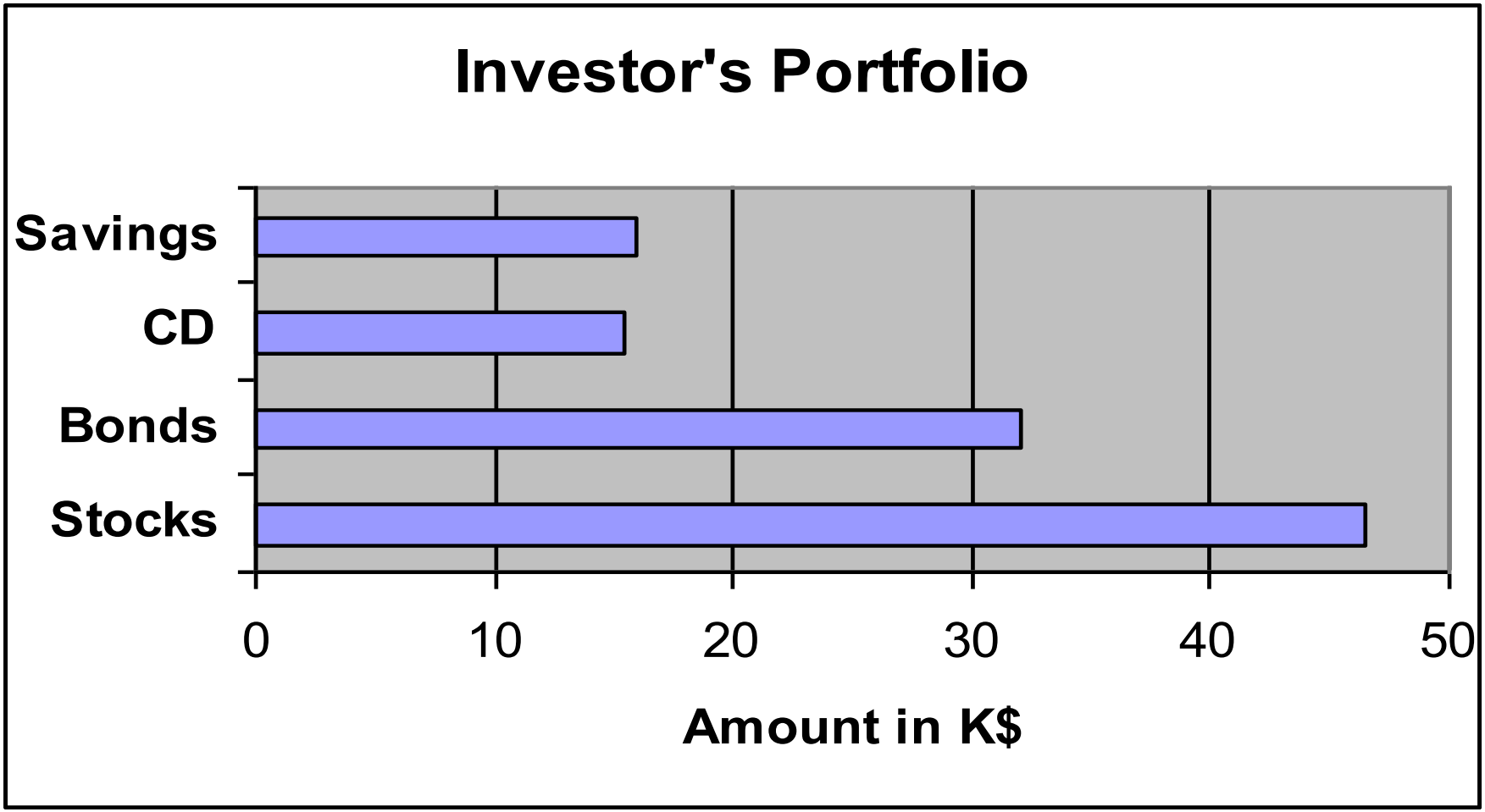


Bar Charts

Pareto Diagram

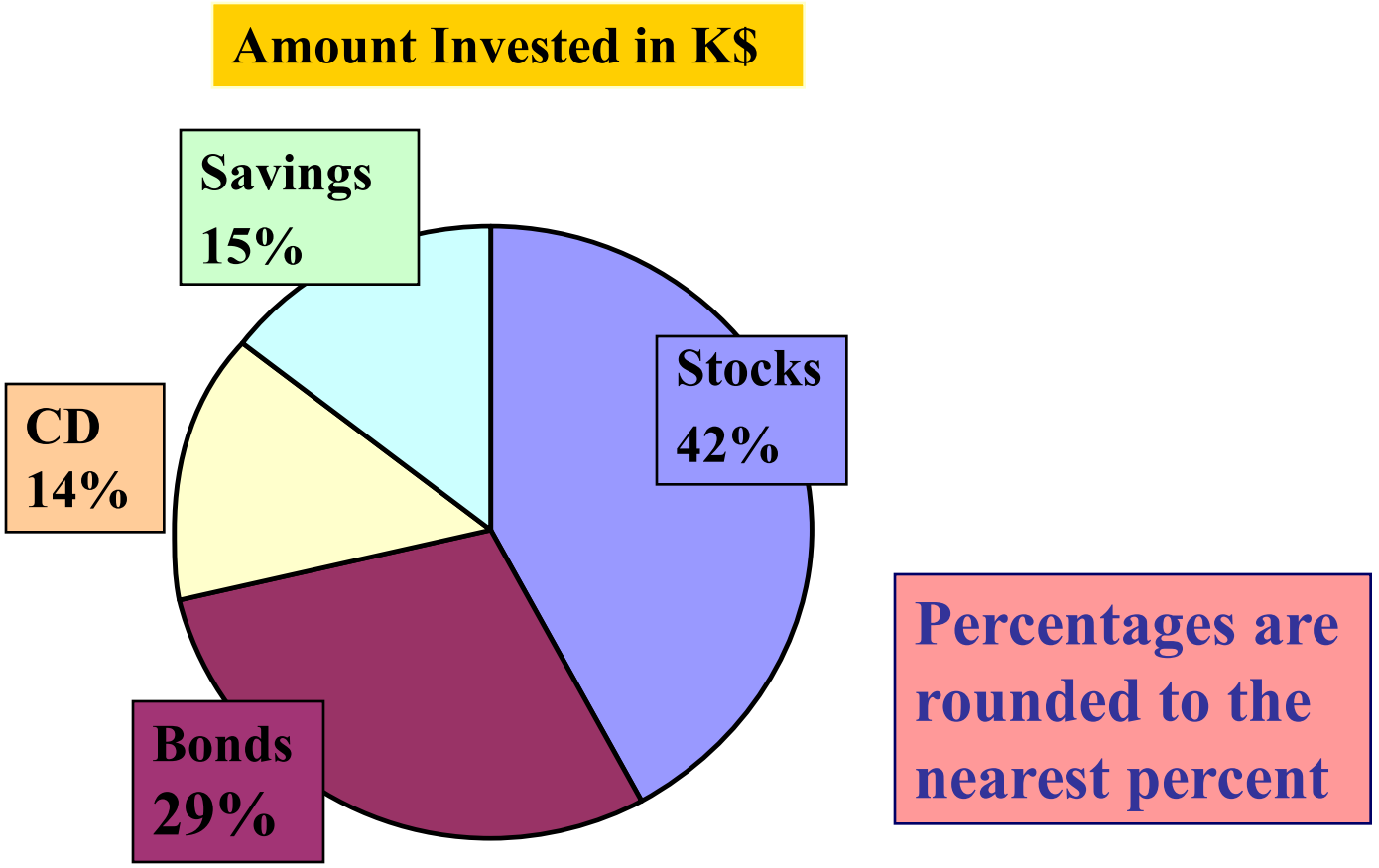


Bar Chart
(for an Investor's Portfolio)

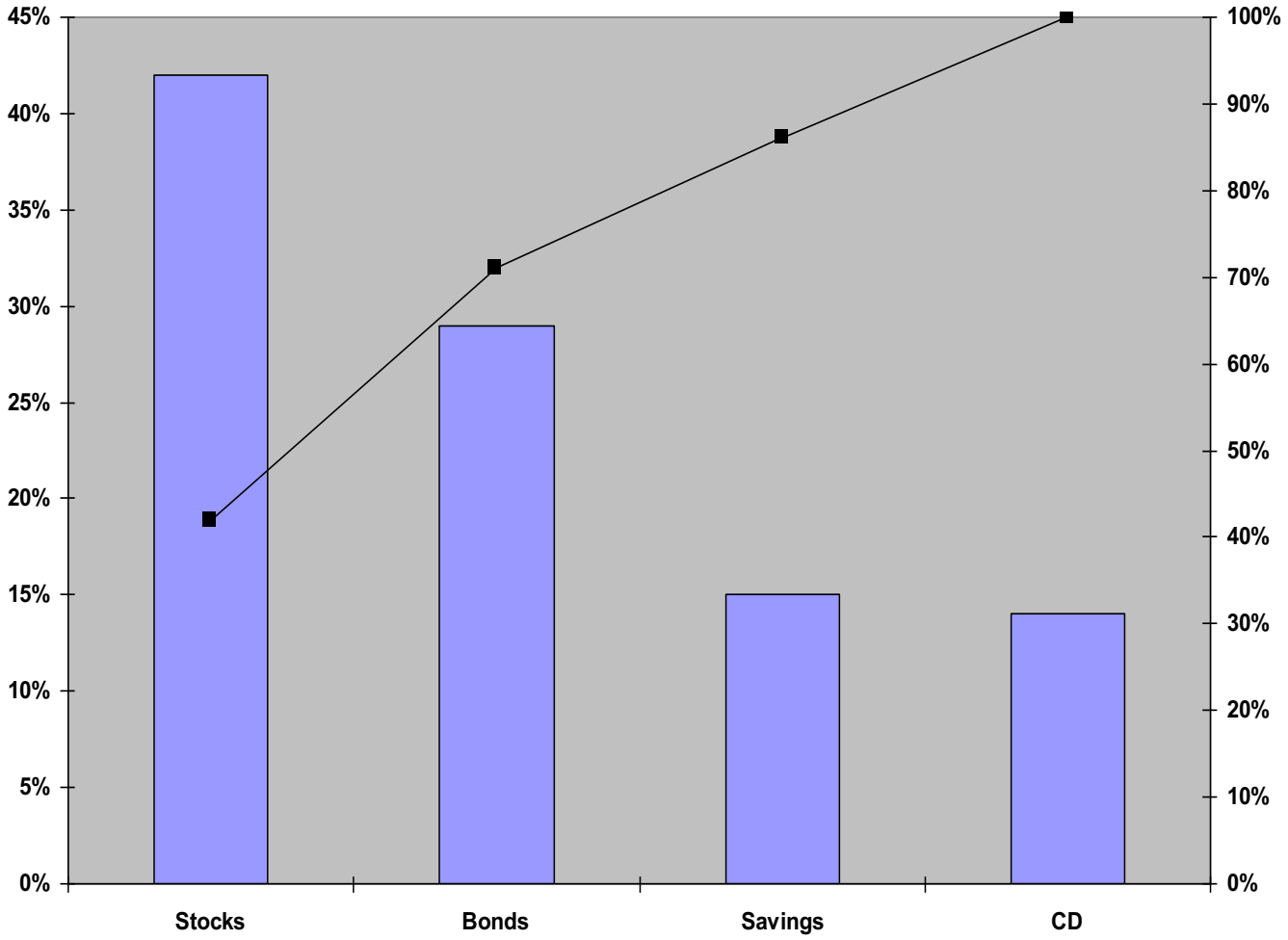


Pie Chart

(for an Investor's Portfolio)



Pareto Diagram



Axis for bar chart shows % invested in each category

Axis for line graph shows cumulative % invested

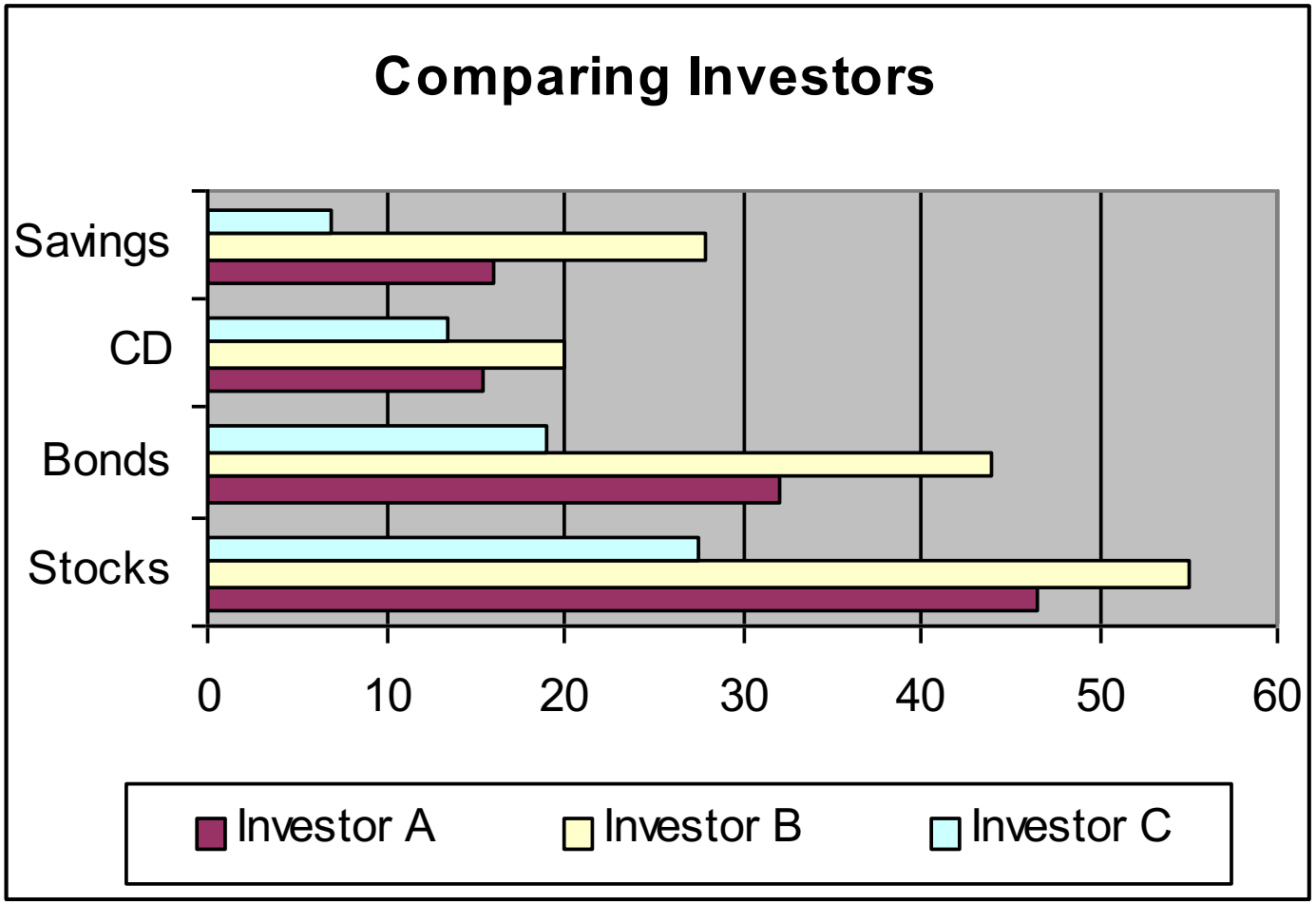
Tabulating and Graphing Bivariate Categorical Data

- Contingency Tables: Investment in Thousands of Dollars

Investment Category	Investor A	Investor B	Investor C	Total
Stocks	46.5	55	27.5	**129**
Bonds	32	44	19	**95**
CD	15.5	20	13.5	**49**
Savings	16	28	7	**51**
Total	**110**	**147**	**67**	**324**

Tabulating and Graphing Bivariate Categorical Data

- Side by Side Charts



Principles of Graphical Excellence

- Well-Designed Presentation of Data that Provides:
  - Substance
  - Statistics
  - Design
- Communicate Complex Ideas with Clarity, Precision and Efficiency
- Gives the Largest Number of Ideas in the Most Efficient Manner
- Almost Always Involves Several Dimensions
- Telling the Truth about the Data

Errors in Presenting Data

- Using 'Chart Junk'
- No Relative Basis in Comparing Data between Groups
- Compressing the Vertical Axis
- No Zero Point on the Vertical Axis

'Chart Junk'

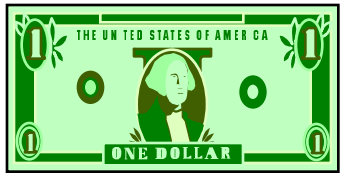
Bad Presentation

Minimum Wage


1960: $1.00


1970: $1.60

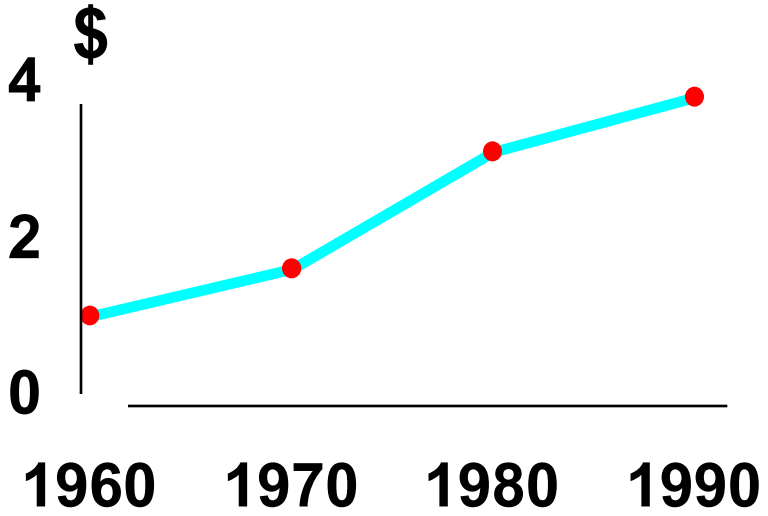
1980: $3.10



1990: $3.80

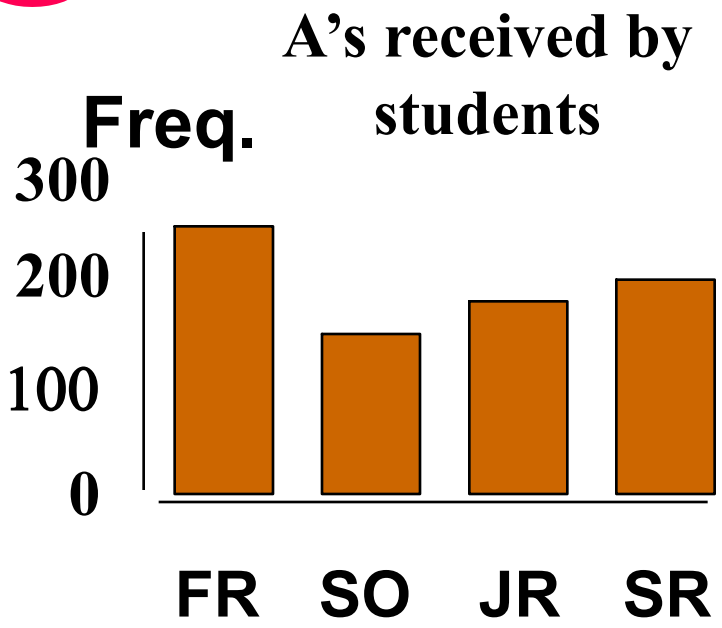
✓ Good Presentation

Minimum Wage

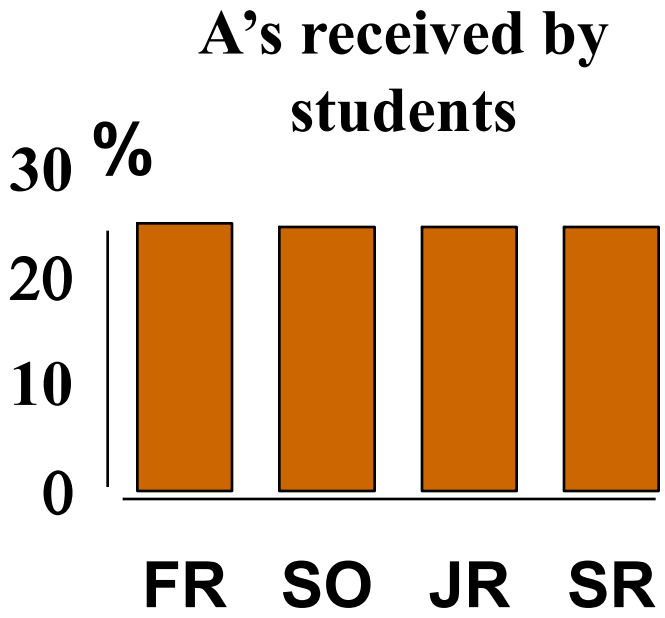


No Relative Basis

Bad Presentation



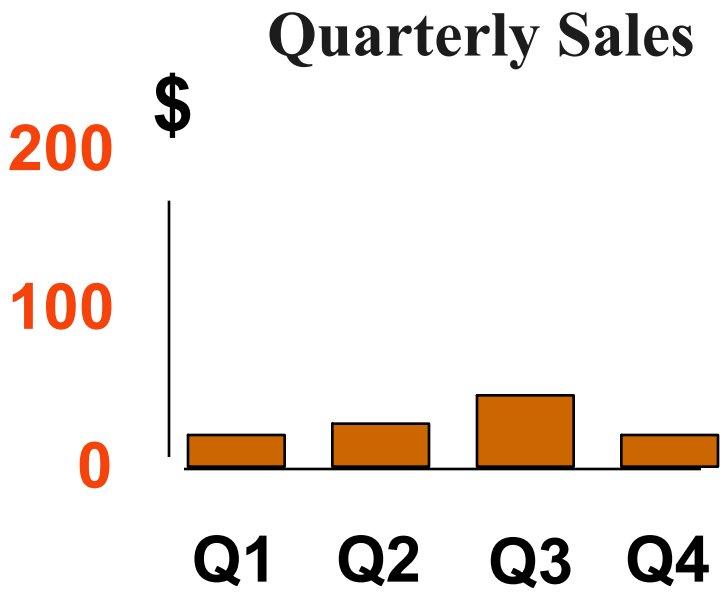
✓ Good Presentation



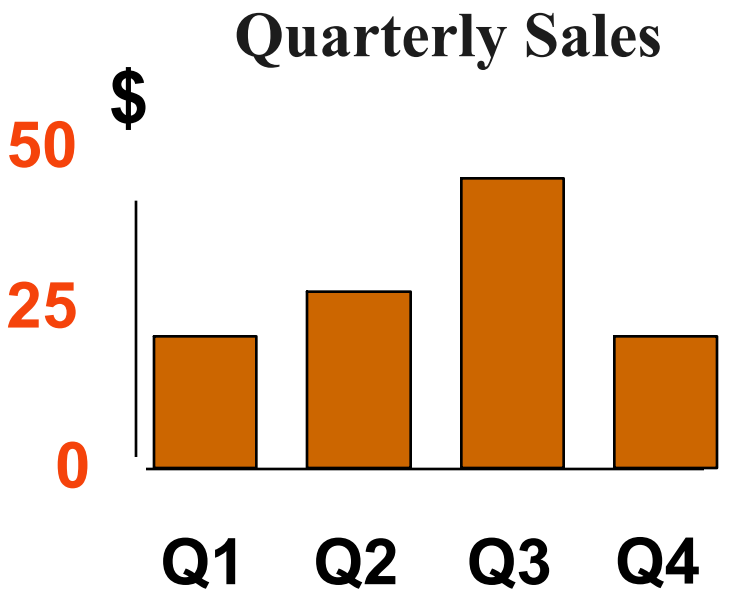
FR = Freshmen, SO = Sophomore, JR = Junior, SR = Senior

Compressing Vertical Axis

Bad Presentation

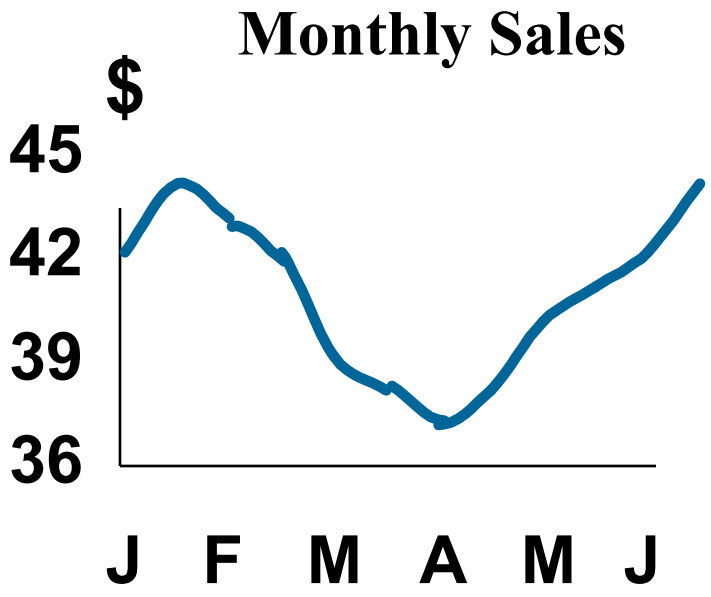


✓Good Presentation



No Zero Point on Vertical Axis

Bad Presentation



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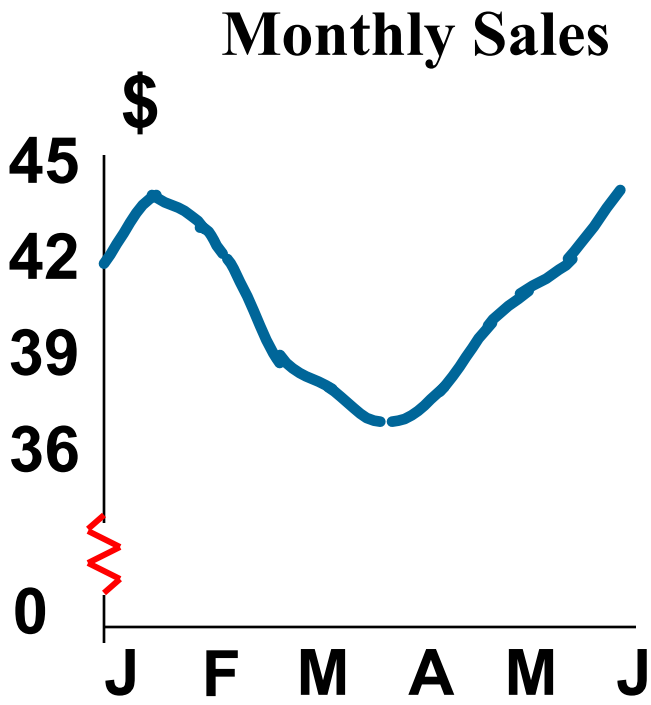
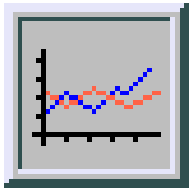


Graphing the first six months of sales

Chapter Summary

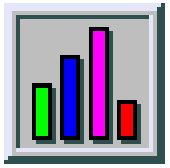
- Organized Numerical Data
  - The Ordered Array and Stem-Leaf Display
- Tabulated and Graphed Univariate Numerical Data
  - Frequency Distributions: Tables, Histograms, Polygons
  - Cumulative Distributions: Tables, the Ogive
- Graphed Bivariate Numerical Data



Chapter Summary

(continued)

- Tabulated and Graphed Univariate Categorical Data
  - The Summary Table
  - Bar and Pie Charts, the Pareto Diagram



- Tabulated and Graphed Bivariate Categorical Data
  - Contingency Tables
  - Side by Side Charts
- Discussed Graphical Excellence and Common Errors in Presenting Data