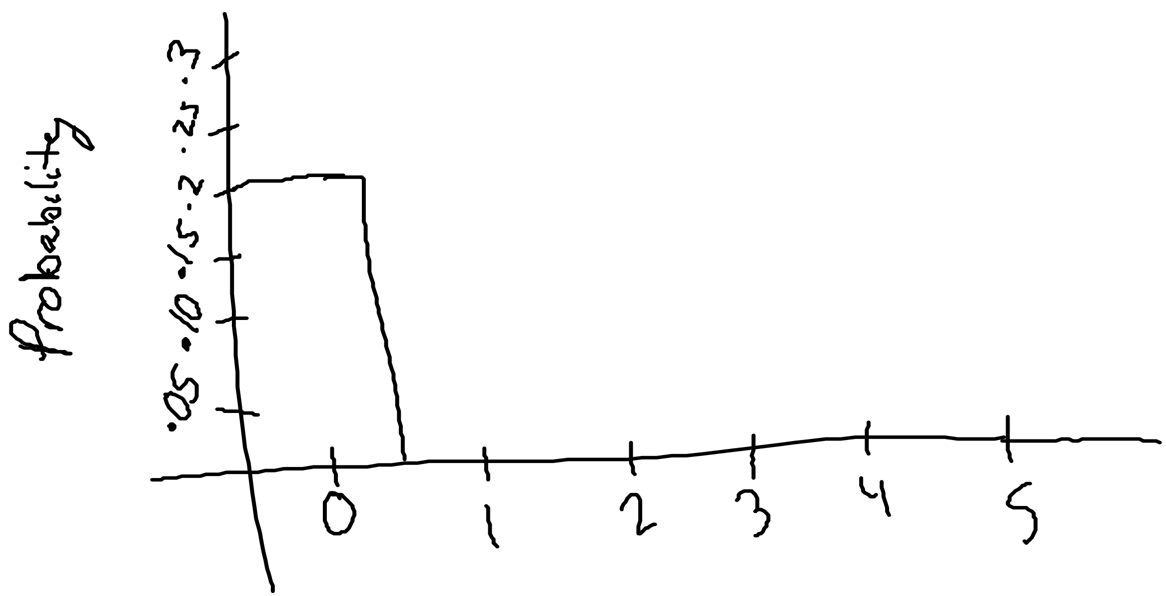
# Get out the Please Be Discrete Task and have questions ready!

April 22$^{th}$, 2014

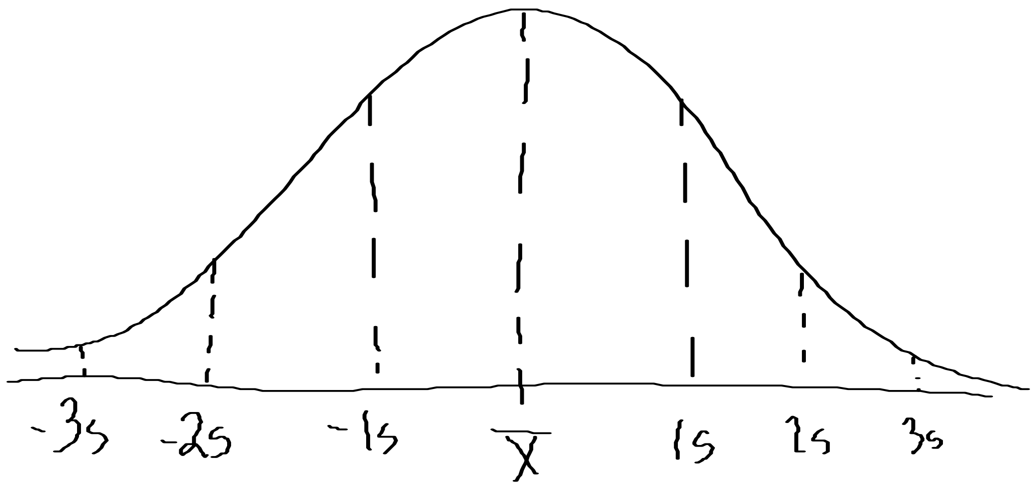
| # of species | 0 | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|---|
| # of yrs | 4 | 5 | 6 | 4 | 0 | 1 | = 20 |
| probability | .2 | .25 | .3 | .2 | 0 | .05 | |
| | 4/20 | 5/20 | | | | | |



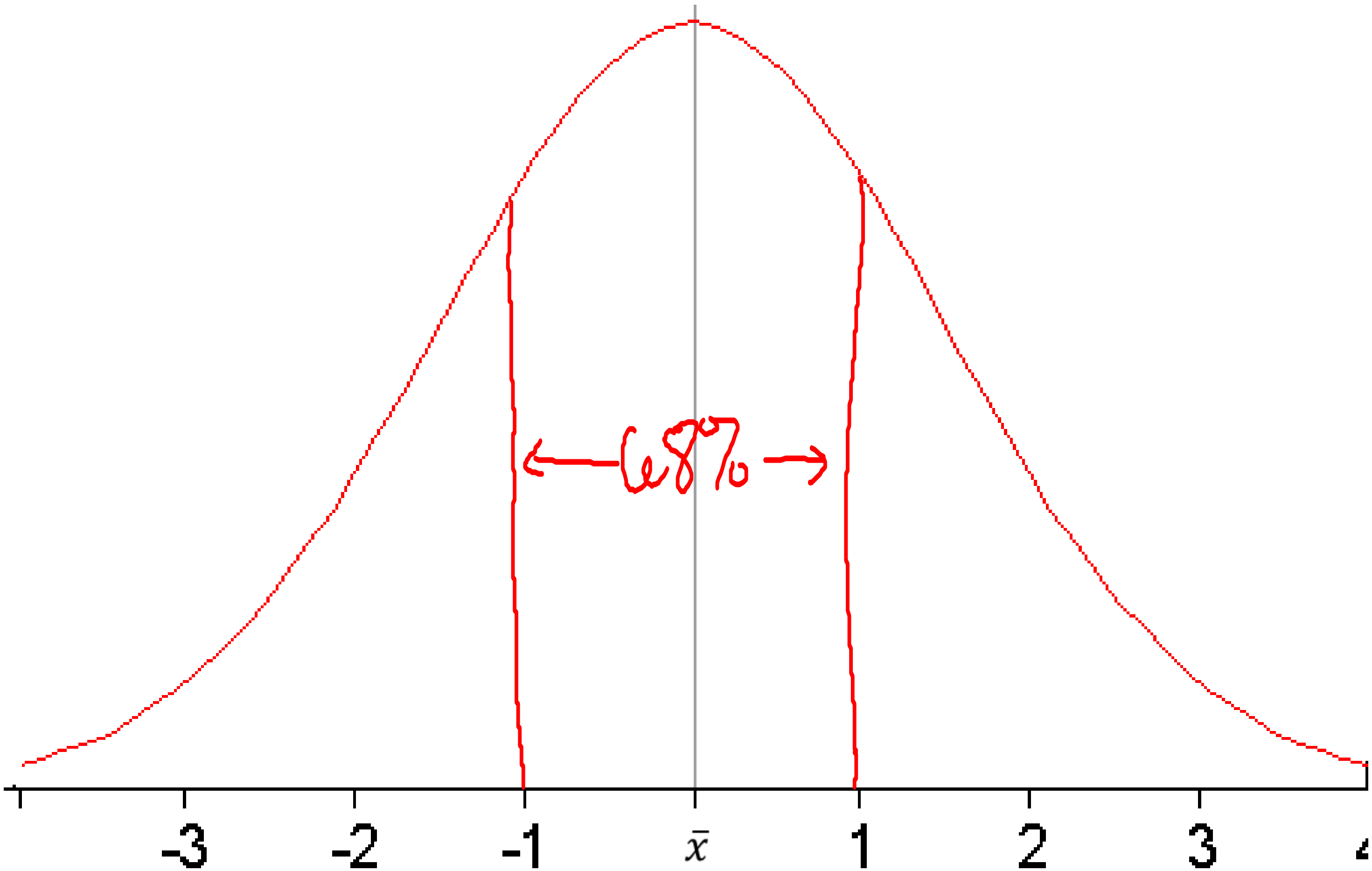
Unit 6: Data Analysis

# EMPIRICAL RULE

# What does a population that is normally distributed look like?

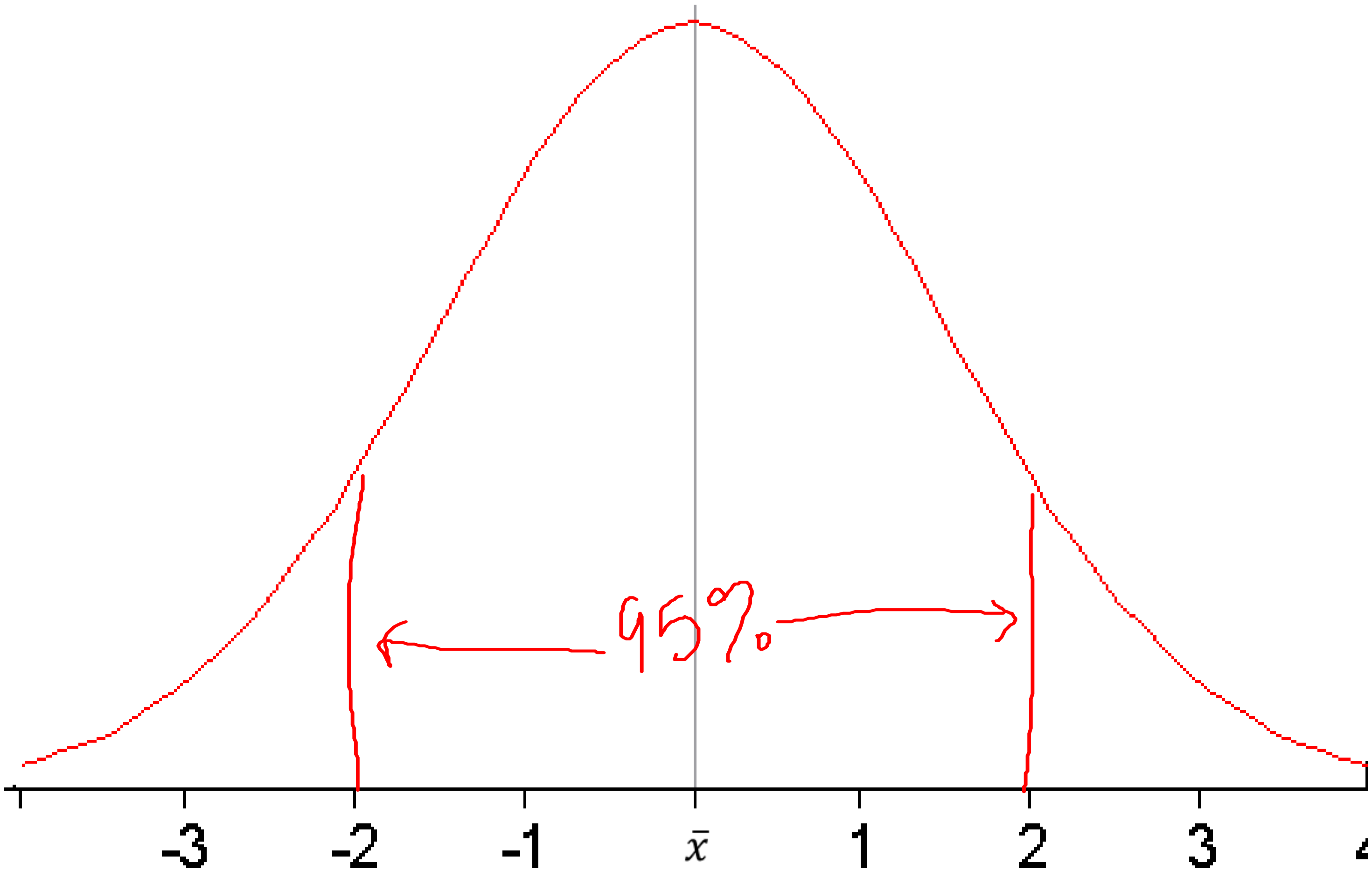


# Empirical Rule
## 1 standard deviation from the mean



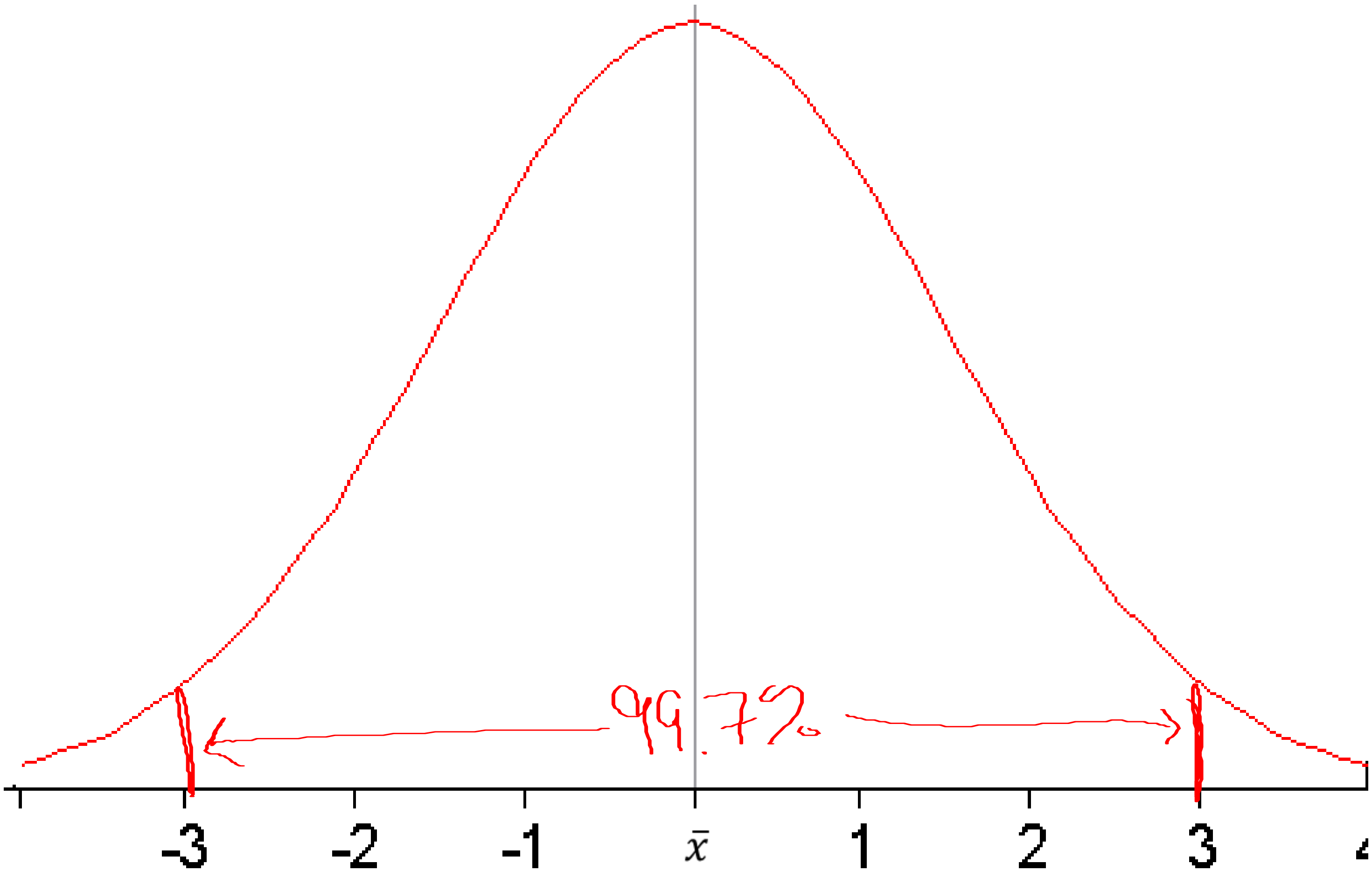

**68-95-99.7% RULE**

# Empirical Rule
## 2 standard deviation from the mean




**68-95-99.7% RULE**

# Empirical Rule
# 3 standard deviation from the mean



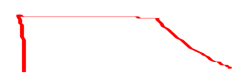

**68-95-99.7% RULE**

# **Empirical Rule**—restated

**68%** of the data values fall within **1** standard deviation of the mean in either direction

**95%** of the data values fall within **2** standard deviation of the mean in either direction

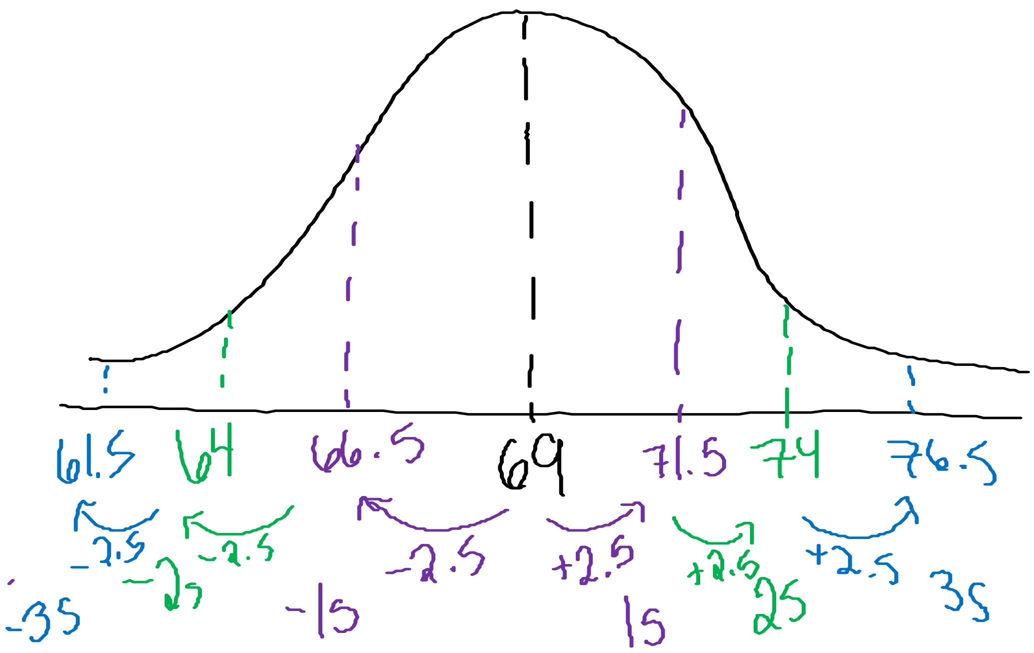
**99.7%** of the data values fall within **3** standard deviation of the mean in either direction

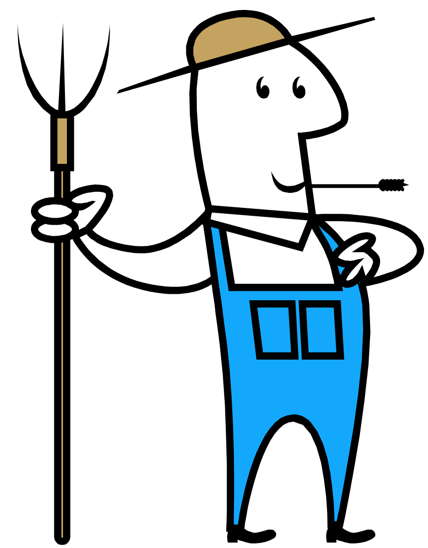


Remember values in a data set must appear to be a normal bell-shaped histogram, dotplot, or stemplot to use the Empirical Rule!

Average American adult male height is 69 inches (5’ 9”) tall with a standard deviation of 2.5 inches.

What does the normal distribution for this data look like?



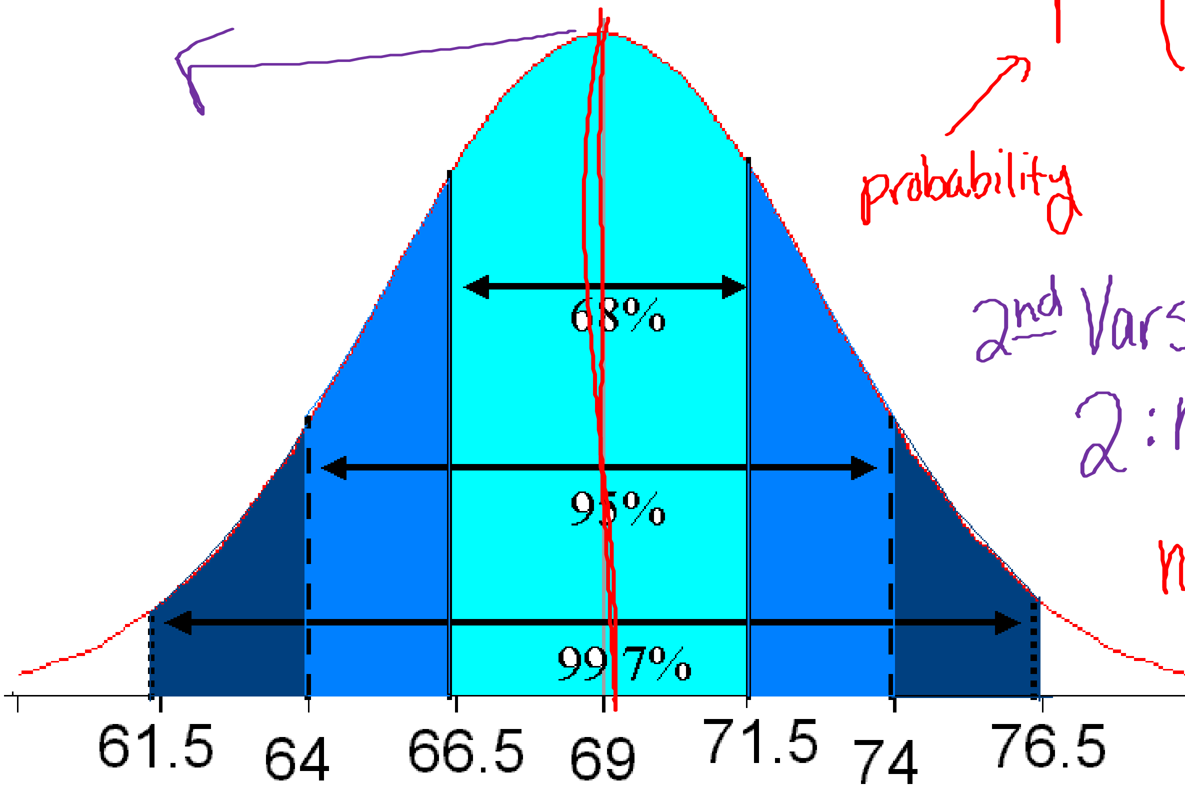
# Empirical Rule-- Let H~N(69, 2.5)

What is the likelihood (probability) that a randomly selected adult male would have a height less than 69 inches?

$P(h < 69) = .5$

probability

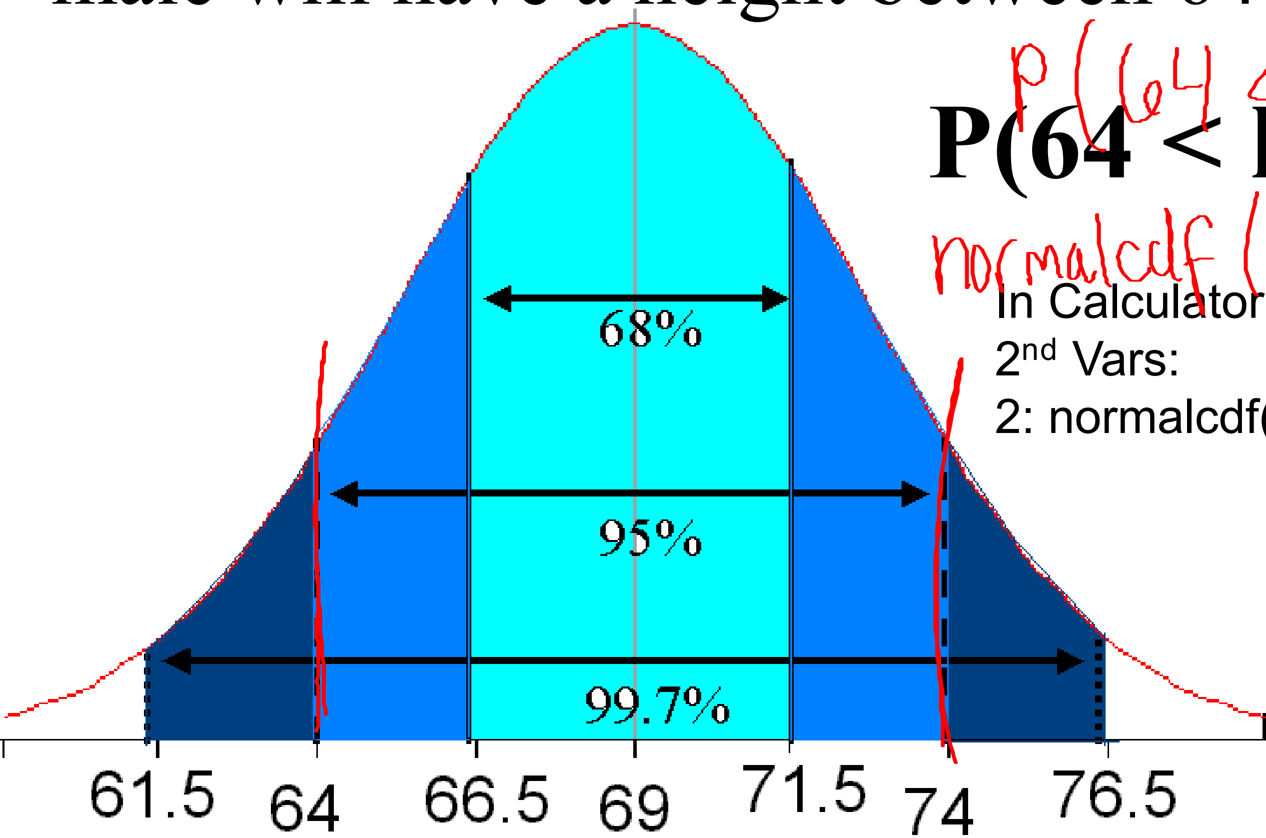
2nd Vars:
2:normalcdf(lower, upper, mean, s.d.)
ncdf(4, 69, 69, 2.5)



# Using the Empirical Rule

**Let H~N(69, 2.5)**

What is the likelihood that a randomly selected adult male will have a height between 64 and 74 inches?




P(64 < h < 74)

**P(64 < h < 74) = .95**

normalcdf(64, 74, 69, 2.5)

In Calculator:
2nd Vars:
2: normalcdf(lower, upper, mean, st. dev.)

.95

# Using Empirical Rule-- Let H~N(69, 2.5)

What is the likelihood that a randomly selected adult male would have a height of greater than 74 inches?

$P(h > 74)$

normalcdf(74, 1000, 69, 2.5)

= .0228

**= .0228**

# Using Empirical Rule--Let H~N(69, 2.5)

What is the probability that a randomly selected adult male would have a height between 64 and 76.5 inches?

normalcdf(64, 76.5, 69, 2.5)

**= .9759**

pg. 923-924 #9 a, c, d

#11 c, d

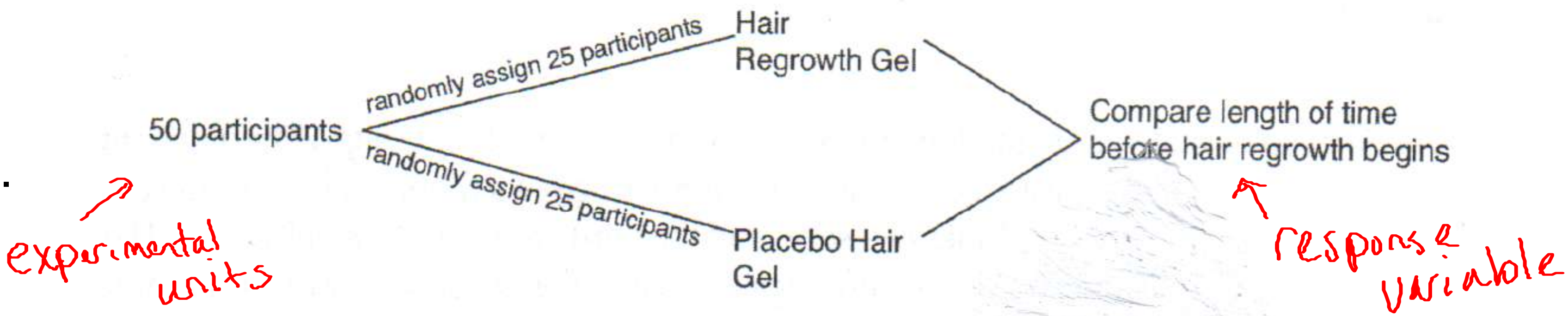
#12 b, c

#13 a, b

#14 a, b

Math 3Warm Up4/23/14

1.




a)What is the explanatory variable? different gels

b)What is the treatment? hair regrowth gel / placebo hair Gel

2.

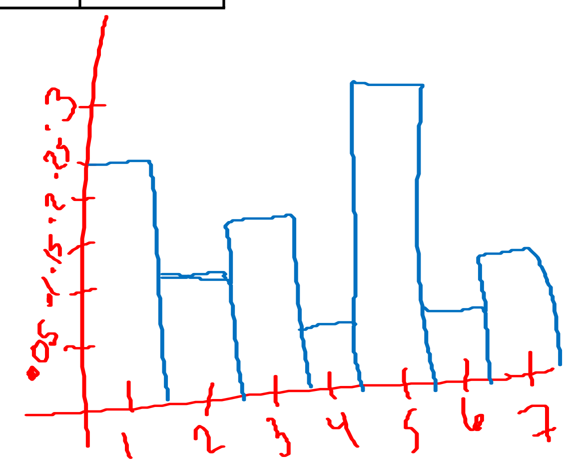
| L1 Result, x | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| L2 P(x) | 0.25 | 0.10 | 0.15 | 0.05 | 0.30 | 0.05 | 0.10 |

a)Create a probability histogram.

b)Find the probability mean and standard deviation.

$\bar{X} = 3.6$

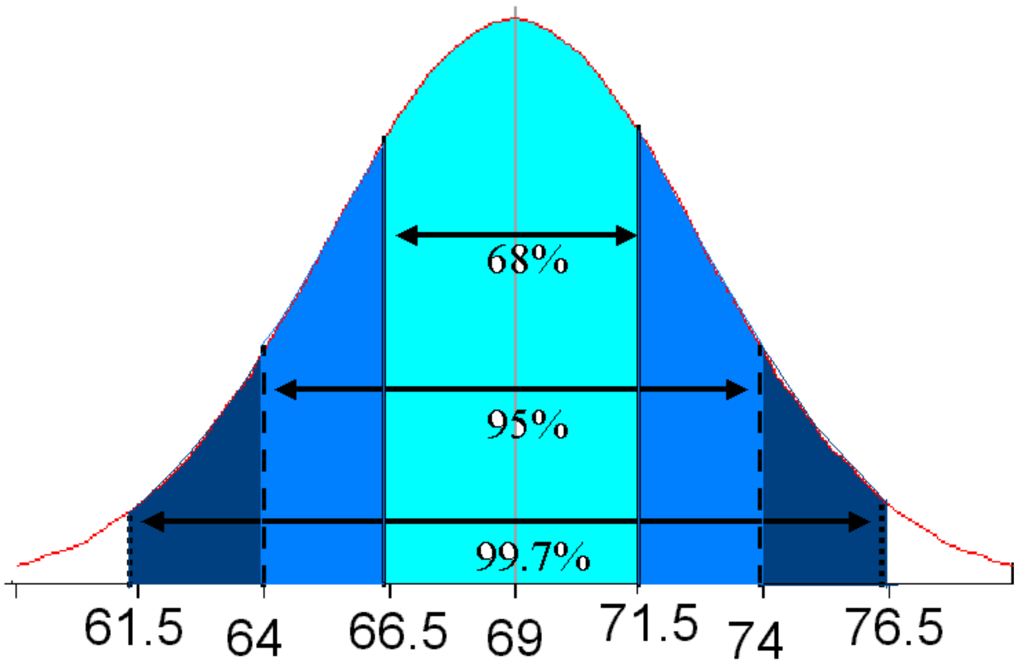
$\sigma x = 2.01$



Unit 6: Data Analysis

# Z-SCORE

# Z-Scores are measurements of how far from the center (mean) a data value falls.




***Ex:*** A man who stands 71.5 inches tall is 1 standardized standard deviation from the mean.

***Ex:*** A man who stands 64 inches tall is -2 standardized standard deviations from the mean.

# Standardized Z-Score

To get a Z-score, you need to have 3 things

1) Observed actual data value of random variable x

2) Population mean, $\mu$ also known as expected outcome/value/center

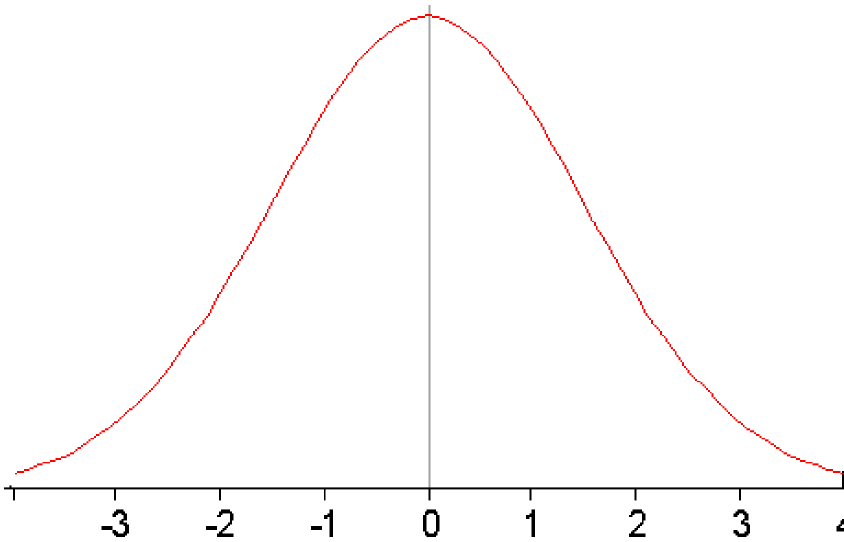
3) Population standard deviation, $\sigma$

Then follow the formula.

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

# Empirical Rule & Z-Score

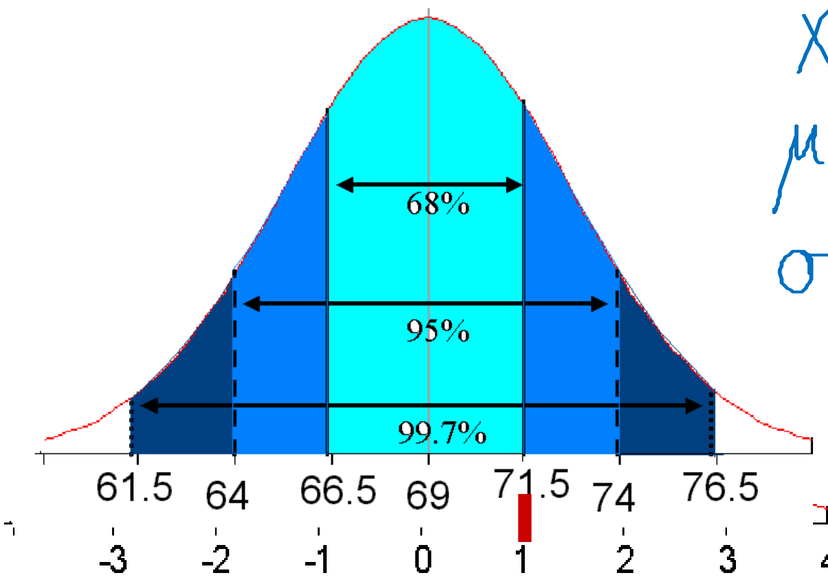
**About** 68% of data values in a normally distributed data set have z-scores between –1 and 1; approximately 95% of the values have z-scores between –2 and 2; and about 99.7% of the values have z-scores between –3 and 3.



# Z-Score & Let H ~ N(69, 2.5)

mean st-dev

What would be the standardized score for an adult male who stood 71.5 inches?




$X = 71.5$

$\mu = 69$

$\sigma = 2.5$

$$\frac{71.5 - 69}{2.5} = 1$$

$H \sim N(69, 2.5)$ $Z \sim N(0, 1)$

# Z-Score & Let H ~ N(69, 2.5)

What would be the standardized score for an adult male who stood 65.25 inches?

$$\frac{(65.25 - 69)}{2.5} = -1.5$$

# Comparing Z-Scores

Suppose Bubba's score on exam A was 65, where Exam A ~ N(50, 10) and Bubbette's score was an 88 on exam B,

where Exam B ~ N(74, 12).

Who outscored who? Use Z-score to compare.

Bubba: $\frac{65-50}{10} = 1.5$

Bubbette: $\frac{88-74}{12} = 1.17$

$1.5 > 1.17$

# Comparing Z-Scores

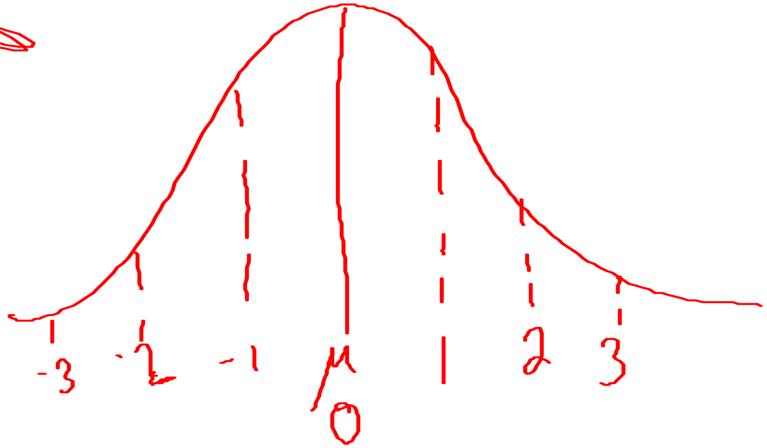
Heights for traditional college-age students in the US have means and standard deviations of approximately 70 inches and 3 inches for males and 165.1 cm and 6.35 cm for females. If a male college student were 68 inches tall and a female college student was 160 cm tall, who is relatively shorter in their respected gender groups?

Male $z = (68 - 70)/3 = -.667$

Female $z = (160 - 165.1)/6.35 = -.803$

# Questions over Yesterday's Worksheet?

# What if I want to know the PROBABILITY of a certain z-score?




Use the calculator! Normcdf!!!

$2^{nd}$ Vars

2: normcdf(

normcdf(lower, upper, mean(0), std. dev(1))

# Find P(z < 1.85)

lower bound z-score: -12

normalcdf(-12, 1.85, 0, 1) = .968

# Find P(z > 1.85)

normalcdf(1.85, 300, 0, 1)

.0321

# Find P( -.79 < z < 1.85)

(-.79, 1.85, 0, 1)

.763

# What if I know the probability that an event will happen, how do I find the corresponding z-score?

Use the z-score formula and work backwards!

Use the InvNorm command on your TI by entering in the probability value (representing the area shaded to the left of the desired z-score), then 0 (for population mean), and 1 (for population standard deviation).

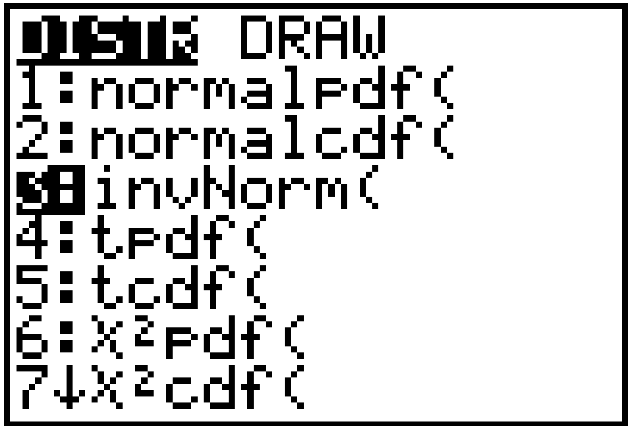
InvNorm (value, mean (0), std. dev (1))

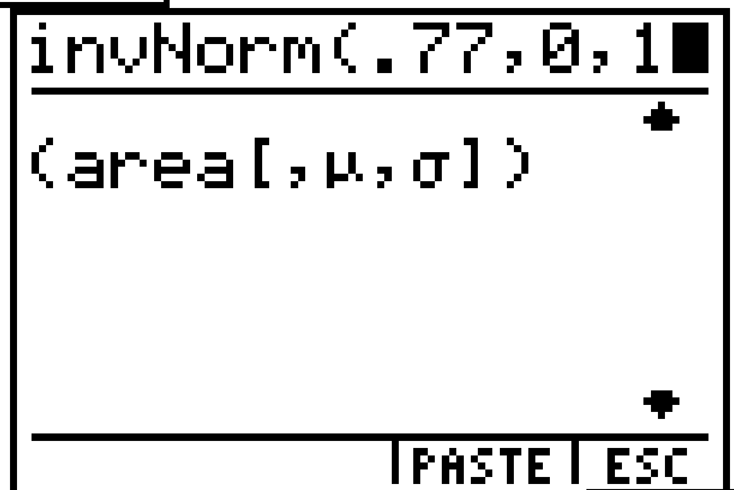
# P(Z < z*) = .8289

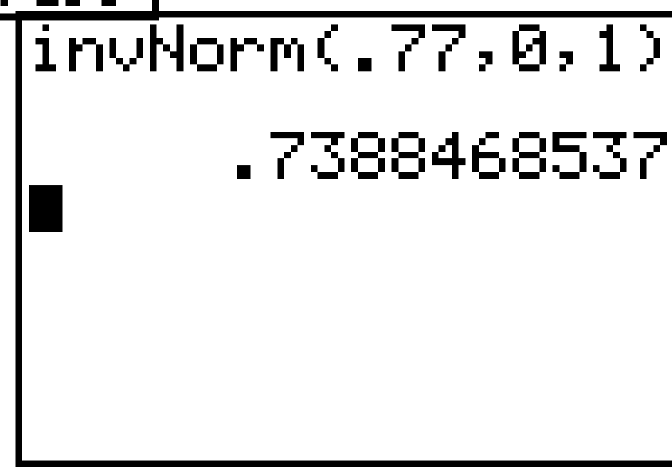
What is the value of **z***?

InvNorm(.8289, 0, 1) = .949

# Using TI-84


DISTR DRAW
1:normalpdf(
2:normalcdf(
3:invNorm(
4:tpdf(
5:tcdf(
6:χ²pdf(
7↓χ²cdf(


invNorm(.77,0,1
(area[,μ,σ])
PASTE
ESC


invNorm(.77,0,1)
.738846853

# $P(Z < x) = .80$

What is the value of **x**?

$$P(Z < z^*) = .77$$

What is the value of $\mathbf{z^*}$?

# Assignment: Statistics Test 1 Review