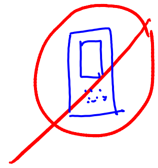
2013-09-26-C02

Thursday, September 26, 2013
10:21 AM

$$z = \frac{x-\mu}{\sigma}$$



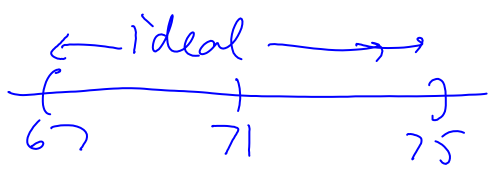
Ex. Test scores

x	$x-\mu$	$z=(x-\mu)/\sigma$
56	-24.6	-1.6
72	-8.6	-0.6
83	2.4	0.2
92	11.4	0.7
100	19.4	1.3

$\mu = 80.60$
$\sigma = 15.44$

Ex. Quality improvement (empirical rule)

Coffee temp



(71 ∓ 4)

73
76
69
67
74
70
69
72
71
68
75
72
67
74
72
68
70
77
68
72
69
75
68
73

Pasted from <file:///C:\DOCUME~1\parlar\LOCALS~1\Temp\CoffeeTemp-Tolerance.xls>

count	24
mean	71.21
sample variance	8.87
sample standard deviation	2.98

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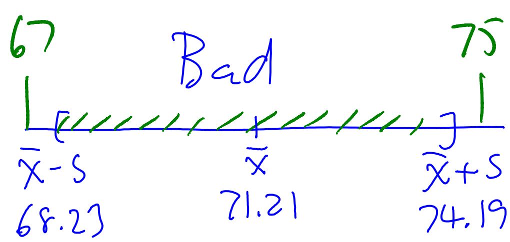
$\bar{x} = 71.21$
$s = 2.98$

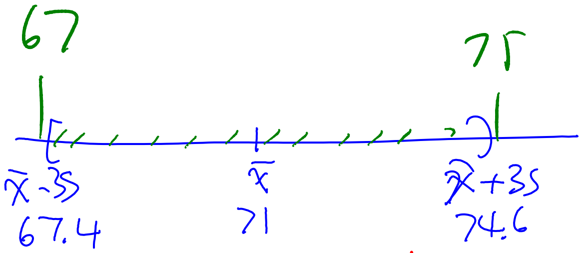
68%



After adjustments, $\bar{x} = 71$

$s = 1.2$

99%



d) More measures of variation

Ex. GMAT

http://profs.degroote.mcmaster.ca/ads/parlar/courses/q600/ChapterComments/documents/GMAT-Percentiles.pdf

The **pth percentile** of a group of *n* measurements is a value such that (approximately) *p*% of measurements fall at or below the value and (approximately) (100-*p*)% fall at or above the value.

Pasted from <http://profs.degroote.mcmaster.ca/ads/parlar/courses/q600/ChapterComments/ch-02.html>

Ex. Test Scores in a small class

$n = 8$

Scores	36	40	72	74	74	80	86	90
Posit.	1	2	3	4	5	6	7	8

Posit. of $p = 25$: 2.5 → 56

" $p = 50$: 4.5 → 74

" $p = 75$: 6.5 → 83

One drops out 36

$n = 7$

Scores	40	72	74	74	80	86	90
Pos.	1	2	3	4	5	6	7

14.28% 28.57%

Pos. $p = 25$: 2 → 72

$p = 50$: 4 → 74

$p = 75$: 6 → 86

An easy method for locating the position of the *p*th percentile of *n* measurements:

- First, order all measurements and calculate $i = (p/100)*n$.
- If *i* is an integer, then the position is the average of measurements in positions *i* and *i+1*.
- If *i* is not an integer, then the position is the next integer greater than *i*.

Pasted from <http://profs.degroote.mcmaster.ca/ads/parlar/courses/q600/ChapterComments/ch-02.html>

$$i = \frac{p}{100} \cdot n$$

$n = 7$: $p = 25$, $i = \frac{25}{100} \cdot 7 = 1.75 \to 2 \to 72$

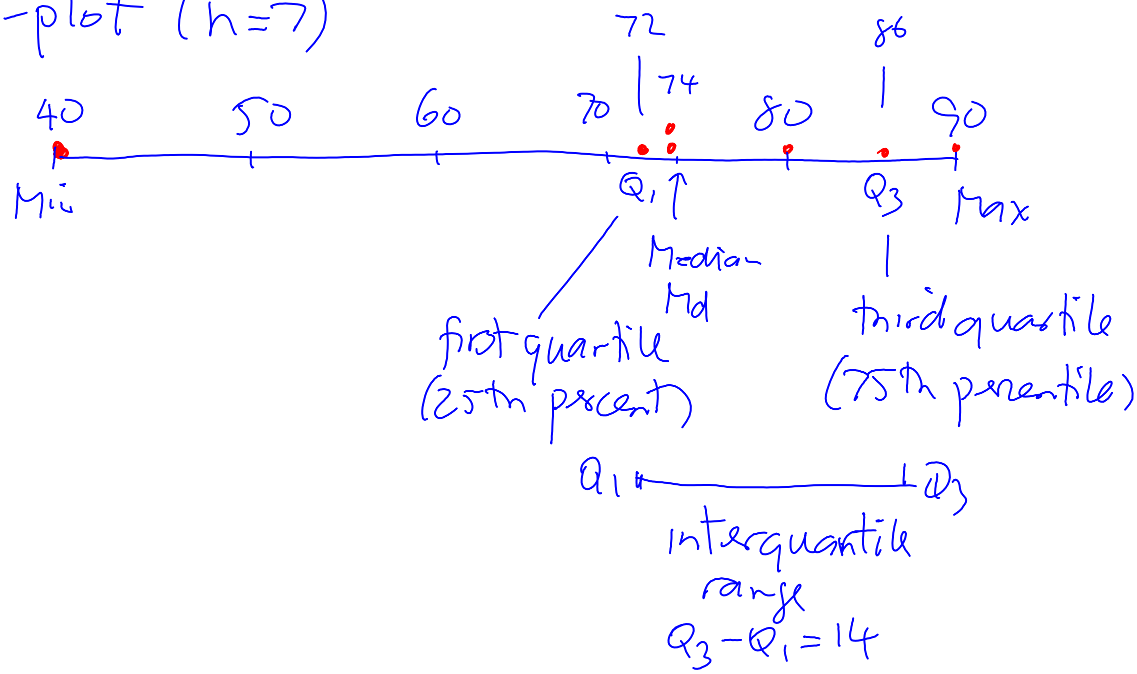
$n=7$: $p=25$, $i = \frac{25}{100} \cdot 7 = 1.75 \rightarrow 2 \rightarrow 72$

$p=75$, $i = \frac{75}{100} \cdot 7 = 5.25 \rightarrow 6 \rightarrow 86$

$n=8$: $p=25$, $i = .25 \times 8 = 2$

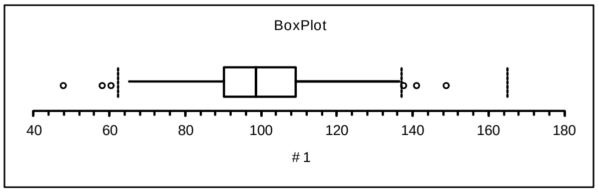
position $= \frac{2+3}{2} = 2.5$

Dot-plot ($n=7$)

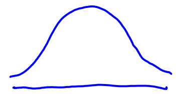


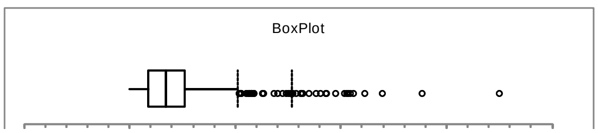
Box-whisker plot

http://profs.degroote.mcmaster.ca/ads/parlar/courses/q600/ChapterComments/documents/Box-Whisker.pdf

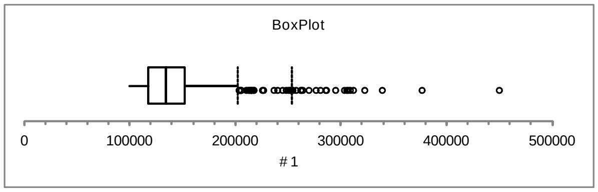


IQ scores

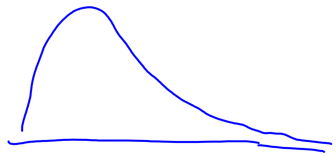




Salary



Salary



Ch3 Probability

Ex. Coin

http://profs.degroote.mcmaster.ca/ads/parlar/courses/q600/ChapterComments/documents/CoinToss.xls

Ex. Lotto 2/4 vs. 6/45

1	2	3	4
1	2		
1		3	
1			4
	2	3	
	2		4
		3	4

$Pr(win) = \frac{1}{6}$

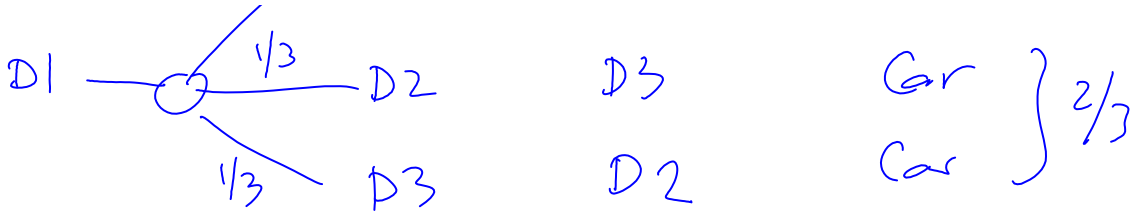
Ex. Birthday

http://profs.degroote.mcmaster.ca/ads/parlar/courses/q600/ChapterComments/documents/3.DB-2013-C02.pdf

Ex. Monty Hall (Car & goats)

chose D1 & switch

		Car behind	Monty will open	Switch
D1	1/3	D1	D2 or D3	Goat
	1/3	D2	D3	Car

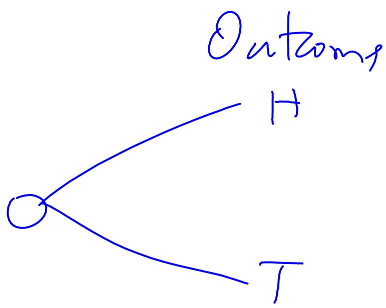


Prob. calc. methods

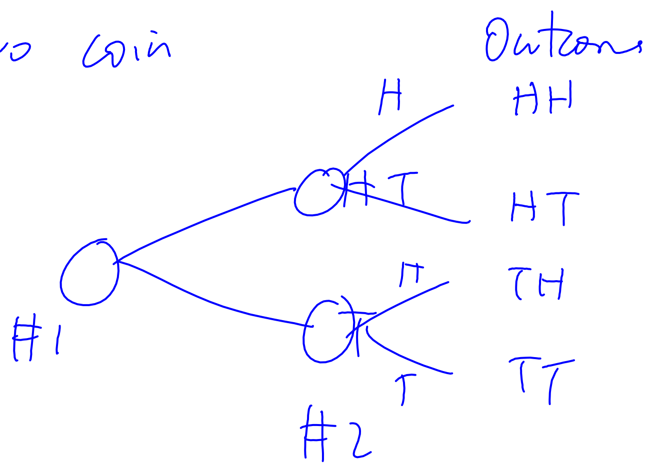
- Classical
- Relat. freq
- Subjective

Random experiment's outcome is uncertain

Ex. Coin



Ex. Two coin



b) Sample spaces & events

Set of all possible outcoms of a random experiment (S)

Ex. Coin $S=\{H,T\}$

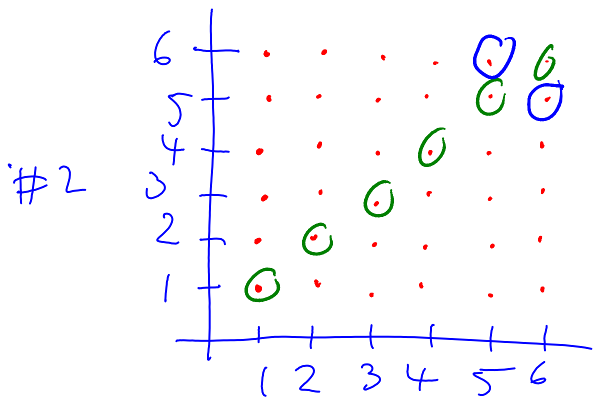
Ex. Two coins $S=\{HH, HT, TH, TT\}$

$Pr(HH)=\frac{1}{4}$

Ex. Backgammon

http://en.wikipedia.org/wiki/Backgammon

Two dice



Same on both $=\{11, 22, \ldots, 66\}$

Sum $=11$

$S=\{11, 12, \ldots, 65, 66\}$ $\# = 36$

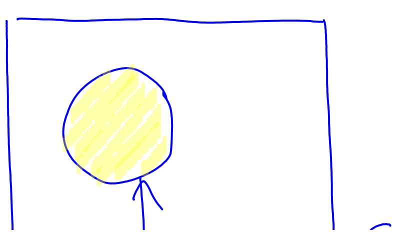
$Pr(\text{same on both}) = \frac{6}{36} = 0.167$

$Pr(\text{Sum}=11) = \frac{2}{36} = 0.055$

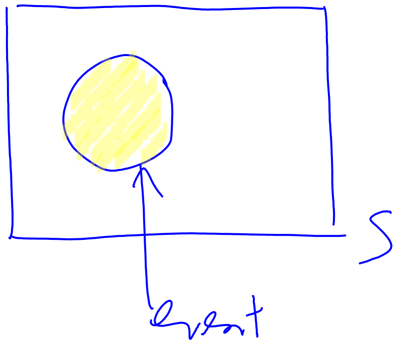
$Pr(\text{same on both } \underline{\underline{\text{OR}}} \text{ Sum}=11) = \frac{8}{36} = 0.222$

An event is a collection of outcomes

Venn



Venn

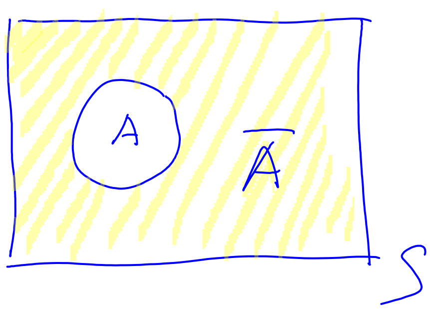


c) Some rules to calculate probs

(i) Complement

A: an event

$\bar{A}$: complement of A



Ex. Two coins

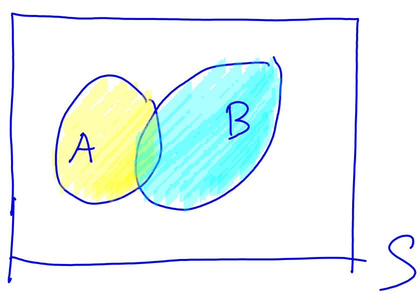
$A = \{HH, TT\}$ both same

$\bar{A} = \{HT, TH\}$

(2) Union

A: event

B: event



Ex. Two dice

$A = \{11, 22, 33, 44, 55, 66\}$ both same

$B = \{46, 55, 64\}$ Sum=10

$A \cup B = \{11, 22, 33, 44, 55, 66, 46, 64\}$