MONASH University

Information Technology

FIT1006
Business Information Analysis

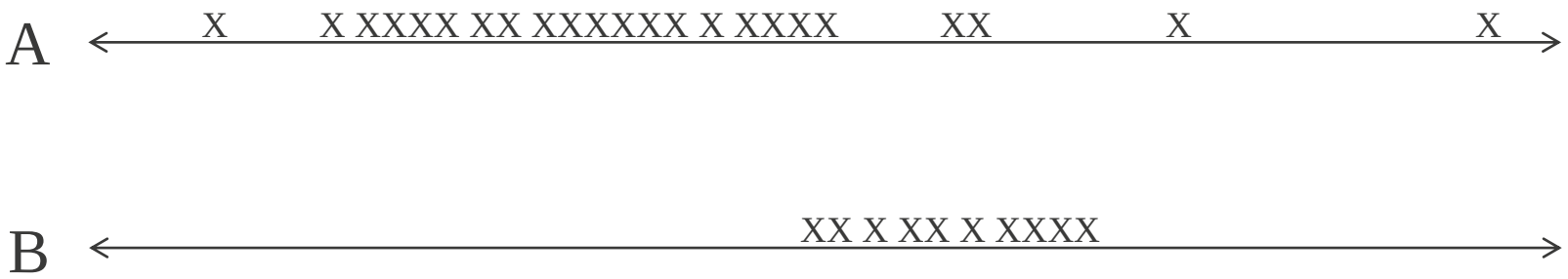
Lecture 5
Descriptive Statistics – Introduction to EXCEL and SYSTAT

Topics covered:

- Calculating descriptive statistics with EXCEL and SYSTAT.
- Comparing groups
- Visualising data
- Using appropriate statistics
- Describing data

Learning Objectives

- This lecture is about how we characterise a data set using some summary statistics.
- A typical problem that could be answered with the techniques covered today is: describe the differences between the two data sets A and B below?



Motivating problem…

- A grocery store wants you to analyse the amount spent by their customers. They also think there might be different types of customers. They have given you the sales history of 10 randomly sampled customers.
- Data is from the Kaggle 'Dunnhumby's Shopper Challenge' which recorded the amount spent and date of the transaction at a supermarket in the US over one year.
  - See: http://www.kaggle.com/c/dunnhumbychallenge
- I have resampled the original data, using approx 20% of the original observations.
- We will use the data for 10 groups of shoppers.

Motivating Problem

- Working in groups of 3, using the data for Customer 3 (shown on the right) do the following:
  - Draw a stem and leaf plot.
  - Calculate the quartiles using the quick method.
  - Calculate Q1 using $q = (n+1)\frac{Q}{4}$
  - Calculate a 10% trimmed mean.

22
18
13
37
14
74
70
62
75
16
21
33
11
101
114
5
94
2
33
10

Sample Data – Stem and leaf plot

22
18
13
37
14
74
70
62
75
16
21
33
11
101
114
5
94
2
33
10

Stem & leaf		
0	|	25
1	|	013468
2	|	12
3	|	337
4	|	
5	|	
6	|	2
7	|	045
8	|	
9	|	4
10	|	1
11	|	4

https://flux.qa (Feed code: SJ6KGV)

Question 1

For Customer 3, using the Quick Method, Q1 =

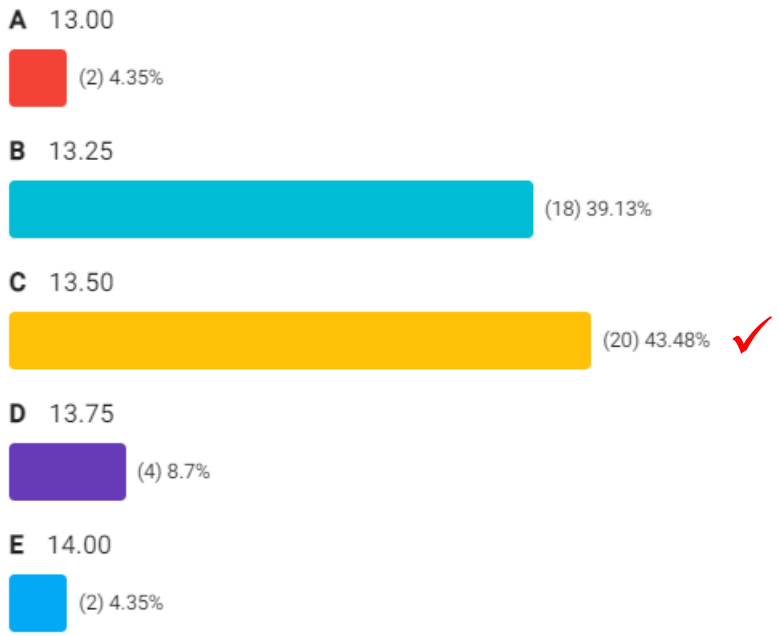
A. 13.00

B. 13.25

C. 13.50

D. 13.75

E. 14.00



2	5	10	11	13	14	16	18	21	22	33	33	37	62	70	74	75	94	101	114

4 x 5 = 20 --> n = 5

Q1 Q2 Q3

https://flux.qa (Feed code: SJ6KGV)
Question 2

- For Customer 3, using $q = (n+1)\frac{Q}{4}$, Q1 =

2	5	10	11	13	14	16	18	21	22	33	33	37	62	70	74	75	94	101	114

A. 13.00
B. 13.25
C. 13.50
D. 13.75
E. 14.00

$q = (n+1)\frac{Q}{4}$ $q = \frac{20+1}{4} = 5.25^{th}$ value

$Q = x_q + r(x_{q+1} - x_q)$ When q is non-integer

$Q_1 \rightarrow 5^{th}$ value + 0.25 (6^{th} value - 5^{th} value)

$Q_1 \rightarrow 13 + 0.25\ (14 - 13) = 13.25$

https://flux.qa (Feed code: SJ6KGV)

Question 3

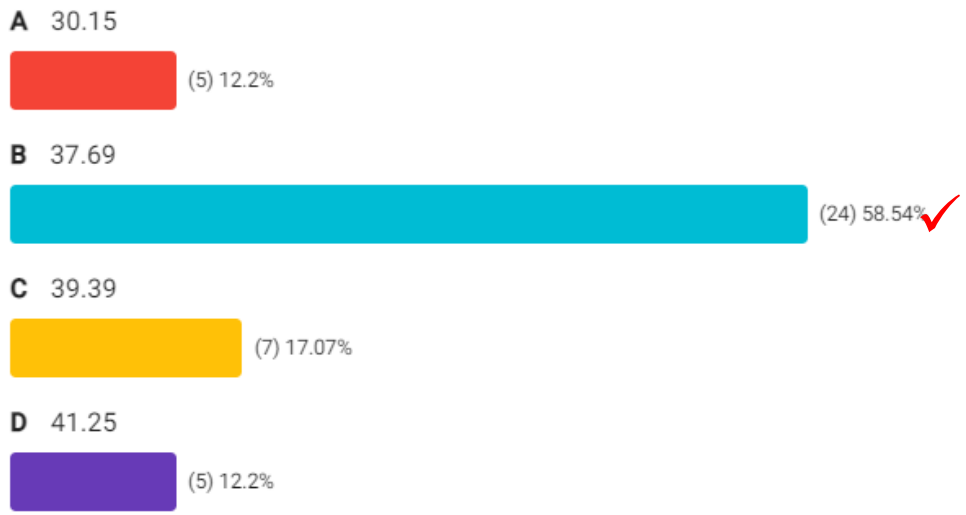
For Customer 3, what is the mean, using the 10% trimmed mean:

A. 30.15

B. 37.69

C. 39.39

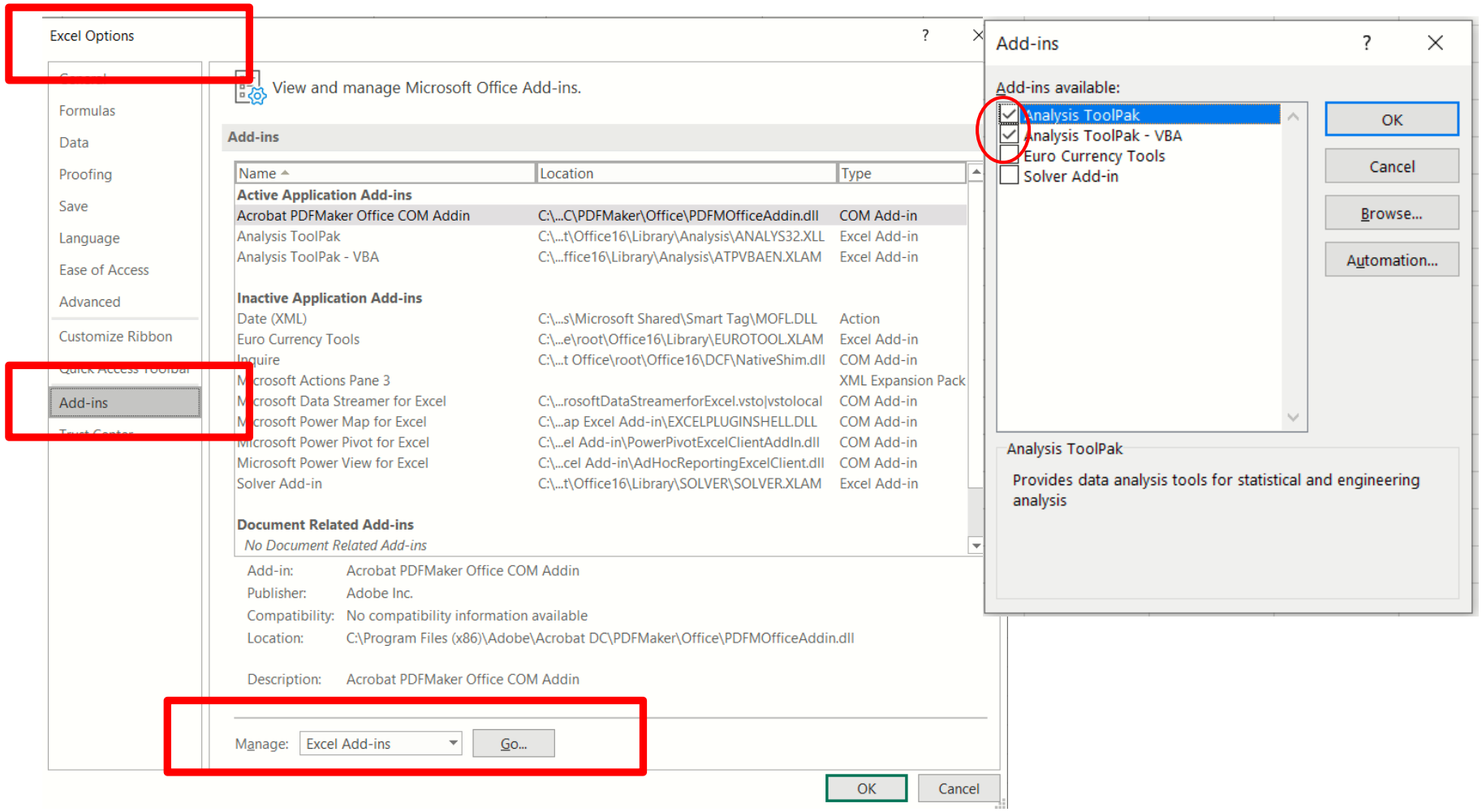
D. 41.25



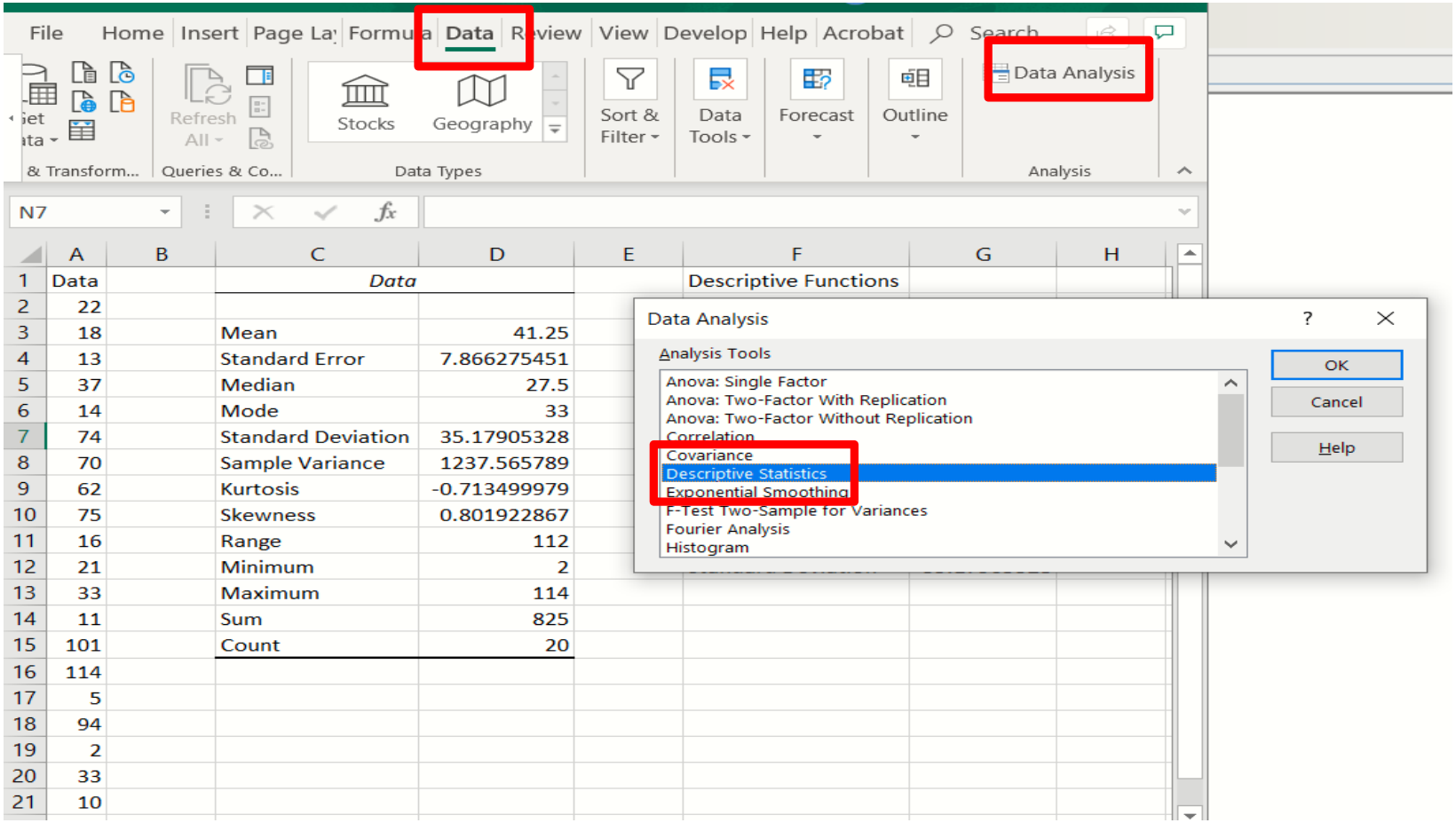
2	5	10	11	13	14	16	18	21	22	33	33	37	62	70	74	75	94	101	114

10% trimmed mean : (10 + 11 + 13 +14 +16 + 18 + 21 + 22 + 33 + 33 + 37 + 62 + 70 + 74 + 75 + 94)/16 = 37.69

Analysis Tools – Excel Add-ins



Data -> Data Analysis



Motivating Problem – SYSTAT

```
ID40(0), N = 13

  0   267
  1 M 3447
  2
  3   9
  4 H 05
  5   4
  6   13

ID79(1), N = 10

  0 H 01233
  0 M 7
  1 H 11
  1   5
  2   3

ID119(2), N = 21

  0   22223
  0 H 68
  1
  1   6
  2 M 000012
  2   6
  3 H 002
  3
  4   1
  4   5
  5
  5   5
```

```
DI123(3), N = 20

  0   25
  1 H 013468
  2 M 12
  3   337
  4
  5
  6   2
  7 H 045
  8
  9   4
 10   1
 11   4

ID134(4), N = 66

  0   022
  0   56677789
  1 H 0112234
  1   555566788889
  2 M 111223344
  2   556678
  3   22
  3 H 58999
  4   0114
  4   68
  5   0014
  5
  6
  6
  7   2
* * * Outside Values * * *
  9   69
 12   1
```

```
ID140(5), N = 32

  0   134699
  1 H 129
  2   3
  3   4
  4   27
  5 M 224467
  6   235
  7 H 33
  8   26
  9   04
 10   357
 11   4

ID148(6), N = 49

  0   111
  0   22
  0   4455555
  0 H 6666667777
  0 M 8899
  1   00
  1   2233
  1   4
  1   7
  1   8
  2 H 001
  2   223
  2   4
  2   6
  2   899
  3
  3   2
* * * Outside Values * * *
  4   6
  9   6
```

```
ID149(7), N = 11

  0   45
  1   4
  2 H 89
  3 M 6
  4   0
  5 H 44
  6   9
  7   7

ID168(8), N = 29

  0   24
  0   6779
  1 H 444
  1   66688
  2 M 0122
  2   9
  3 H 0004
  3   6
  4   3
  4
  5   44
* * * Outside Values * * *
  6   8
 14   1

ID177(9), N = 10

  4   9
  5
  6 M 1334
  7   3
  8   1
  9 H 6
 10   79
```

Describe the different types of customers…

Motivating Problem - SYSTAT

```
Stem and Leaf Plot of Variable: ID40(0), N = 13

Minimum     :  2.000
Lower Hinge : 13.000
Median      : 17.000
Upper Hinge : 45.000
Maximum     : 63.000

Stem and Leaf Plot of Variable: ID79(1), N = 10

Minimum     :   5.000
Lower Hinge :  25.000
Median      :  57.500
Upper Hinge : 115.000
Maximum     : 239.000

Stem and Leaf Plot of Variable: ID119(2), N = 21

Minimum     :  2.000
Lower Hinge :  6.000
Median      : 20.000
Upper Hinge : 30.000
Maximum     : 55.000

Stem and Leaf Plot of Variable: DI123(3), N = 20

Minimum     :   2.000
Lower Hinge :  13.500
Median      :  27.500
Upper Hinge :  72.000
Maximum     : 114.000

Stem and Leaf Plot of Variable: ID134(4), N = 66

Minimum     :   0.000
Lower Hinge :  13.000
Median      :  21.500
Upper Hinge :  39.000
Maximum     : 121.000
```

```
Stem and Leaf Plot of Variable: ID140(5), N = 32

Minimum     :   1.000
Lower Hinge :  15.500
Median      :  54.000
Upper Hinge :  77.500
Maximum     : 114.000

Stem and Leaf Plot of Variable: ID148(6), N = 49

Minimum     :  1.000
Lower Hinge :  6.000
Median      :  9.000
Upper Hinge : 20.000
Maximum     : 96.000

Stem and Leaf Plot of Variable: ID149(7), N = 11

Minimum     :  4.000
Lower Hinge : 21.000
Median      : 36.000
Upper Hinge : 54.000
Maximum     : 77.000

Stem and Leaf Plot of Variable: ID168(8), N = 29

Minimum     :   2.000
Lower Hinge :  14.000
Median      :  20.000
Upper Hinge :  30.000
Maximum     : 141.000

Stem and Leaf Plot of Variable: ID177(9), N = 10

Minimum     :  49.000
Lower Hinge :  63.000
Median      :  68.500
Upper Hinge :  96.000
Maximum     : 109.000
```

Or use Excel…

- Descriptive Statistics (after cleaning up).

	ID40(0)	*ID79(1)*	*ID119(2)*	*DI123(3)*	*ID134(4)*	*ID140(5)*	*ID148(6)*	*ID149(7)*	*ID168(8)*	*ID177(9)*
Mean	28.85	80.90	20.14	41.25	27.38	51.94	14.18	37.27	27.41	76.60
Standard Error	6.14	23.60	3.32	7.87	2.81	6.16	2.21	7.38	5.02	6.60
Median	17.00	57.50	20.00	27.50	21.50	54.00	9.00	36.00	20.00	68.50
Mode	14.00	#N/A	20.00	33.00	15.00	73.00	6.00	54.00	16.00	63.00
Standard Deviation	22.12	74.63	15.19	35.18	22.82	34.85	15.45	24.49	27.01	20.86
Sample Variance	489.47	5569.66	230.83	1237.57	520.76	1214.32	238.74	599.82	729.75	435.16
Kurtosis	-1.55	0.80	-0.13	-0.71	5.23	-1.11	16.00	-0.97	10.93	-1.08
Skewness	0.38	1.09	0.58	0.80	2.03	0.08	3.40	0.16	2.91	0.58
Range	61.00	234.00	53.00	112.00	121.00	113.00	95.00	73.00	139.00	60.00
Minimum	2.00	5.00	2.00	2.00	0.00	1.00	1.00	4.00	2.00	49.00
Maximum	63.00	239.00	55.00	114.00	121.00	114.00	96.00	77.00	141.00	109.00
Sum	375.00	809.00	423.00	825.00	1807.00	1662.00	695.00	410.00	795.00	766.00
Count	13.00	10.00	21.00	20.00	66.00	32.00	49.00	11.00	29.00	10.00

Or SYSTAT…

- Summary Statistics + quartiles

	ID40(0)	ID79(1)	ID119(2)	DI123(3)	ID134(4)	ID140(5)	ID148(6)	ID149(7)	ID168(8)	ID177(9)
N of Cases	13	10	21	20	66	32	49	11	29	10
Minimum	2.000	5.000	2.000	2.000	0.000	1.000	1.000	4.000	2.000	49.000
Maximum	63.000	239.000	55.000	114.000	121.000	114.000	96.000	77.000	141.000	109.000
Median	17.000	57.500	20.000	27.500	21.500	54.000	9.000	36.000	20.000	68.500
Arithmetic Mean	28.846	80.900	20.143	41.250	27.379	51.938	14.184	37.273	27.414	76.600
Standard Deviation	22.124	74.630	15.193	35.179	22.820	34.847	15.451	24.491	27.014	20.860
Method = CLEVELAND										
1 of 4	11.500	25.000	5.250	13.500	13.000	15.500	5.750	17.500	14.000	63.000
2 of 4	17.000	57.500	20.000	27.500	21.500	54.000	9.000	36.000	20.000	68.500
3 of 4	47.250	115.000	30.000	72.000	39.000	77.500	20.250	54.000	31.000	96.000

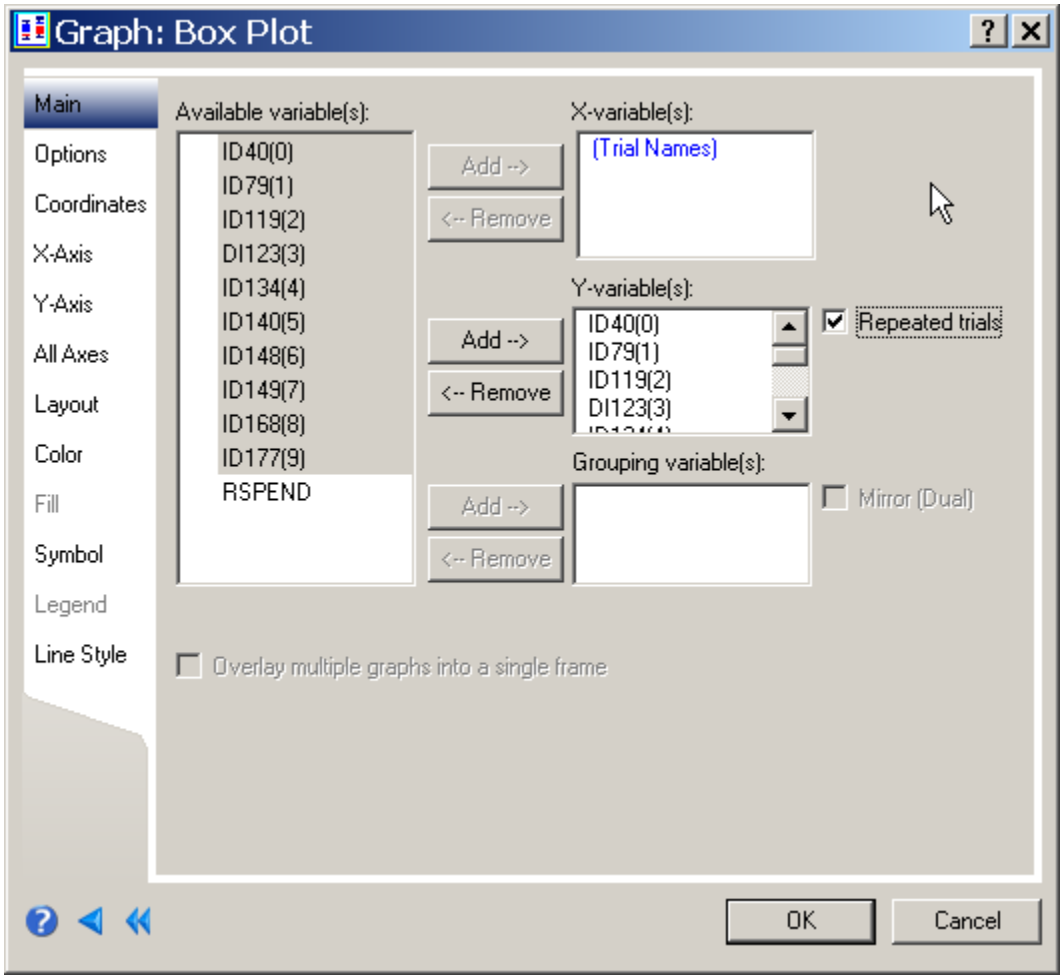
SYSTAT

- SYSTAT is a Windows-based statistics platform. You can download a free version: MYSTAT from the link below.

- https://systatsoftware.com/

- https://systatsoftware.com/products/systat/mystat-statistical-analysis-product-for-student-use/

Screenshot from SYSTAT…



Making sense of the data…

- How do we make sense of all these information?
- What can we infer from:
  - Descriptive statistics of the data
  - The distribution from stem and leaf plot
  - The box plot, etc…

https://flux.qa (Feed code: SJ6KGV)

Question 4

From the boxplot who has the greater median spend?

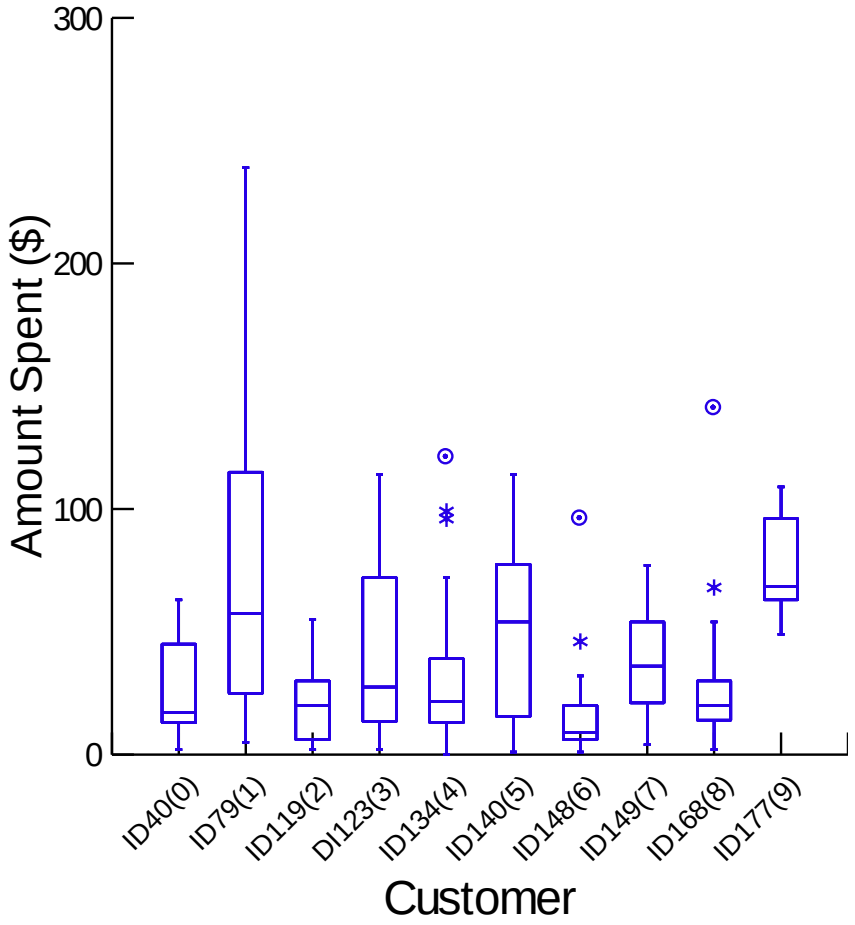
A. ID79

B. ID123

C. ID140

D. ID177

E. None of the above.



https://flux.qa (Feed code: SJ6KGV)

Question 5

From the boxplot who is the most "inconsistent" customer?

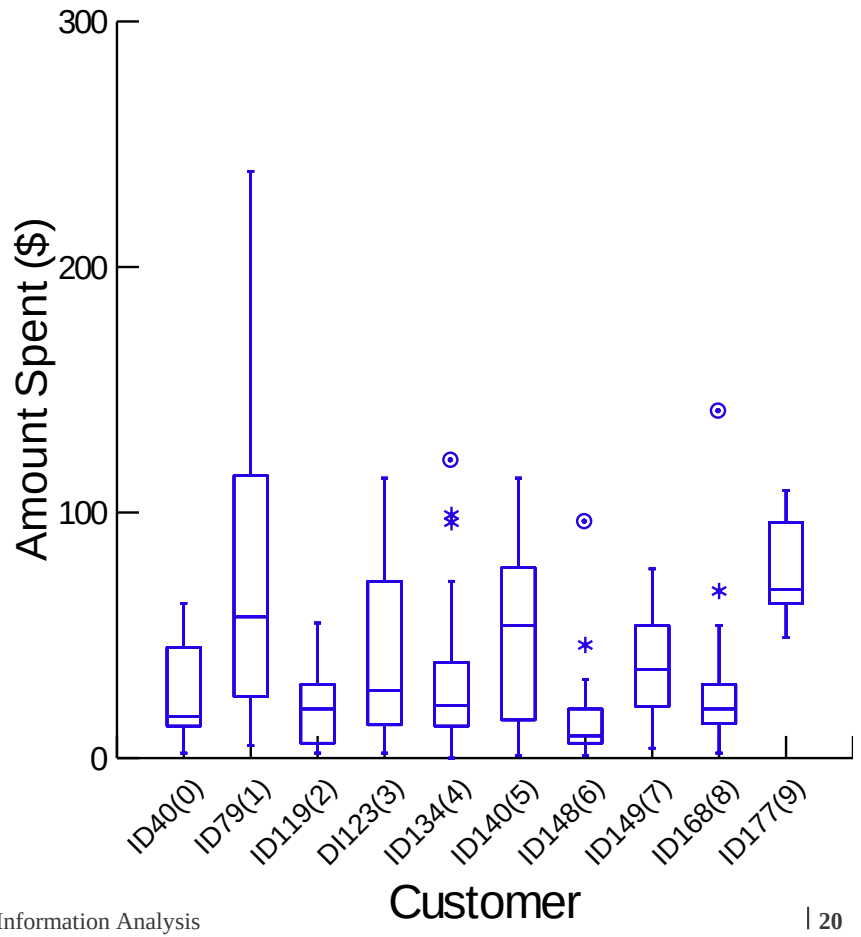
A. ID79

B. ID123

C. ID140

D. ID177

E. None of the above.



https://flux.qa (Feed code: SJ6KGV)

Question 6

From the boxplot who is the best customer?

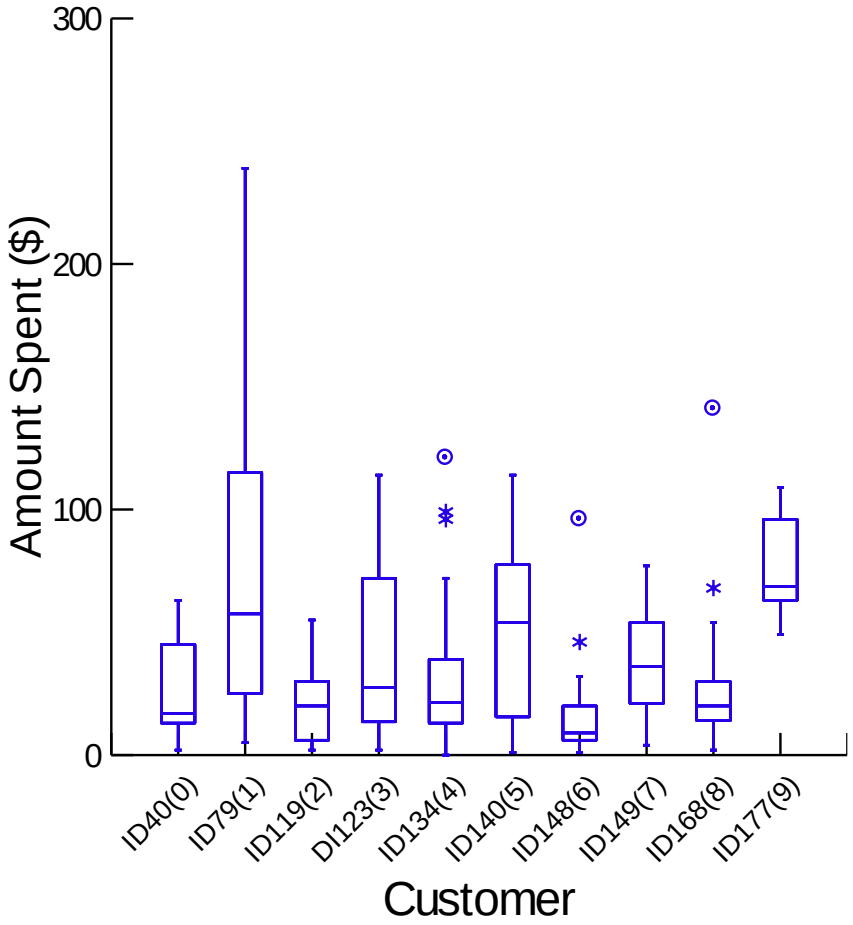
A. ID79

B. ID123

C. ID140

D. ID177

E. None of the above.



Measures of spread

- The variance is the average of the squared deviations adjusted for estimation of the mean.
- The standard deviation is the most well known. It is the square root of the variance.
- The range is largest – smallest observation.
- The interquartile range is Q3 – Q1 it contains the middle 50% of observations.

Let's have a look at the 'shape' of distribution…

https://flux.qa (Feed code: SJ6KGV)

Question 7

The histogram on RHS corresponds to which data set:

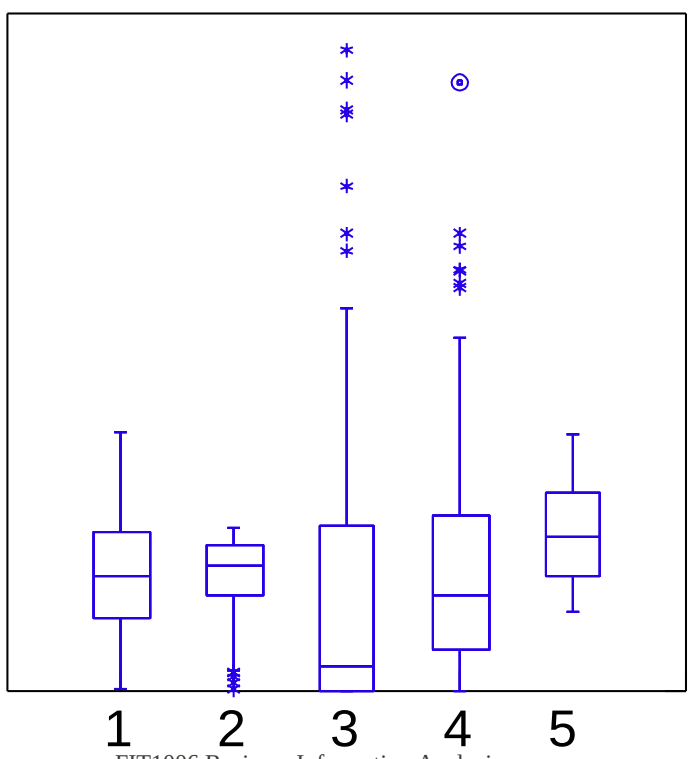
A. 1

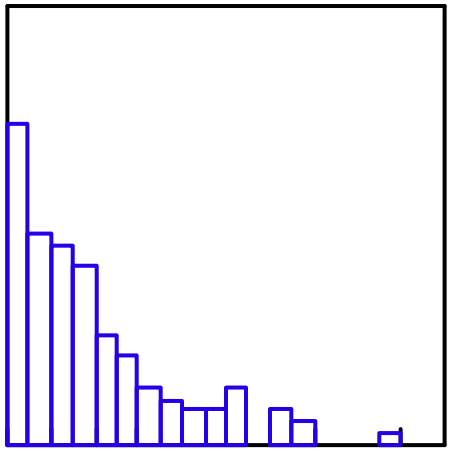
B. 2

C. 3

D. 4

E. 5





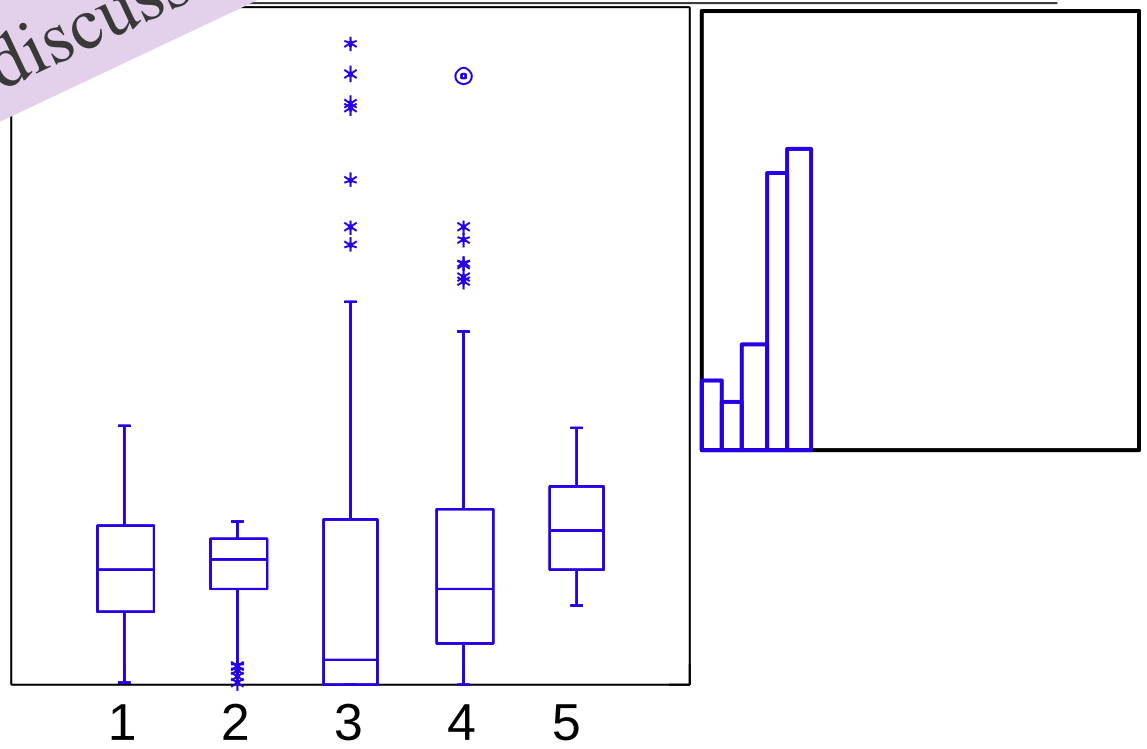
https://flux.qa (Feed code: SJ6KG

Question 8

The histogram RHS corre to which data set:

We will discuss this in tomorrow's lecture

A. 1
B. 2
C. 3
D. 4
E. 5



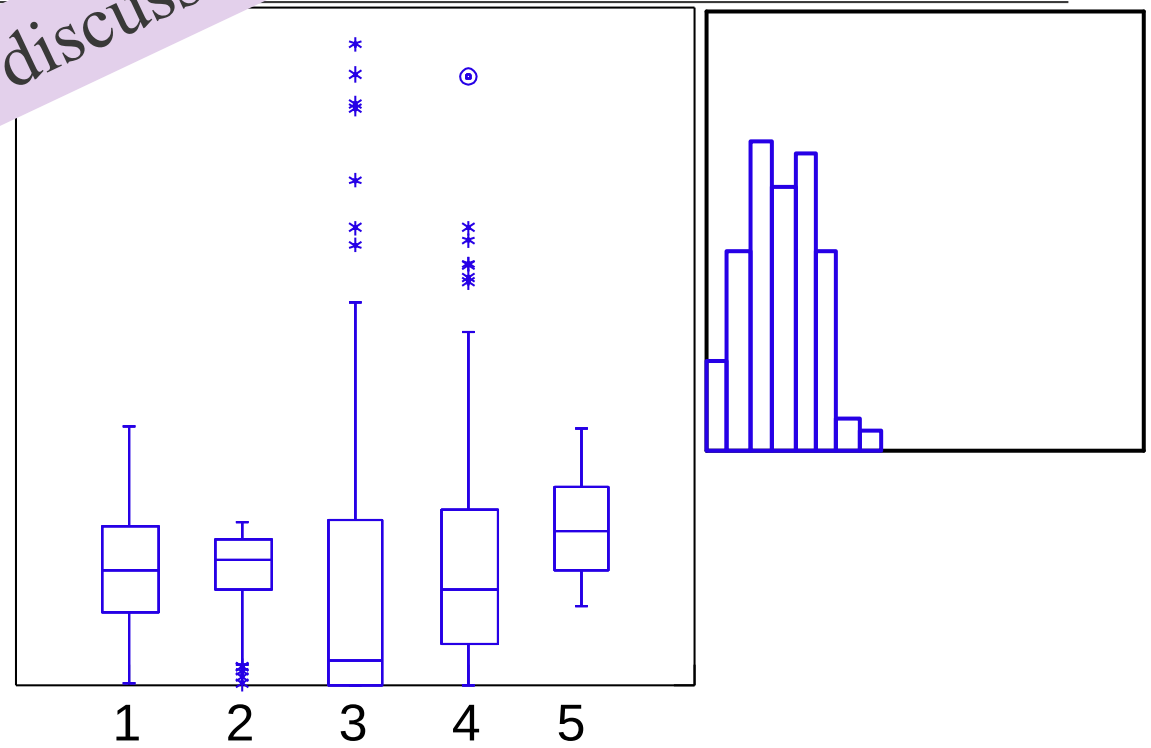
https://flux.qa (Feed code: SJ6K

Question 9

The histogram RHS corr as to which data set:

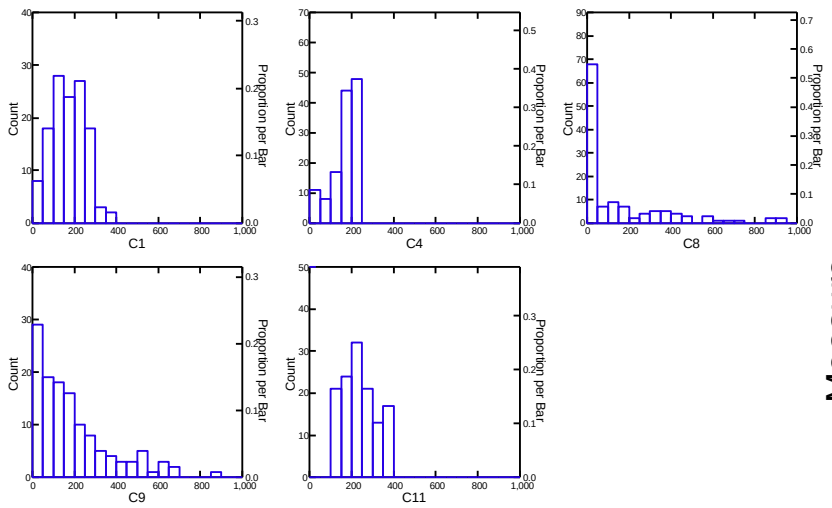
We will discuss this in tomorrow's lecture

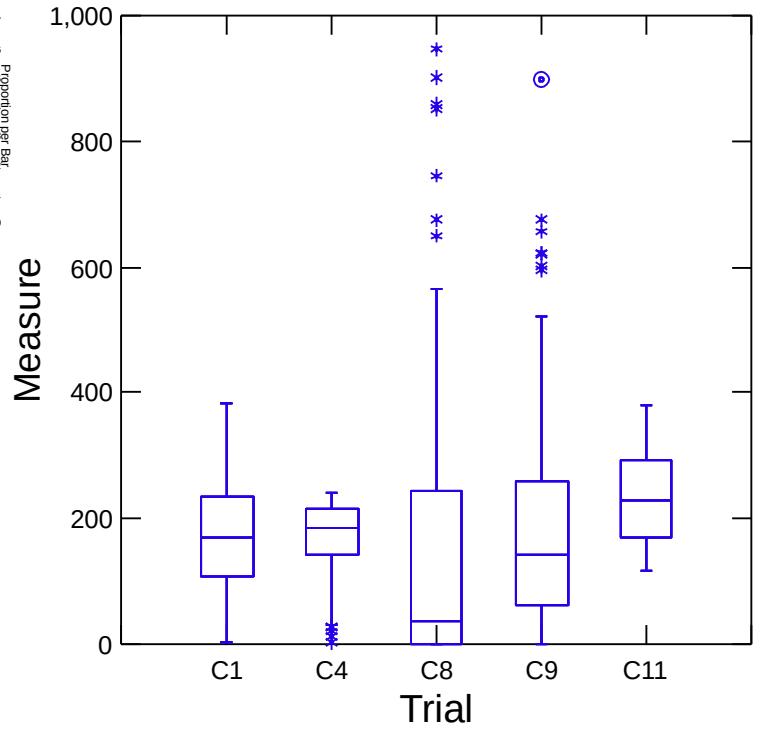
A. 1
B. 2
C. 3
D. 4
E. 5



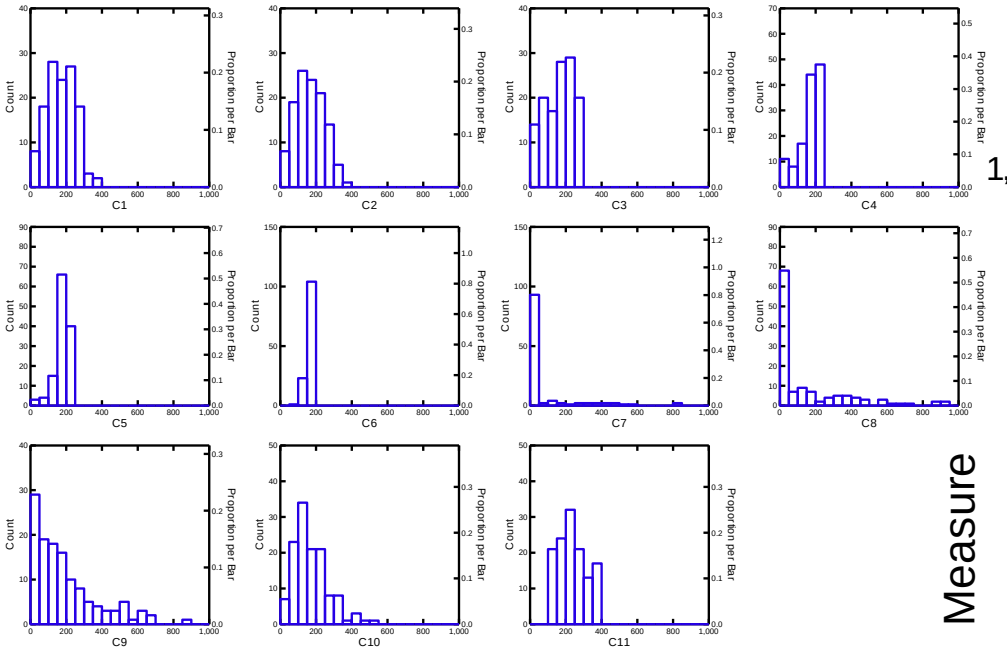
Distribution Shape and Boxplot

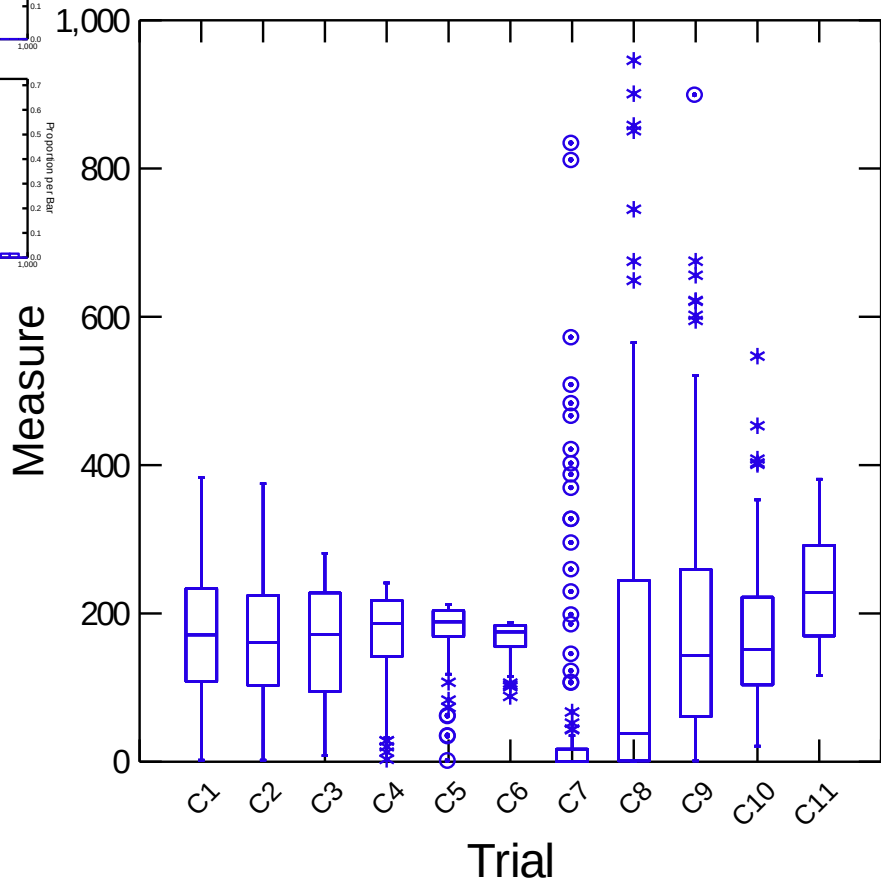
- Here's 5 distributions and the corresponding boxplots





Full Set


Count
Proportion per Bar
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11


Measure
1,000
800
600
400
200
0
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
Trial

Key Ideas

- You should be able to:
- Calculate the basic descriptive statistics using Excel and SYSTAT;
- Plot histograms and boxplots of data, including several groups of data on a single plot using SYSTAT

Reading/Questions

- Reading: Graphical / Numerical Descriptive Methods
    - 7th Ed. Sections 2.1, 3.1, 4.1, 4.4, 5.1 - 5.3.
- Questions: Graphical / Numerical Descriptive Methods
    - 7th Ed. 5.17, 5.41, 5.45, 5.46, 5.67, 5.70.
- Tutorial 3 Questions