§5-4 The Normal Distribution

normal curve – a symmetrical curve that represents the normal distribution (also called a bell curve)

mean
median

normal distribution – data when graphed as a histogram or frequency polygon, results in a unimodal symmetrical distribution about the mean
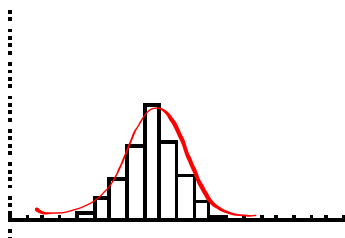
Example → generate 100 random heights of females from a population with a normal distribution.

$\bar{x}$ is the sample mean

μ is the population mean

σ is the standard deviation

Female heights
$\mu = 162.6$ cm
$\sigma = 7$ cm

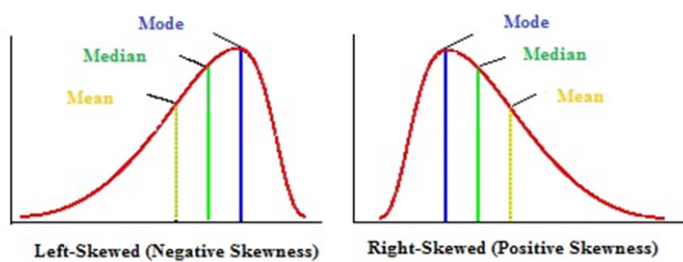$\bar{x} = 162.5$ cm (sample mean)
(from 1-var stats)

How many values are between
($\mu \pm \sigma$)
162.6 cm $\pm$ 7
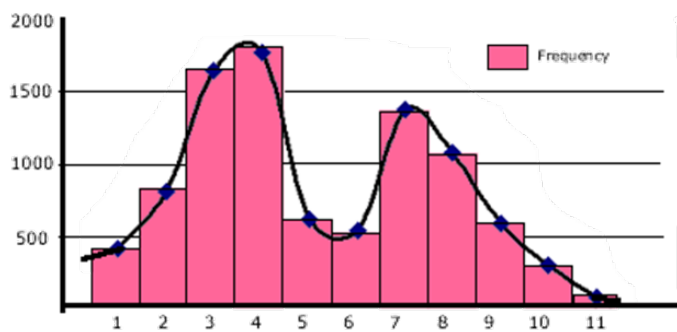
155.6 to 169.6 cm

69   62
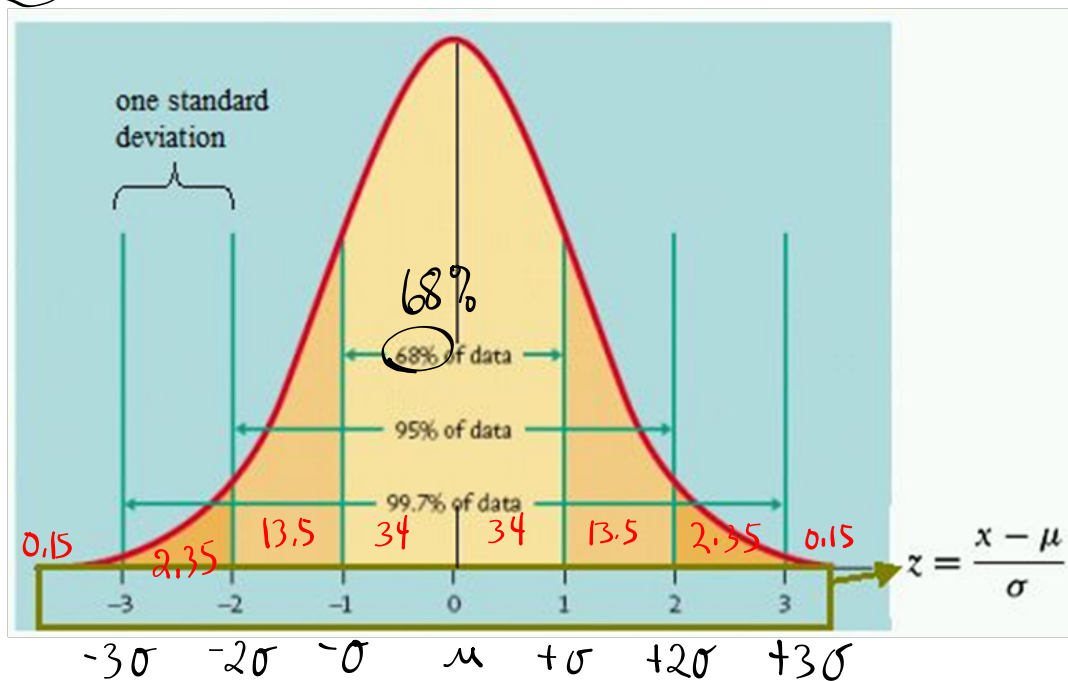62   62
61   69
62   68

Other Types of Distributions

A left-skewed distribution   has a long left tail. Left-skewed distributions are also called negatively-skeweddistributions. That's because there is a long tail in the negative direction on the number line. The mean is also to the left of the peak.
A right-skewed distribution   has a long right tail. Right-skewed distributions are also called positive-skew distributions. That's because there is a long tail in the positive direction on the number line. The mean is also to the right of the peak.

Bimodal Distribution

Normal Distribution

one standard deviation

68%

68% of data

95% of data

99.7% of data

0.15   2.35   13.5   34   34   13.5   2.35   0.15

-3   -2   -1   0   1   2   3

-3σ -2σ $-\sigma$ μ $+\sigma$ $+2\sigma$ $+3\sigma$

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

68% of the data falls within 1 st. dev
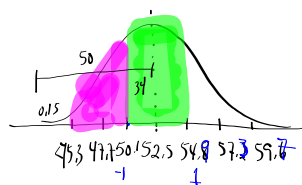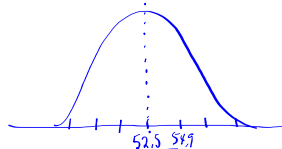
95% of the data falls within 2 st. dev.

99.7% of the data falls within 3 st. dev.

68 - 95 - 99.7

Example 2 - Analyzing a normal Distribution

pop mean $\mu = 52.5\ lb$

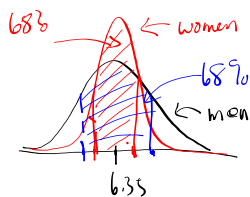st. dev $\sigma = 2.4\ lb$

What % is between 50.1 and 54.9 ?   68%

What % is between 45.3 and 50.1 ?

$$50\% - 34\% - 0.15\% = 15.85\%$$

(OR) $49.85 - 34\% = 15.85\%$

Example 3 (p247)

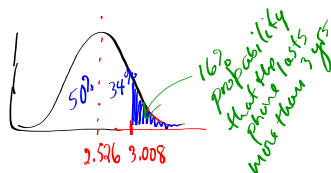| Team	μ (kg)	σ (kg)
men	6.35	1.04
women	6.35	0.59

Example 4 (p248)

a) Does the data approximate a normal distribution?

    - create a histogram see if it looks normal

    - 1 var stats → is the median about
                        the same as the mean?

$\mu = 2.526$

$\sigma = 0.482$

median = 2.55

16% probability that plants Phone more than 3 yrs.

- appears to be normal

TO DO

    C4u (p251) → Be sure to sketch
                   the normal distribution & label
                   with the mean + other values
                             $(\pm 1\sigma, \pm 2\sigma,$
                                     $\pm 3\sigma)$

§5-4 The Normal Distribution

- you must be told that you have a normal distribution **OR** see from the histogram that the data appears to follow a normal distribution. Also use 1-var stats to see that the mean and median are about the same.
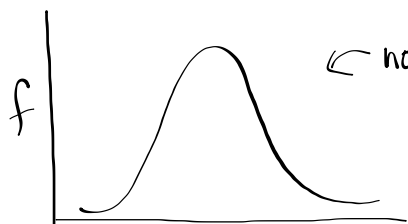
← normal curve (bell curve)

$\bar{x}$ – sample mean
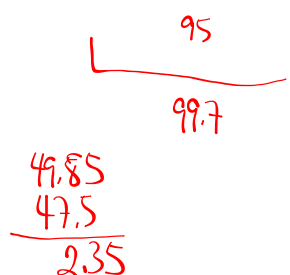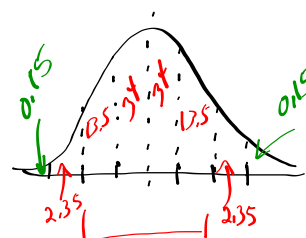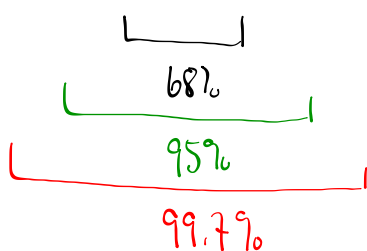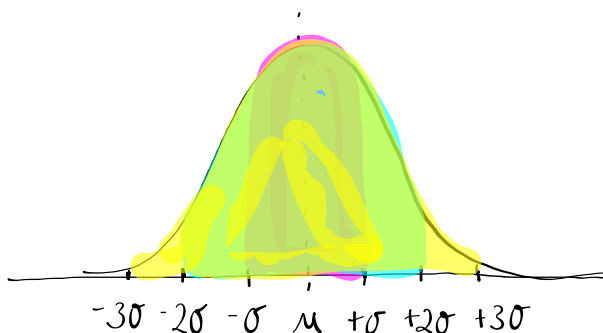
μ – population mean

σ – standard dev

68-95-99.7 Rule

68% of the data is within 1 st.dev

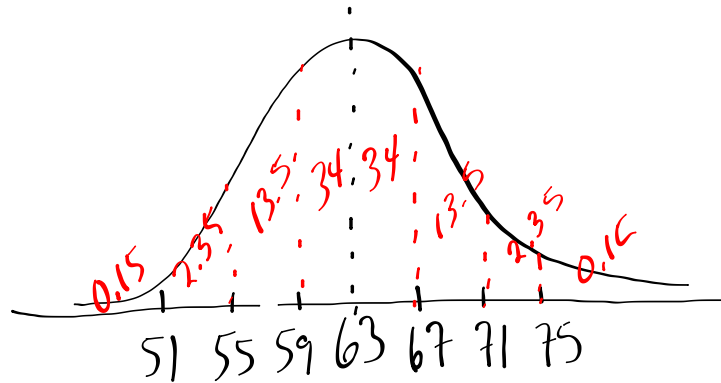95% of the data is within 2 st.dev

99.7% of the data is within 3 st.dev.

$-3\sigma \quad -2\sigma \quad -\sigma \quad \mu \quad +\sigma \quad +2\sigma \quad +3\sigma$

68%

95%

99.7%

0.15

13.5 34 34 13.5

0.15

2.35   2.35

95

99.7

49.85
47.5
2.35

CYU (p251)

1. $\mu = 63$ y

$\sigma = 4$ y

normal

Bell curve with values along the axis: 51 55 59 63 67 71 75, and region percentages: 0.15, 2.35, 13.5, 34, 34, 13.5, 2.35, 0.15

a) % between 55 and 63? $13.5 + 34 = \boxed{47.5\%}$

OR $\frac{1}{2}(95\%) = 47.5\%$

b) % between 67 and 75? $13.5 + 2.35 = \boxed{15.85\%}$

c) Older than 75% 0.15%

TO DO

① Finish CYU (p251)

② p251 | 4 – 14