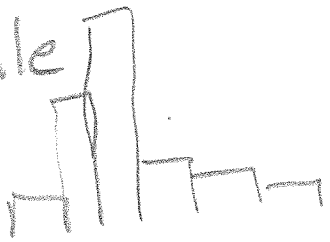
§6.5 Does Sample Come from a Normal Population

In §7.2 we'll start Inferential Statistics
→ Applying CLT so we Need the distribution of Sample Mean is Normal

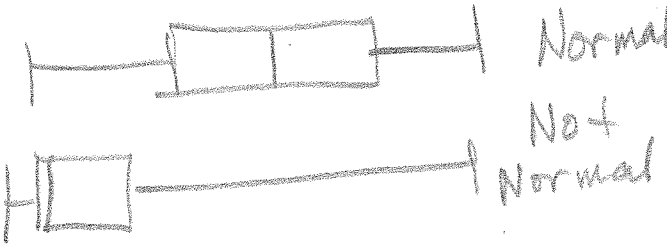
Two ways
1. $n > 30$
2. If Original Population is Normal

It is Good enough if Sample looks close to Normal.

1. Histogram
   - One peak - unimodle
   - Symmetric
   - Start & End Low

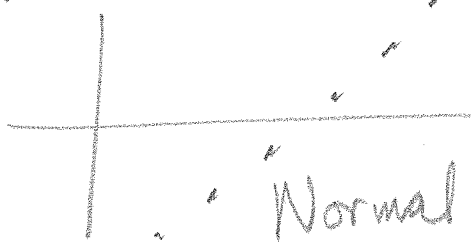


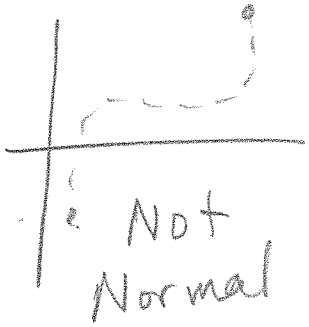
2. Box Plot Symmetric



3. QQ Plot or Normal Plot

(x, y)
(x-value, z-Score of its %tile)





Lecture 6.5 Math 15 Jones Name_____

Goal: Determine if a sample comes from a normal distribution.

1) If selecting samples of size $n \leq 30$ from a population, what requirement, if any, must be satisfied in order to assume that the distribution of the sample means has a normal distribution?

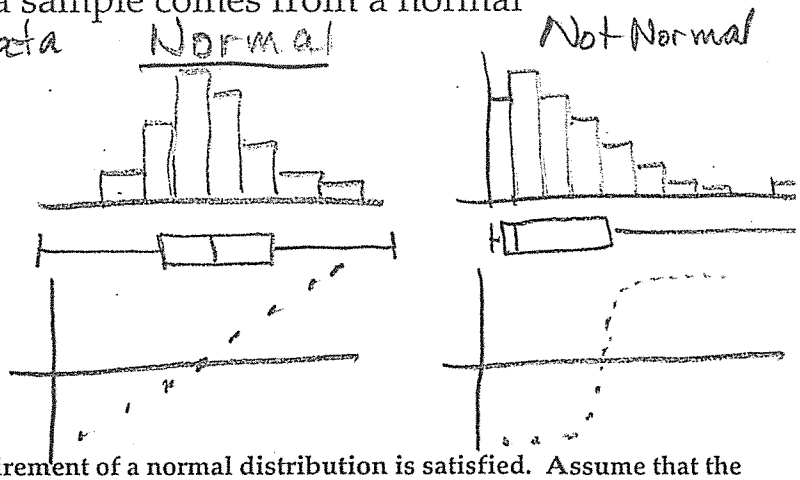
The original population must be Normal.
If $n < 30$, Salaries are Not Normal, then CLT does Not work

2) What are the ways to determine if a sample comes from a normal population. Given a set of Data

Histogram → Start & End Low
One Max Middle
Symmetric

Box Plot → Symmetric

QQ Plot → Line

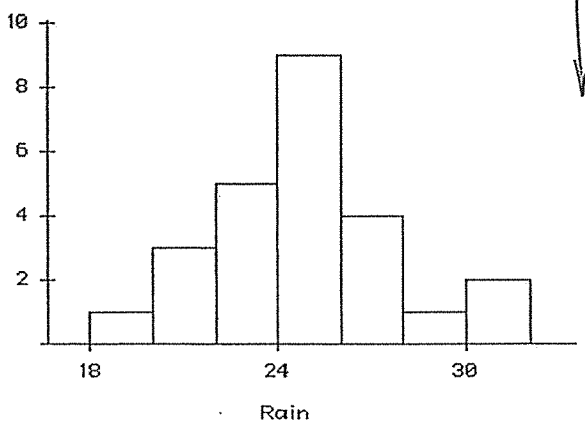


Examine the given data set and determine whether the requirement of a normal distribution is satisfied. Assume that the requirement for a normal distribution is loose in the sense that the population distribution need not be exactly normal, but it must have a distribution which is basically symmetric with only one mode. Explain why you do or do not think that the requirement is satisfied.

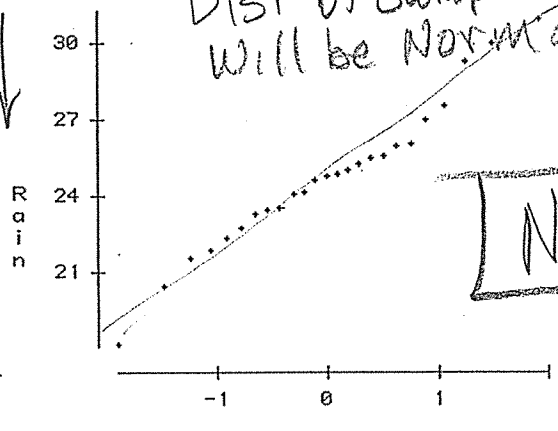
3) The amount of rainfall (in inches) in 25 consecutive years in a certain city.

20.4	25.1	22.8	27.0	23.5
24.2	26.0	25.6	23.3	24.1
21.9	27.6	24.7	25.3	21.6
31.0	23.6	26.1	25.5	24.8
18.1	22.4	24.9	30.0	29.3

Close to Normal
OK to use CLT
Dist of Sample Means
Will be Normal



Data



Normal

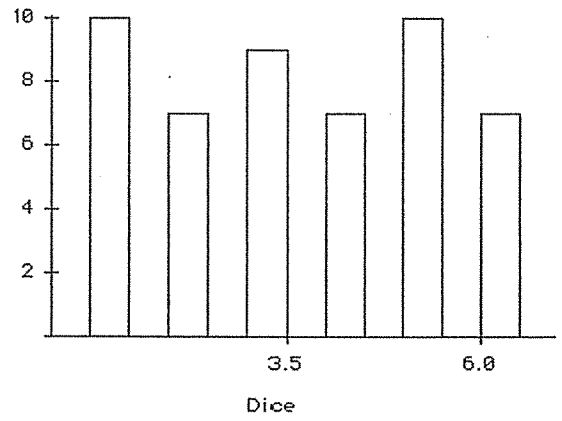
Z-Scores = x-Values
% percentiles of Data

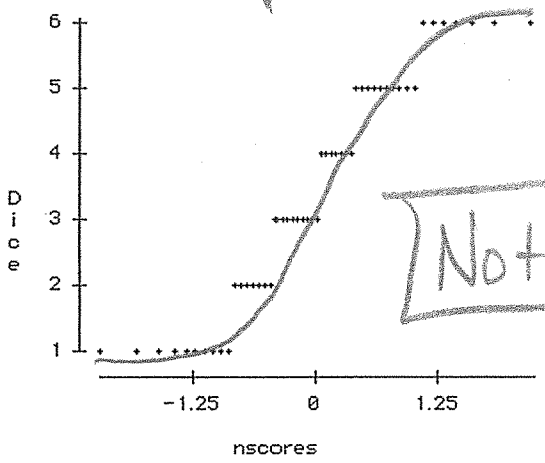
4) The numbers obtained on 50 rolls of a die.

1	5	5	3	6	4	5	6	3	4
2	5	3	5	4	2	1	4	3	1
6	1	2	6	1	2	5	3	3	4
4	1	3	1	6	2	2	5	5	3
3	5	1	6	2	1	1	4	6	5

Uniform

Pattern that is not a straight line



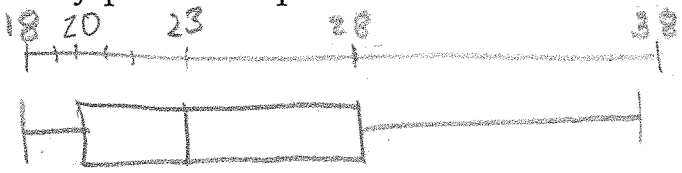


Not Normal

5) The ages of 30 students selected randomly from one college are as follows. Graph a histogram and a normal probability plot to help determine if this data comes from a normal population.

21	23	20	24	20
19	20	19	22	32
20	24	26	21	37
23	18	34	25	30
22	24	23	19	28
20	29	21	35	25
20	21	28	22	32

① Box Plot



Min = 18

$Q_1 = 20$

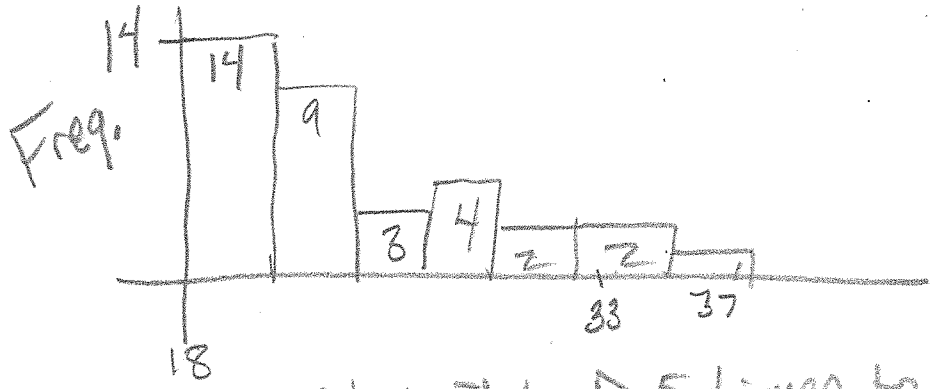
Med = 23

$Q_3 = 28$

Max = 37

② Histogram Stat Plot

Zoom 9: ZoomStat



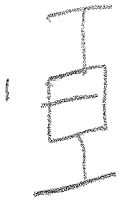
③ QQ Plot Stat Plot ▷ 5 times to last graph

Zoom 9: ZoomStat

Not Normal

- Write a Sentence about Each of the Stat crunch Graphs,

Histogram starts & Ends low, has one Max and is Symmetric



Box plot is Symmetric

the QQPlot is a straight line

So Data comes from a Normal Population.

- Print or Sketch each graph

#12a) $P(X < 22) = ncdf(LB, UB, \mu, \sigma)$

$= ncdf(-9999, 22, 18.2, 1)$

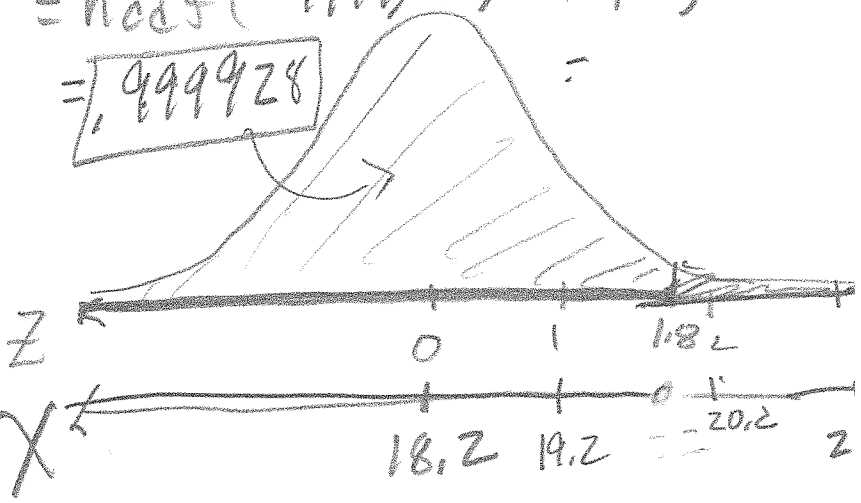
$= .999928$

$\mu = 18.2$

$\sigma = 1$

$Z = \frac{X - \mu}{\sigma} = \frac{22 - 18.2}{1}$

$Z = 3.8$



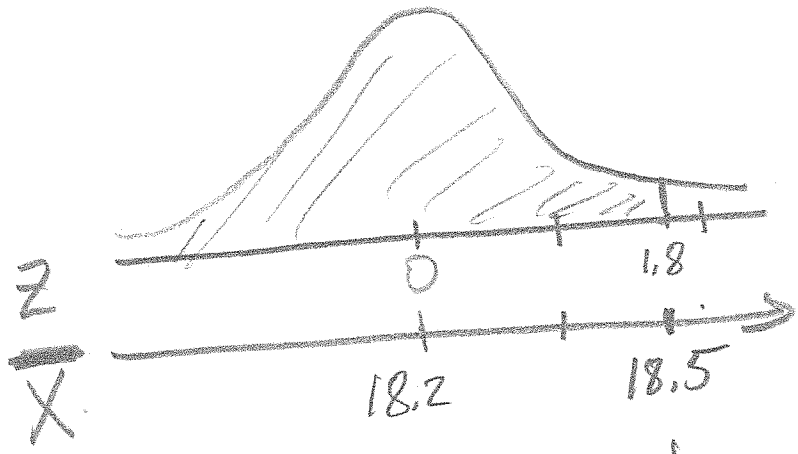
b) $P(\bar{x} < 18.5)$

$\mu = 18.2 \quad n = 36$

$\sigma_{\bar{x}} = \frac{1}{\sqrt{36}} = \frac{1}{6} = \frac{\sigma}{\sqrt{n}}$

$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{(18.5 - 18.2)}{(1/6)}$

$Z = 1.8$



$P(\bar{x} < 1.8) = ncdf(-9999, 18.5, 18.2, \frac{1}{\sqrt{36}})$

$= .9641$

No, Individual Men Need to fit.
If ~~the~~ diameter is 18.5, then
% of men who fit is only .6179.

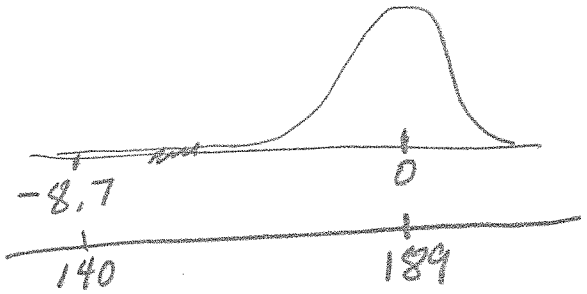
#18 a) $P(\bar{x} > 140)$

$n = 50$ $\mu = 189$ $\sigma = 39$

$= ncdf(140, \infty, 189, 39)$

$= 1$

$z = \frac{140 - 189}{39/\sqrt{50}} = -8.7$



b) $P(\bar{x} > 174)$

$n = 14$ $\mu = 189$ $\sigma = 39$

$= ncdf(174, \infty, 189, 39/\sqrt{14})$

$= .9249$

$= .9251$

$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{174 - 189}{39/\sqrt{14}}$

$z =$