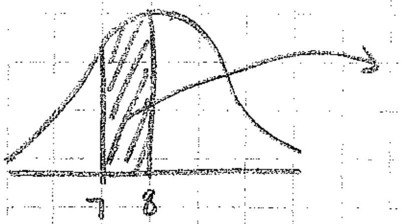
Chapter 2: The Normal Distributions
2.1 Density Curves and The Normal Distribution – Day 1
Obj: You will describe a single quant. variable by using a smooth curve.

Discuss Example 2.1 – pg. 78/79

Density Curve: Always on or above the horizontal Axis.
: Area underneath = 1



$K = .22$ 22% of obs. are between 7 + 8.

The median and mean of a Density Curve

Median – Equal Areas Point
– Q_1: 1/4 Area to the left (3/4 to the right)
– Q_3: 3/4 Area to the left (1/4 to the right)

Mean – Balance point of the curve if it were solid – See pg. 82.
– Think of weights: 80, 100, 210
$M = 100$
$\mu = 130$

Idealized Distribution (Pop. Density)
μ = Mean of a Density curve
σ = St. Dev of a Density Curve

Sample Dist.
$\bar{x}$ = Mean of a sample Dist.
S = St Dev " " "

2.2

HW: 2.3, 2.4 (Tomorrow to Pg 88)

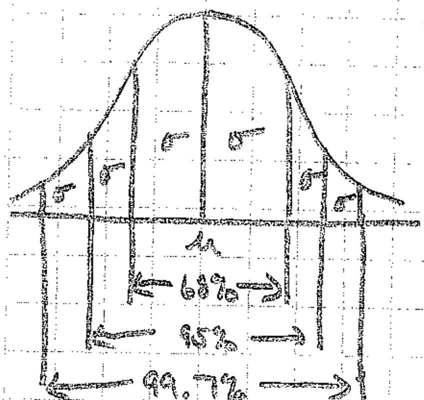
2.1 Density curves + The Normal Distributions — Day 2

Obj: - You will solve Alg II and harder St. Dev. problems w/ your calculator.

__Normal Distributions__ - Density curves that are symmetric, single peaked, and Bell-shaped (See Table A)

σ controls the spread of the curve.

Locate σ by eye (use the inflection pts)



Normal Dist. w/ mean μ + St. Dev σ.

Notation: $N(\mu, \sigma)$

The notation for the normal dist. of women's heights w/ $\mu = 64.5$" and $\sigma = 2.5$" is written: $N(64.5, 2.5)$

__Percentiles__ - Equal to or lower than the obs.
- Seeing where an individual stands relative to others in the dist.

normal cdf (min, max, μ, σ) → 2.8 Pg 89 (Show Alg II method. Also)
invNorm (Area (L→R), μ, σ)

2.7

2.9

__HW:__ 2.12, 2.14, 2.15 (Quiz tomorrow)

2.2 Standard Normal Calculations - Day 1

OBS: You will standardize an obs. X.

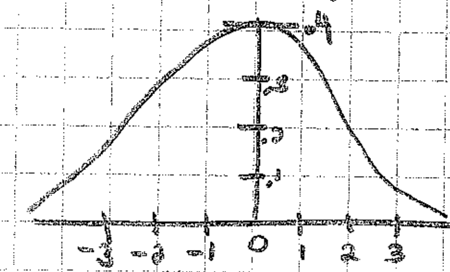
Z-score: How many std. Dev the original obs. is above (+) or below (-) the mean.

Formula: $Z = \frac{x-\mu}{\sigma}$ (Standardized Value)

Example 2.4 (Pg 94)

Standardizing makes All normal dist. into a single dist., + this dist. is still normal.

Standard Normal Distribution: $N(0,1)$



Using Table A:

Find the Prop. of obs. from the std. normal Dist. That are:

1) Less than 1.4 $= .9192$
2) Greater than -2.15 $= 1 - .0158 = .9842$ (or look up 2.15)
3) Between -1.66 and 2.85 $= .9978 - .0485 = .9493$

Example 2.8 (Pg 99) - Read Question, put import. info on board, close book.

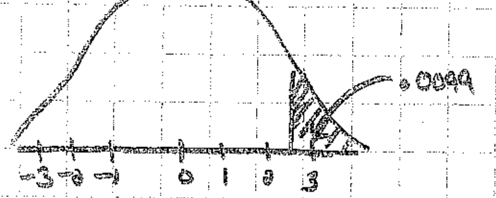
X = Chol Level

$X > 240$, $\mu = 170$, $\sigma = 30$

$P(Z > \frac{x-\mu}{\sigma})$

$P(Z > \frac{240-170}{30})$

$P(Z > 2.33)$



Probability = Area = .0099 ≈ 1%

∴ only 1% of boys have high chol. * Conclusions based on the context of the problem.

If $Z < -3.49$, $A = 0$ If $Z > -3.49$, $A = 1$

If $Z > 3.49$, $A = 0$ If $Z < 3.49$, $A = 1$

⟹

If $X > 240$, the area is the same if $X \geq 240$.
The area under the curve @ $X = 240$ is 0 b/c the width of a point is zero.
But, There maybe a boy w/ a chol. level of 240.

2.33

$\mu = 69$
$\sigma = 2.5$
X = Height
$X > 72$

a) $P\left(Z > \frac{x-\mu}{\sigma}\right)$

$P\left(Z > \frac{72-69}{2.5}\right)$

$P(Z > 1.2)$

Prob = Area = .1151 $\approx$ $\boxed{11.51\%}$

b) $60 < X < 72$

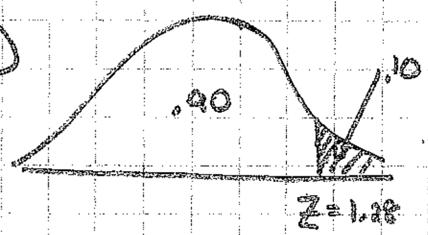
$P\left(\frac{x-\mu}{\sigma} < Z < \frac{x-\mu}{\sigma}\right)$

$P\left(\frac{60-69}{2.5} < Z < \frac{72-69}{2.5}\right)$

$P(-3.6 < Z < 1.2)$

Prob = Area = .8849 $\approx$ $\boxed{88.49\%}$

c)



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

$1.28 = \frac{x-69}{2.5}$

$\boxed{X = 72.2''}$

HW: 2.20, 2.24, 2.25 a, b

2.2 Standard Normal Calculations – Day 2

Do 2.19 if problems w/ 2.20

In a Normal Dist. $\mu = M$
If $\approx$ Normal, $\mu \approx M$

Assessing Normality:
1. Construct a Histogram
2. Construct a Boxplot
3. Construct a Stemplot
4. Construct a Normal Prob. Plot

Using the ages of the Presidents construct 1, 2, + 4 above.

For a normal Prob. Plot, the Data is $\approx$ Normal if the plotted Pts are $\approx$ Linear.
Data Axis: x

<u>Class/HW</u>: 2.32, 2.45, 2.46