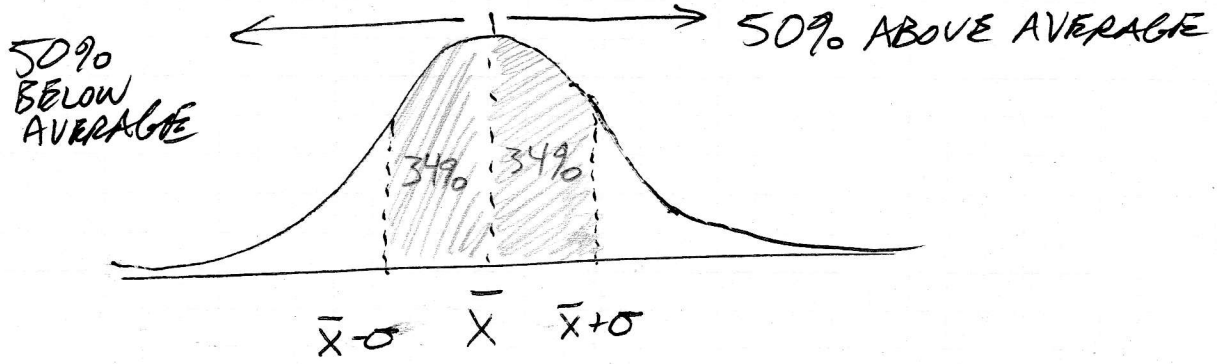
4-5

THE NORMAL CURVE AND AREA UNDERNEATH IT



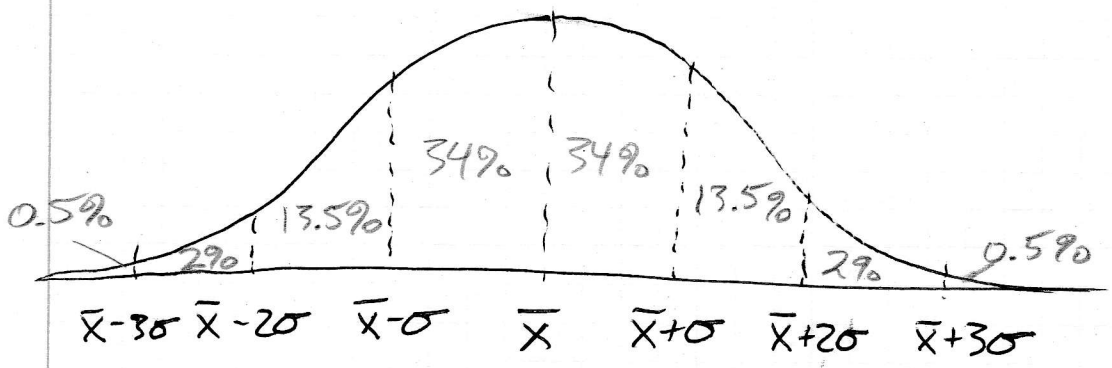
34% OF POPULATION HAS A VALUE OF x BETWEEN $\bar{x}$ AND $\bar{x}+\sigma$

WHAT % IS BETWEEN $\bar{x}-\sigma$ AND $\bar{x}+\sigma$

$34\% + 34\% = 68\%$

WHAT % HAS AN x ABOVE $\bar{x}+\sigma$? $50\% - 34\% = 16\%$

OR $0.5 - 0.34 = 0.16$



I CAN ANSWER QUESTIONS LIKE:

- WHAT % IS BETWEEN ___ AND ___?
- WHAT % IS ABOVE ___?
- WHAT % IS BELOW ___?

YOU ADD THE PERCENTAGES ASKED FOR.

TRUE FOR ALL NORMAL DATA: ~2/3

WHAT % IS BETWEEN $\bar{x}-\sigma$ AND $\bar{x}+\sigma$? 68%

" " " " $\bar{x}-2\sigma$ AND $\bar{x}+2\sigma$? 95%

13.5 + 13.5 + 34 + 34 = 95%

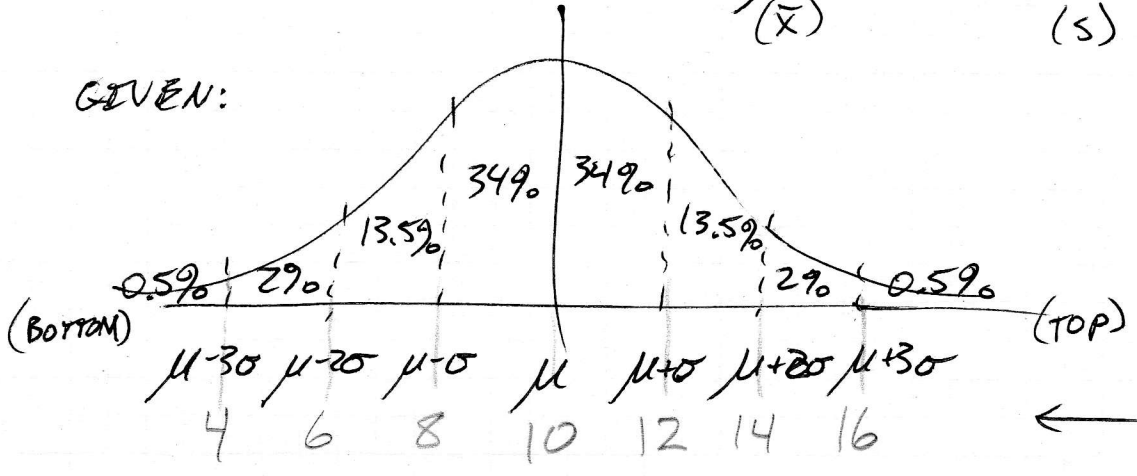
OR 100% − 2.5 − 2.5 = 95%

WHAT % BETWEEN $\bar{x}-3\sigma$ AND $\bar{x}+3\sigma$? 99%

NUMERICAL EXAMPLE: YOU HAVE NORMAL DATA

WITH $\mu = 10$ AND $\sigma = 2$
($\bar{x}$) (s)

GIVEN:



← YOU'LL LABEL

WHAT % IS BETWEEN 8 AND 12? 68% OR 0.68 OUT OF 1

" " " 6 AND 16? 97%

WHAT % IS ABOVE 12? 16% (13.5+2+.5)

WHAT % IS BELOW 12? 50% + 34% = 84%

OR 100% − 16% = 84%

WHAT IS THE CHANCE (OR PROBABILITY) THAT X IS BETWEEN 12 AND 16?

0.135 + 0.02 = 0.16 OF 1

WHAT PERCENTILE IS A VALUE OF $x = 14$?

↑ WHAT PERCENT IS BELOW? 97.5th PERCENTILE

PERCENTILE OF $x = 10$? 50th PERCENTILE

WHAT VALUE OF x PUTS US IN THE TOP 16% ?

(ADD %s FROM RIGHT UNTIL YOU GET 16%)

($x = 12$ HAS 16% ABOVE IT) $x = 12$ OR MORE

WHAT VALUE (OR BELOW) OF x PUTS US IN THE BOTTOM 16%? $x = 8$ OR LESS

WHAT VALUE OF x PUTS US IN THE BOTTOM 84% ?

$x = 12$ OR LESS

WHAT VALUE TO BE IN THE 2.5th PERCENTILE ?

$x = 6$

SO FAR, I'M LIMITED TO THE LINES AT

$\mu \pm 0, \mu \pm 1\sigma, \mu \pm 2\sigma, \mu \pm 3\sigma$

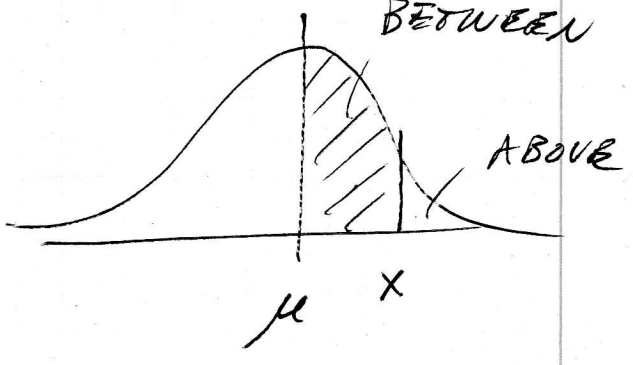
I'D LIKE MORE FIDELITY, SO I COULD CALCULATE %s FOR MORE LINES:

$\mu, \mu \pm 0.001\sigma, \mu \pm 0.002\sigma, \ldots$

- GRAPHING WOULD BE IMPLAUSIBLE, SO MOVE TO A TABLE FORM
- CAN USE SYMMETRY AND CALCULATE JUST FOR VALUES ABOVE μ

$\mu, \mu + 0.001\sigma, \mu + 0.002\sigma, \ldots$

FOR OUR EFFORTS SO FAR,



X
10
12
14
16

34%
13.5%
2%
0.5

X	BETWEEN μ AND X	ABOVE X
10		
12		
14		
16		

LET'S PICK A SINGLE μ AND σ,
FORM A TABLE, THEN

CONVERT ~~ACT~~ ACTUAL DATA WITH $\bar{X}$ AND s
INTO μ, σ STANDARD.

STANDARD NORMAL CURVE

$\mu = 0$

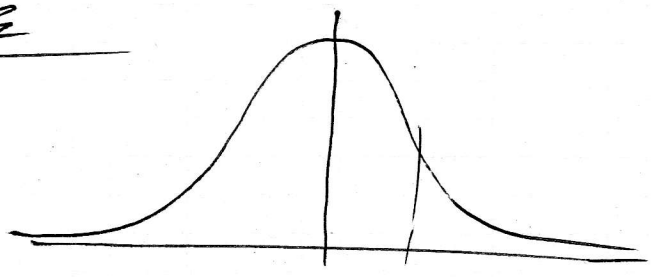
$\sigma = 1$

DATA VARIABLE IS

Z

TABLE FORM FOR DATA IS

Z-TABLE



$\mu=0$ $\sigma=1$