STT 200 9-21-09

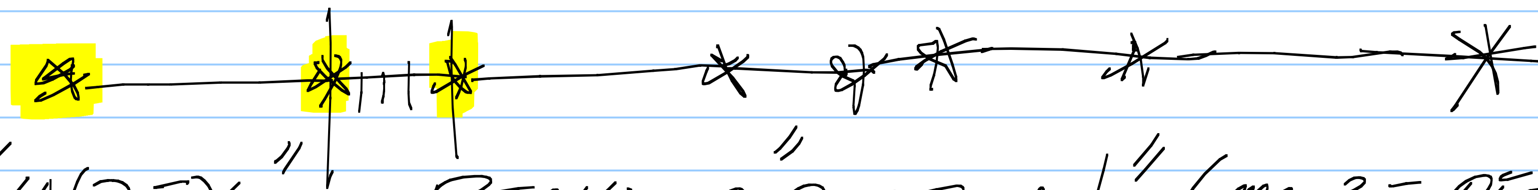
Note Title 9/21/2009

EXAM 1 IS WEDNESDAY 9-23 IN B108 WH
(CHANGED FROM 9-22 IN RECITATIONS)

* APPROX 22 MULTIPLE CHOICE
* DEDICATED CALCULATORS OK - NO <u>PHONES</u>.
* EXPECT YOU WILL HAVE ABOUT 60-65 MINUTES.
* SHOW ANY FORMULA YOU USE - e.g. σ, PERCENTILES.
* GIVE SOME BRIEF INDICATION OF YOUR METHOD.
* EXAM IS ASSIGNED SEATING CONSULT CHARTS TODAY (END OF CLASS) OR TOMORROW.

PERCENTILE BY METHOD OUTLINED IN RECITATION.

FIRST ORDER DATA $\qquad n = 8$



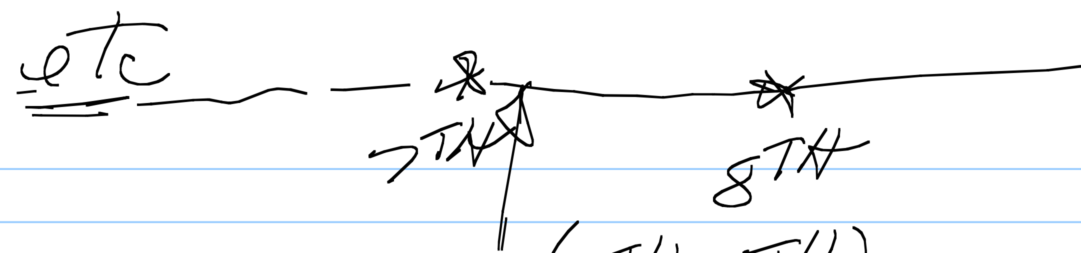
"INDEX" REALLY A "POSITION" (MAYBE DECIMAL) IN THE LIST.

INDEX OF LOWER QUARTILE (25%)

$$(n+1)\,.25 = (8+1)(.25) = \underline{\underline{2.25}}$$

IN GENERAL p^{TH} PERCENTILE eg $p = .8$ (80% OF WAY THRU DATA)

$$(8+1)\,.8 = 7.2$$



7^{TH} # ON LIST + .2 OF GAP (8^{TH} − 7^{TH})

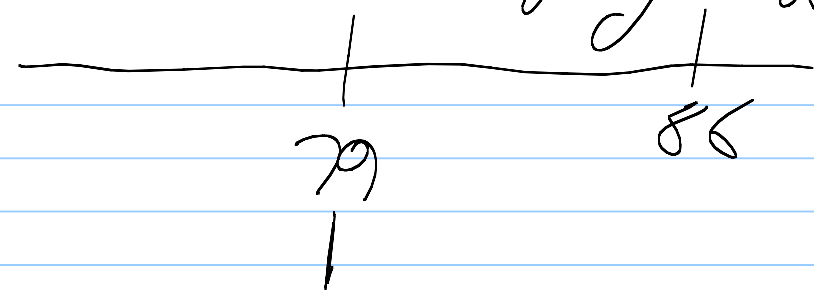
p^{TH} PERCENTILE INDEX = $(n+1)\,p$ ← DECIMAL BETWEEN ZERO + ONE

eg HAVE LIST + THIS WORKS OUT TO 10.7

+ FOR THIS LIST LET'S SUPPOSE 10^{TH} ON LIST IS 79 (SAY)

+ THE 11^{TH} IS 86 (SAY) $79 + (.7)(86 - 79)$

.7 of way between

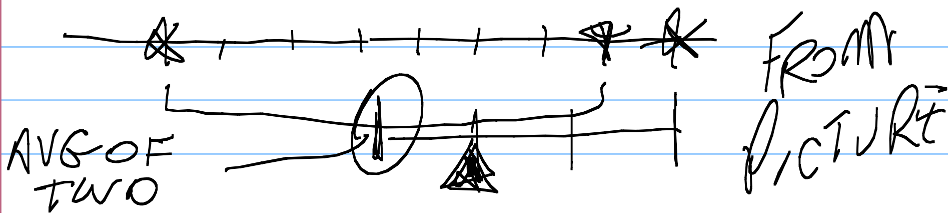


SAMPLE STANDARD DEVIATION $\sigma = \sqrt{\left((x_1-\bar{x})^2 + \cdots + (x_n-\bar{x})^2\right)/(n-1)}$

σ IS A MEASURE OF SPREAD.

GIVEN A LIST 0 7 8 $\bar{x} = 15/3 = 5$

from #2



WHAT ABOUT s? $(0-5)^2=25$ $(7-5)^2=4$ $(8-5)^2=9$

$\{0, 7, 8\}$ LIST OF #s. $\bar{x}=5$

SURE USE CALCULATOR (REMEMBER s NOT σ)

<u>OR</u> PICK OUT CORRECT ANS.

a) $\cancel{\sqrt{\frac{25+4+9}{3}}}$ USING n

c) $\sqrt{\frac{25+4+9}{2}}$ ok

PROPERTIES OF $\bar{X}$

$y = 7x - 2$

MANIPULATION OF A LIST -

$$\bar{y} = \sum y_i/n = \frac{\sum(7x_i - 2)}{n}$$

$$= 7\frac{\sum x_i}{n} - 2\frac{n}{n} = 7\bar{x} - 2$$

ARITH RULES

$$\overline{ax+b} = a\bar{x} + b$$

a, b CONSTANTS
x A LIST
$\bar{x}$ = AVG OF LIST x

WHAT ABOUT σ?

$$y = 7x - 2$$

OLD # $x_i - \bar{x}$

$$(x_i - 2) - (\bar{x} - 2)$$

$$\sigma_y = \sqrt{\sum_i (y_i - \bar{y})^2 / (n-1)}$$

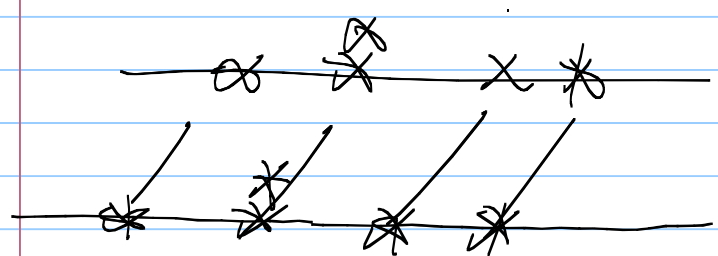
$$= \sqrt{\sum_i \underbrace{\left((7x_i - \cancel{2}) - (7\bar{x} - \cancel{2})\right)^2}_{49(x_i - \bar{x})^2} / (n-1)}$$

$|7|$

RULE: $\sigma_{ax+\cancel{b}} = |a| \sigma_x$

DOES

THE ~~THE~~ STD DEVIATION OF A LIST SHIFTED BY CONST "b" REMAINS SAME



$b<0$

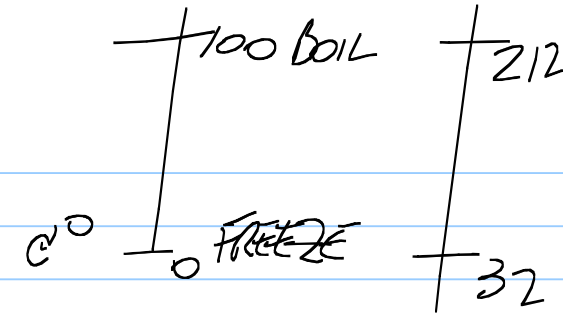
$F^\circ = \frac{9}{5} C^\circ + 32^\circ F$

SAY A LIST OF TEMPS AT AIRPORT HAS $\overline{C^\circ} = 39$

$\Rightarrow \overline{F^\circ} = \frac{9}{5}(39) + 32$

$\sigma_{C^\circ} = 14$ (SAY)

AND $s_{F^\circ} = \left|9/5\right| 14 = (9/5)(14)$.



NOT ON EXAM 1

RECALL OUR CLASSROOM EXERCISE

$\bar{\bar{x}}$	s	n	HIT?
→ 3	2.82	9	NO
3.71	3.25	7	YES
6.33	3.81	9	NO
5.09	3.33	11	YES
4.1	3.1	9	YES.
4.29	3.18	7	YES.
4.33	3.5	6	YES

$5/8 = 62.5\%$

0 1 2 . 9
AVG IS 4.5
Pop^n σ (n DIVISOR)
IS 2.87

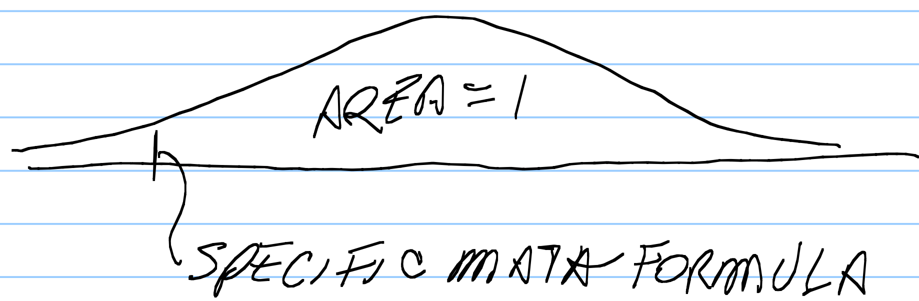
3.5 2.7 6 NO

METHOD? $\bar{x} \pm 1.0 \frac{\sigma}{\sqrt{n}}$ THIS HAS ≈ 68% CHANCE OF ENCLOSING POPULATION MEAN 4.5

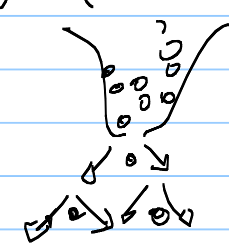
AS $n \to \infty$:

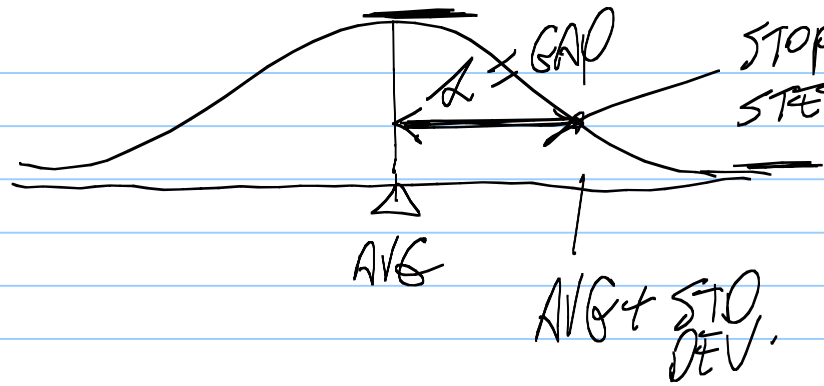
OTHERS $\bar{x} \pm 1.96 \frac{\sigma}{\sqrt{n}}$ ≈ 95%

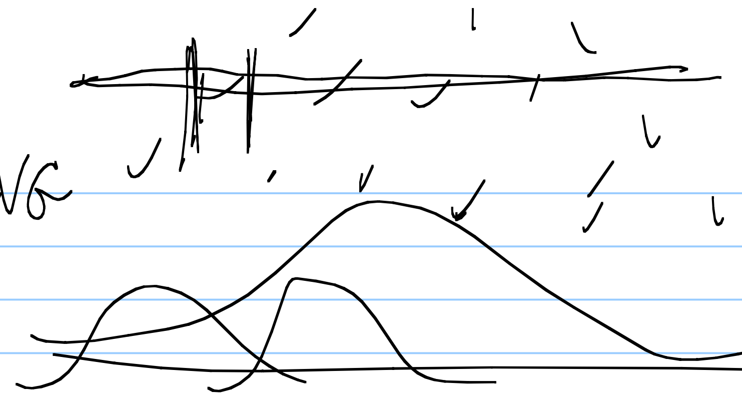
ON EXAM 1 BELL CURVE

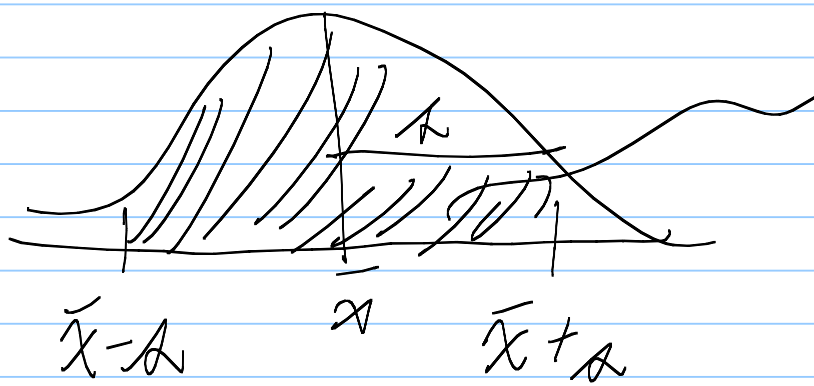


NORMAL DISTRIBUTION ("BELL CURVE")

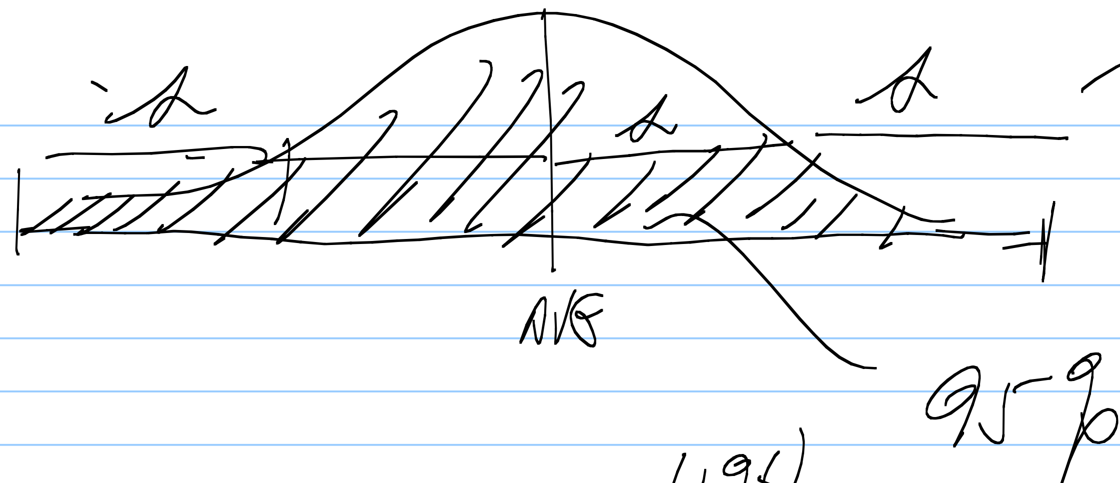








68% AREA IS WITHIN
ONE σ UNIT EITHER
SIDE OF THE MEAN



MORE ACCURATELY
$\bar{x} \pm 1.96\,\sigma$

ON EVERY BELL CURVE.

NORMAL !!

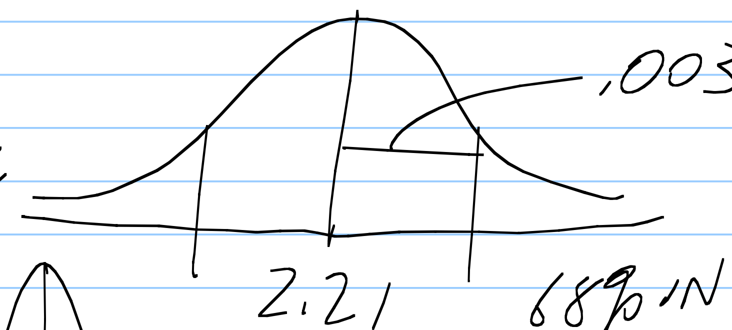
NOTE:

$\bar{x} \pm 2\,\sigma$ (1.96) CAPTURES $\approx$ 95% OF POPULATION

$\bar{x} \pm 2\,\frac{\sigma}{\sqrt{n}}$ HAS AROUND 95% CHANCE OF COVERING POPULATION MEAN IN RANDOM SAMPLES FOR n LARGE

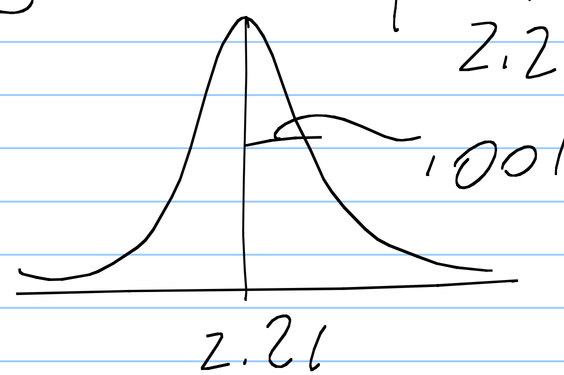
eg IF SHAFT DIAMETERS ARE $\approx$ NORMAL
WITH MEAN 2.21 AND SD σ OF .003

QUALITY ASSURANCE PROGRAM $\rightsquigarrow$ LEADS TO $\approx$



68% IN $2.21 \pm .003$

OVER TIME $\approx$



68% IN $2.21 \pm .001$

α SAMPLE STD DEV $= \sqrt{\dfrac{\sum_{i} (x_i - \bar{x})^2}{(n-1)}}$

α for list $\{0, 4, 2\}$ $\bar{x} = 6/3 = 2$

$$\sqrt{\frac{(0-2)^2 + (4-2)^2 + (2-2)^2}{3-1}} = \sqrt{\frac{8}{2}} = \sqrt{4} = 2$$

$\alpha = 2$ $\alpha = 2$

0 2 4