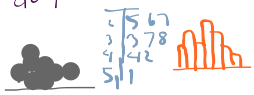
Section 2.2
day 1 of 3

Overiew of
Exploring
Quantitative
Data

Always plot data
(dotplot, stemplot, histogram)



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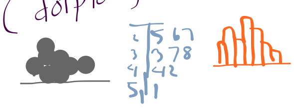

Overiew of Exploring Quantitative Data

Look for a pattern
(shape, center, variability)
and striking departures
outliers

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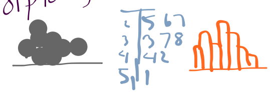

Overiew of Exploring Quantitative Data

Look for a pattern
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• • outliers

Calculate numerical summaries to describe center & variability

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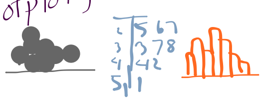


Overiew of Exploring Quantitative Data

Look for a pattern
(shape, center, variability)
and striking departures
• • outliers

When there is a regular overall pattern, use a model called a **density curve** to desribe it.

Calculate numerical summaries to describe center & variability

Use density curves to model distributions

[handout]

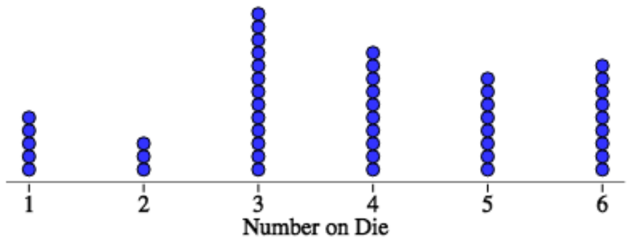
Lesson 2.2 Day 1-Exploring Density Curve

Complete each of the following experiments and submit your values to Mr. Cedarlund in the form requested. Then predict (sketch) what the graphs of the class data from each experiment will look like if the class did this **many many** times. Draw and label lines where you predict the mean and median will be.

Experiment 1: Roll a die and record the value it lands on. 1st roll:__ 2nd roll:__ 3rd roll: __

Prediction: Actual:

- Roll die
- Call out #'s to me
- Predict graph after many many rolls



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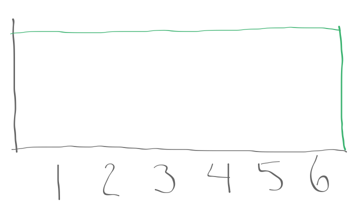

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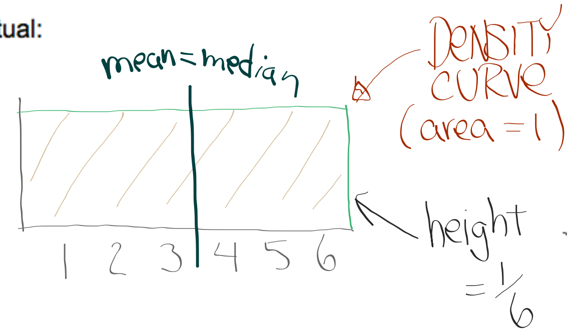

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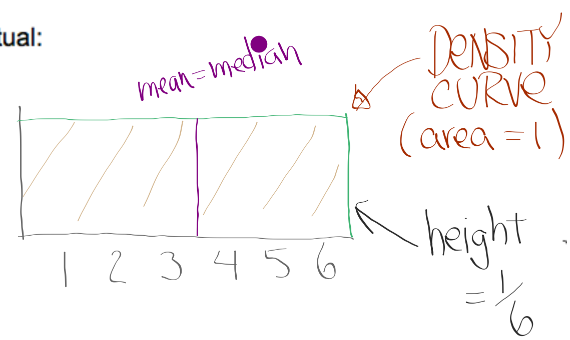

Experiment 2: Try to toss a penny and make it land on the target. Measure the distance of the penny from the target in cm. Round to the nearest tenth.
1st Attempt: _______ 2nd Attempt: _______ 3rd Attempt: _______

Prediction: Actual:

from about 1 meter away
- teams of 2
- each person goes 3 times
- then rotate
- then predict graph

Experiment 2: Try to toss a penny and make it land on the target. Measure the distance of the penny from the target in cm. Round to the nearest tenth.
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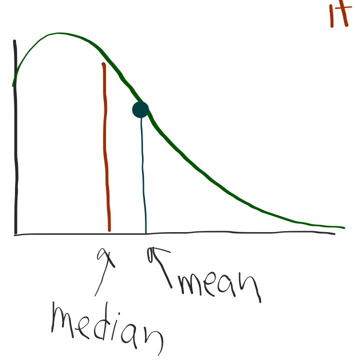
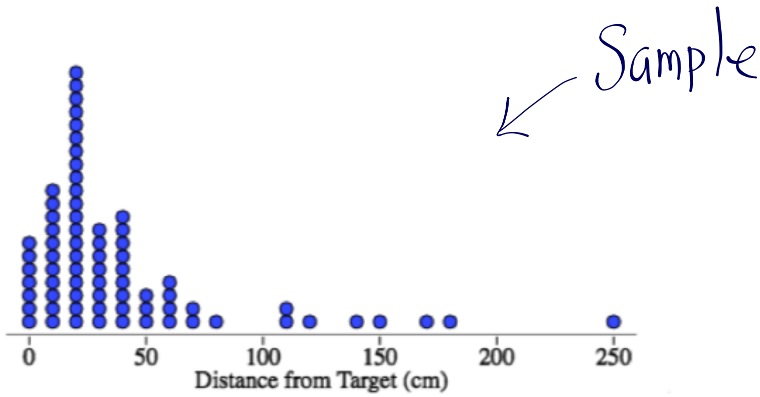
Prediction: Actual:



if skewed right
mean > median



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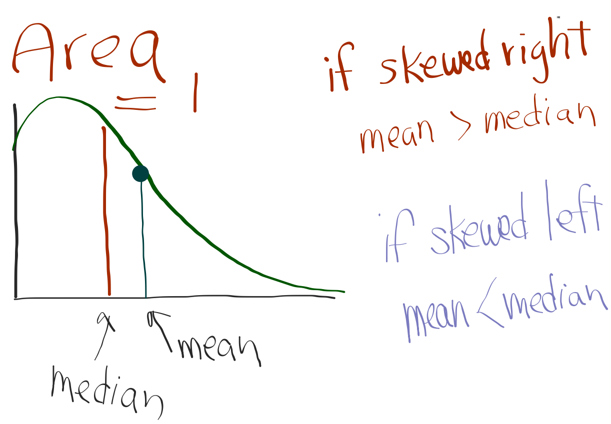
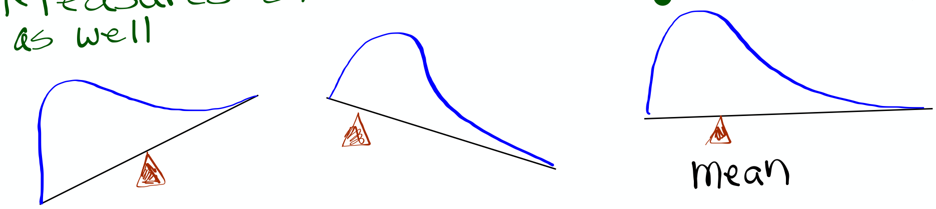
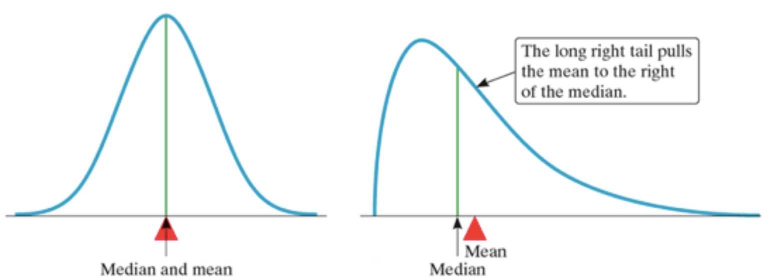


Measures of Center apply to density curves as well

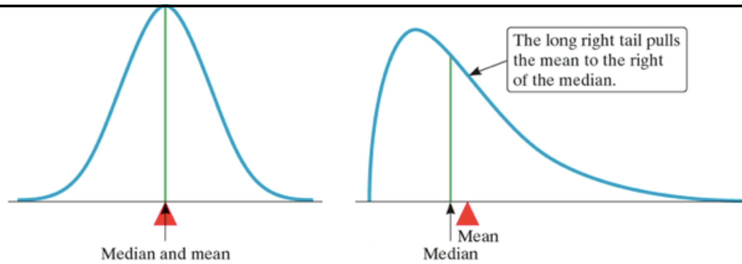


Mean (△) is a balance point at which the curve was made of solid material. (like wood)

The median of a density curve is the curves equal areas point, the point that divides the area in half.



The median and the mean are the same for a symmetric density curve. They both lie at the center of the curve. The mean of a skewed curve is pulled away from the median in the direction of the long tail.



- A density curve is an idealized description of a distribution of data.
- We distinguish between the mean and standard deviation of the density curve and the mean and standard deviation computed from the actual observations.
- The usual notation for the mean of a density curve is μ (the Greek letter mu). We write the standard deviation of a density curve as σ (the Greek letter sigma).

Big Ideas:

Density Curves

Relative Position of Mean & median

Big Ideas:

Density Curves

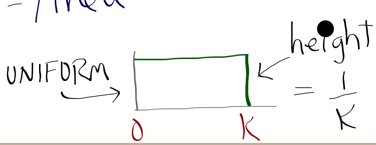
- Theoretical
- Always above X-axis
- Area = 1

Relative Position of Mean & median

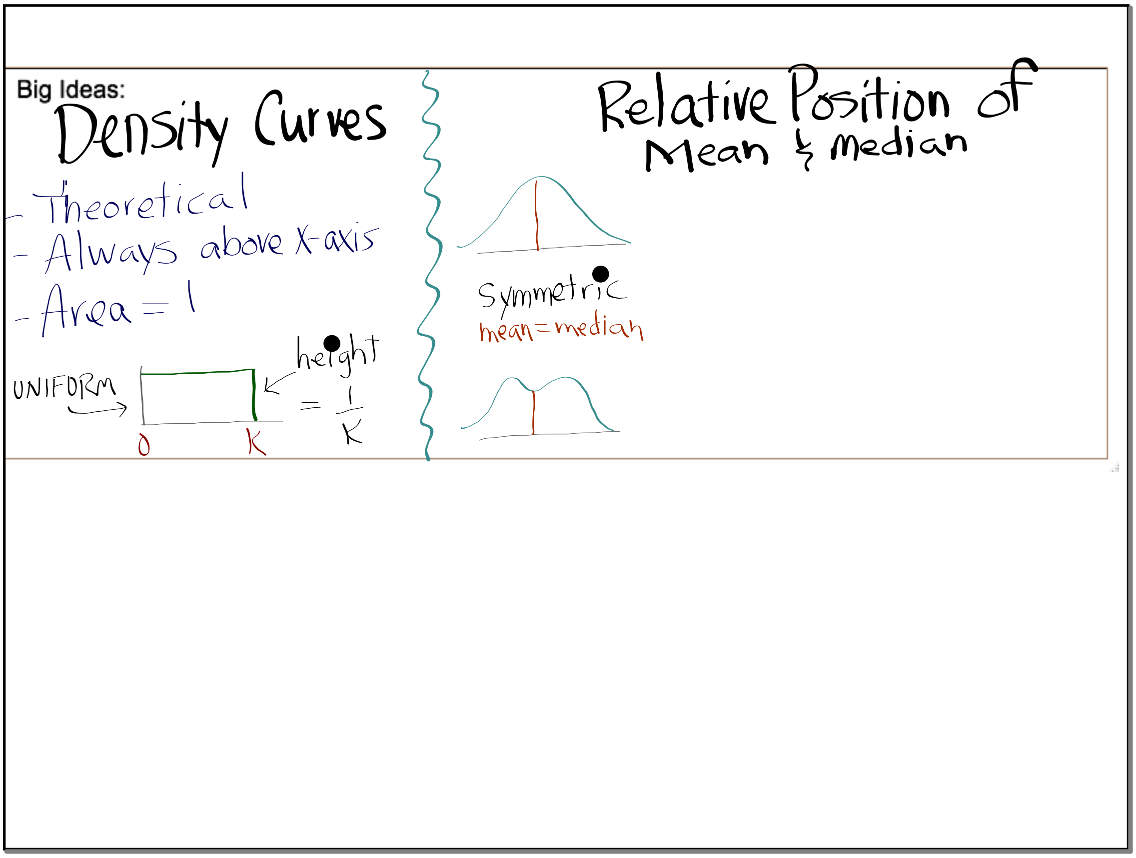
Big Ideas:

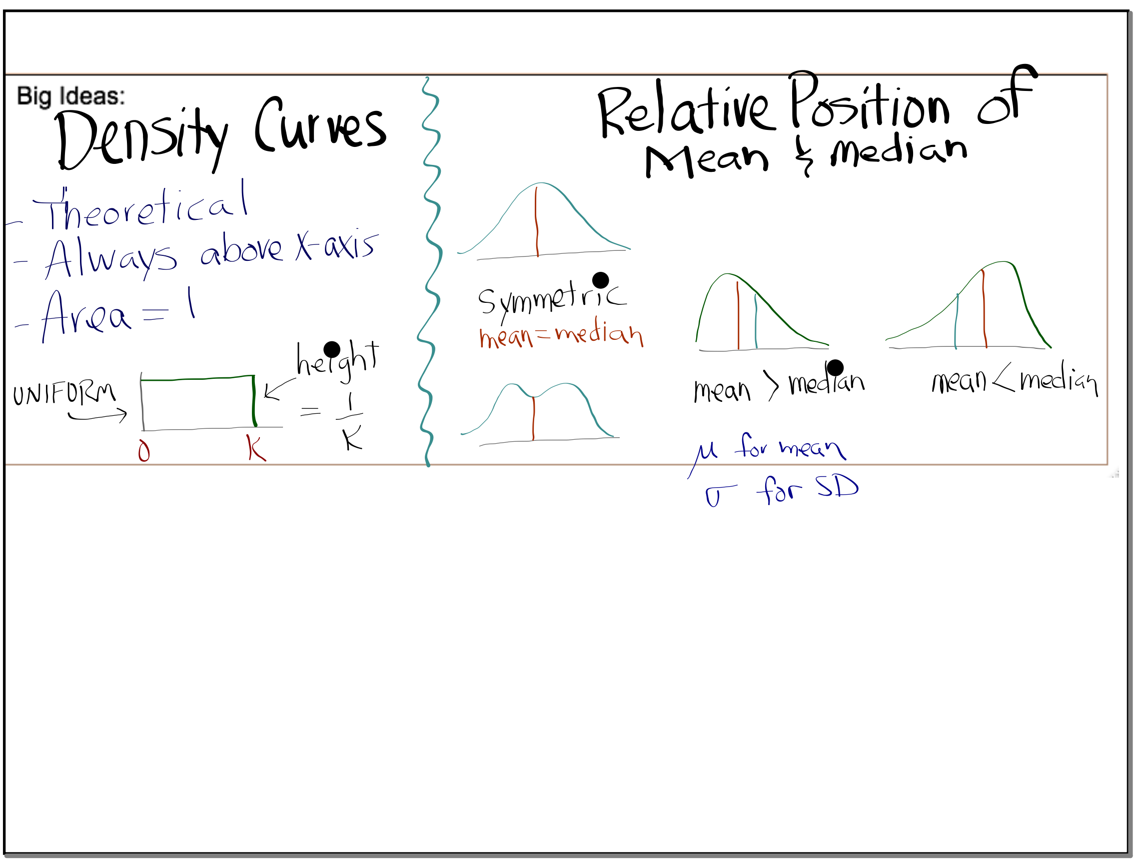
Density Curves

- Theoretical
- Always above X-axis
- Area = 1



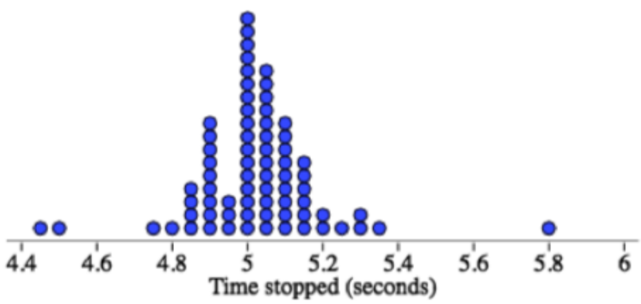
Relative Position of Mean & median


Big Ideas:
Density Curves
- Theoretical
- Always above x-axis
- Area = 1
UNIFORM
height
= 1/K
0
K
Relative Position of Mean & median
Symmetric
mean=median


Big Ideas:
Density Curves
- Theoretical
- Always above x-axis
- Area = 1
UNIFORM
height
= 1/K
0
K
Relative Position of Mean & median
Symmetric
mean=median
mean > median
mean < median
μ for mean
σ for SD

Experiment 3: Try to stop your stopwatch at exactly 5 seconds. Record what the stopwatch reads below. Record to the hundredths place.
1st Attempt: _______ 2nd Attempt: _______ 3rd Attempt: ______

Prediction: Actual:



Sample

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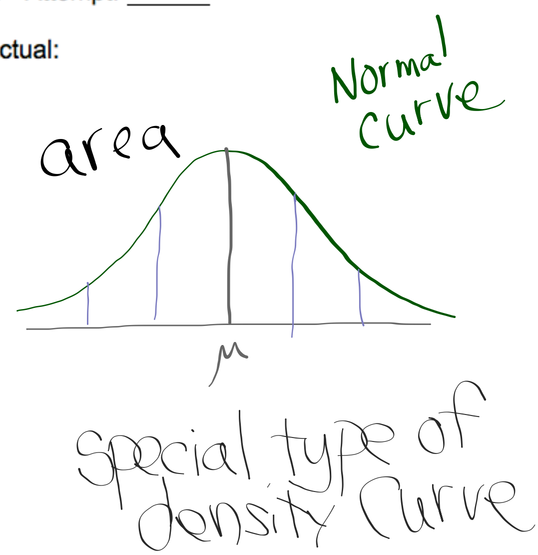
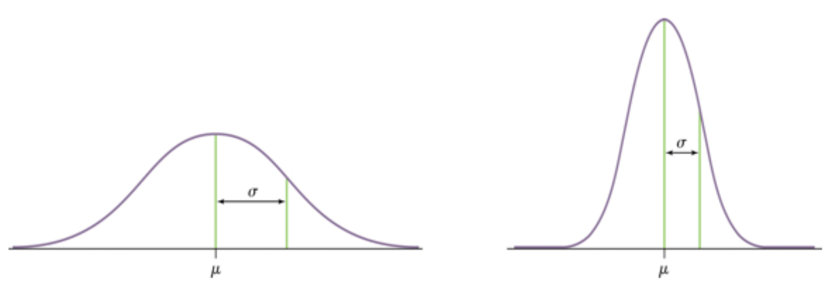
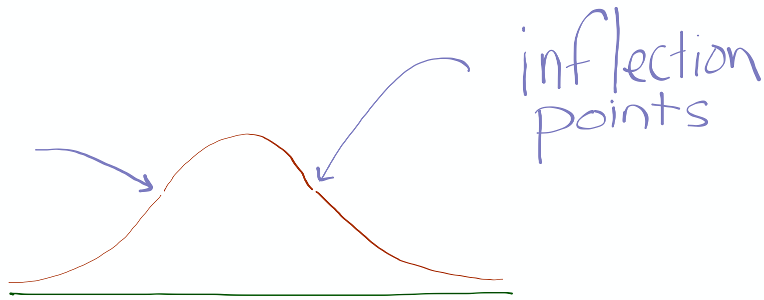
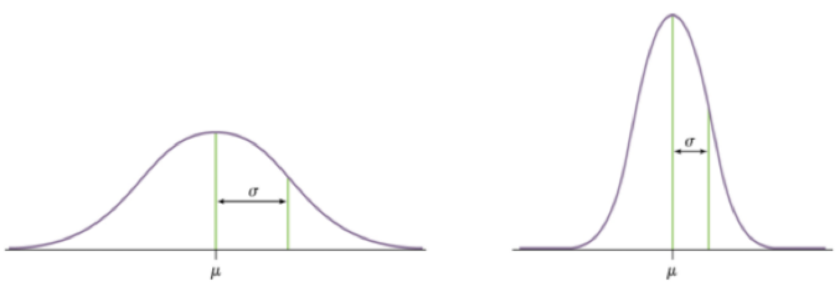


One particularly important family of density curves are the **Normal curves,** which describe **Normal distributions.**

- **Shape:** All Normal distributions have the same overall shape: symmetric, single-peaked, and bell-shaped.

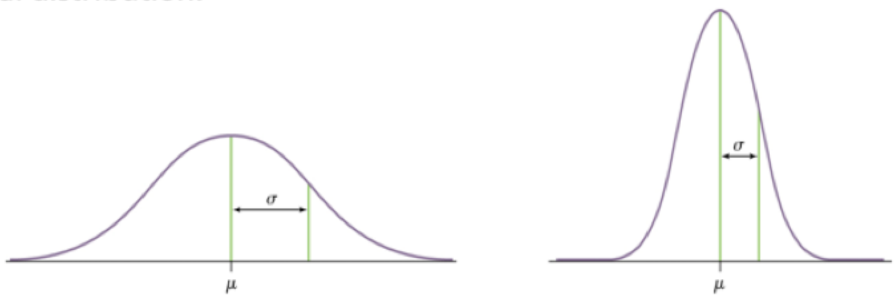






- **Center:** The mean μ is located at the midpoint of the symmetric density curve and is the same as the median.

- **Variability:** The standard deviation σ measures the variability (width) of a Normal distribution.



3 reasons why

Normal Distributions are important in Statistics they are good descriptions for certain types of data

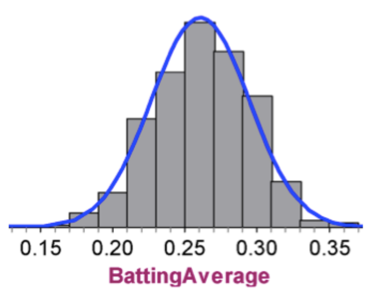
Scores taken by people.

- SAT's
- Employment tests
- Exams
- Physical Tests
- Athletic measurements
- etc

Density Curves

Example: Batting Averages

The histogram below shows the distribution of batting average (proportion of hits) for the 432 Major League Baseball players with at least 100 plate appearances in the 2009 season. The smooth curve shows the overall shape of the distribution.



every year would be the same

Normal Distributions are good approximations for chance outcomes

Normal Distributions are good approximations for chance outcomes

Many of the inference methods in Ch. 8-12 are based on Normal Distributions.

What is so special about Normal Distributions?

Activity with laptops

cell phones ???

Write answers down in your notes

Class demo
(due to time)

Activity: What is so special about Normal Distributions?

Write your answers for the Page 116 activity below. (You will need a laptop)

1a

1b

1c

2

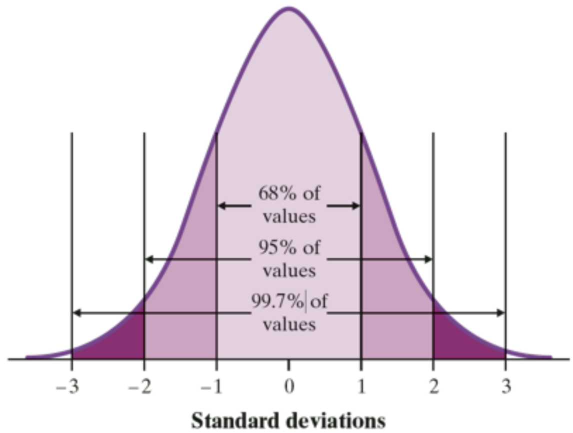
3 ___within 1 std dev about 68% within 2 std. dev about 95 within 3 std. dev about 99.7%

4. For any Normal distribution, the area under the Normal curve within 1, 2, and 3 standard deviations of the mean is about 68 %, 95 %, and 99.7 %

The 68-95-99.7 Rule

In a Normal distribution with mean μ and standard deviation σ:

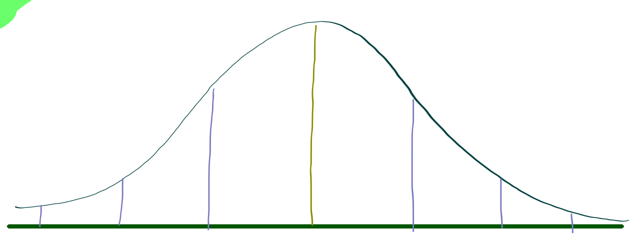
- Approximately **68%** of the observations fall within σ of the mean μ.
- Approximately **95%** of the observations fall within 2σ of the mean μ.
- Approximately **99.7%** of the observations fall within 3σ of the mean μ.

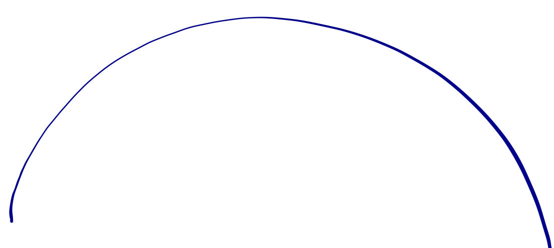


Summary: Normal Distributions

Big Ideas:

Normal Curve





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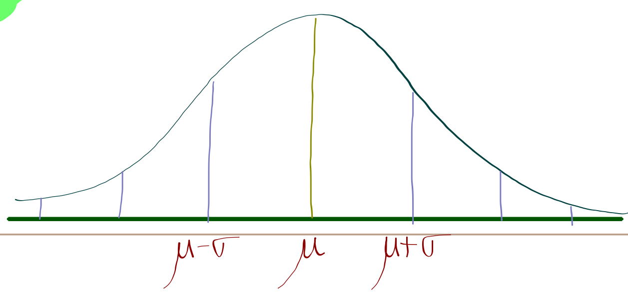

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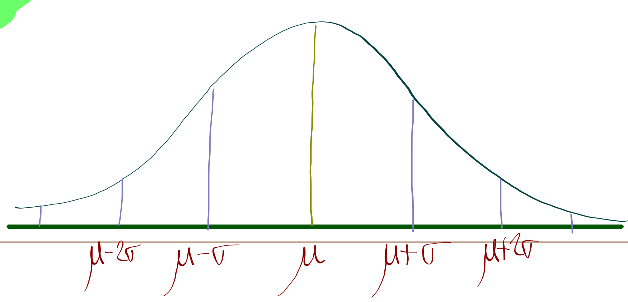

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Big Ideas:

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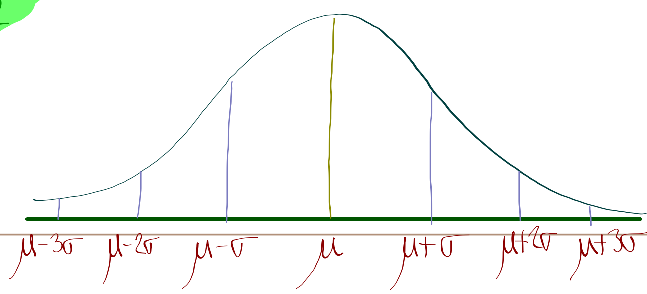

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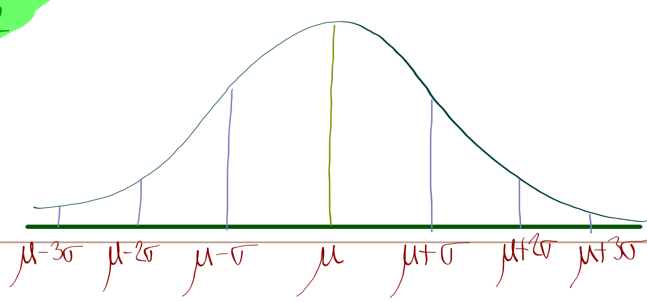
Big Ideas:

Normal curve

Emperical Rule
68-95-99.7



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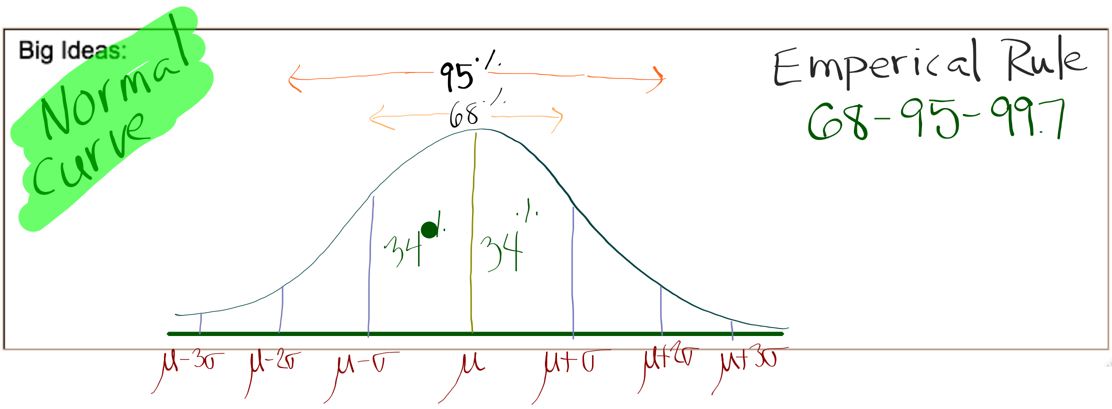

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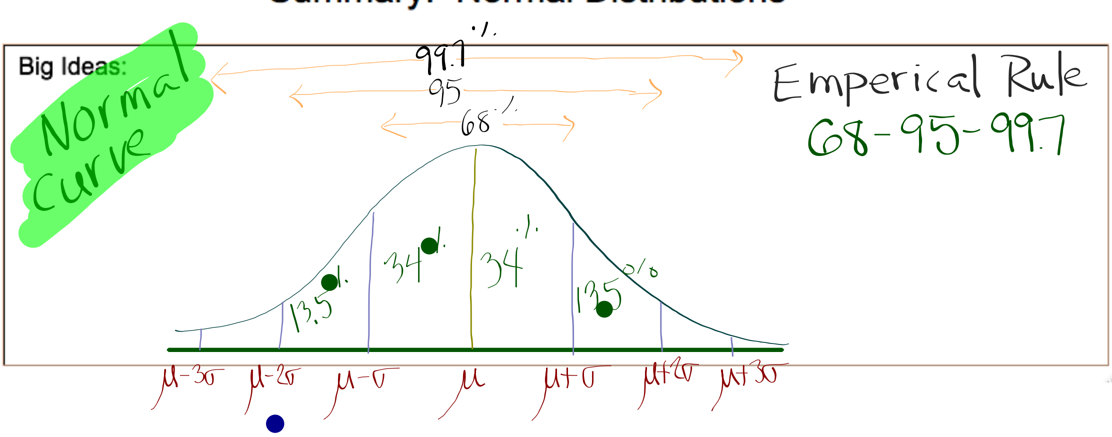

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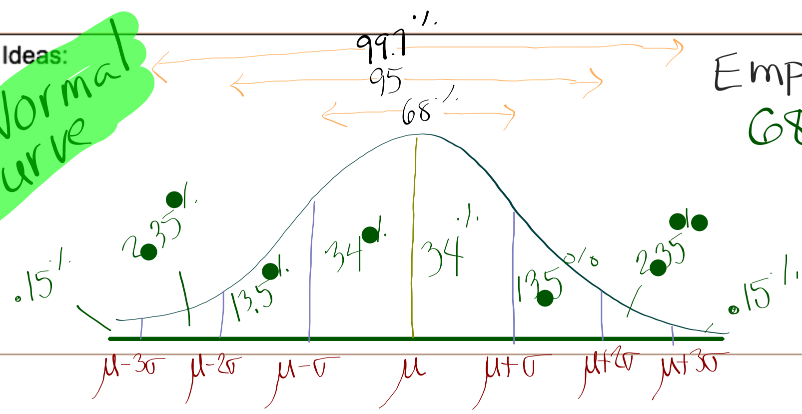
Big Ideas:

Normal Curve

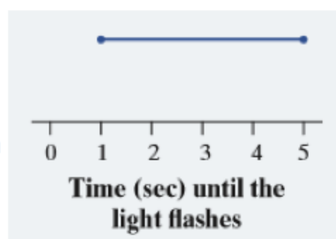


Emperical Rule
68-95-99.7

Check Your Understanding:

1. An Internet reaction time test asks subjects to click their mouse button as soon as a light flashes on the screen. The light is programmed to go on at a randomly selected time after the subject clicks "Start." The density curve models the amount of time the subject has to wait for the light to flash.

   a. What height must the density curve have? Justify your answer.

   b. About what percent of the time will the light flash more than 3.75 seconds after the subject clicks "Start"?

   c. Calculate and interpret the 38th percentile of this distribution.

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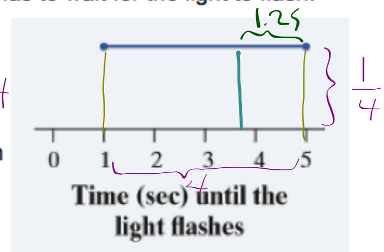
   area = 1 so $\frac{1}{4} \times 4 = 1$ height = 1/4



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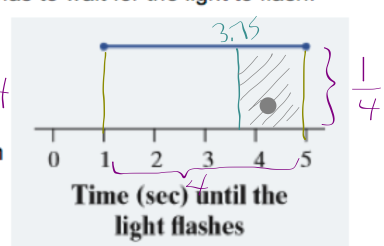

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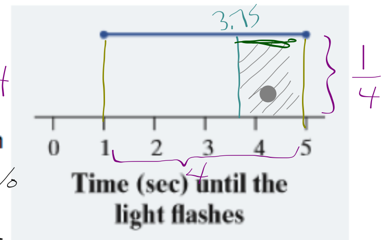

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width = 1.25 Area = $1.25 \times \frac{1}{4} = .3125 = 31.25\%$

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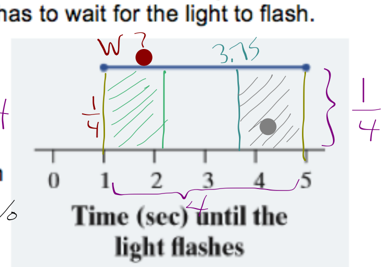

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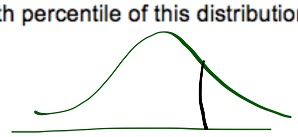
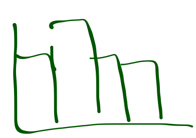
$\frac{1}{4} \times W = .38$





$W = 1.52$

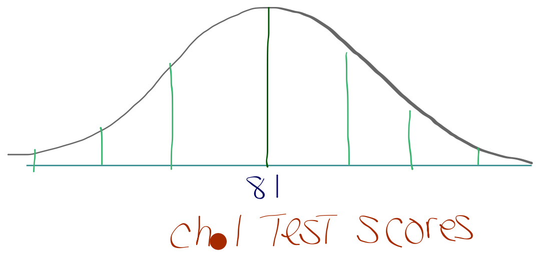
+1 second start

Approx 38% of the time, the flash will go off befor 2.52 sec

2. Sketching a Normal distribution

Chapter 1 test scores from the first-hour class follow an approximately Normal distribution with a mean of 81 and standard deviation of 6.

a) Sketch the Normal curve that approximates the distribution of Chapter 1 test scores. Label the mean and the points that are 1, 2, and 3 standard deviations from the mean.



b) Using your diagram, what percent of the scores are greater than 81?

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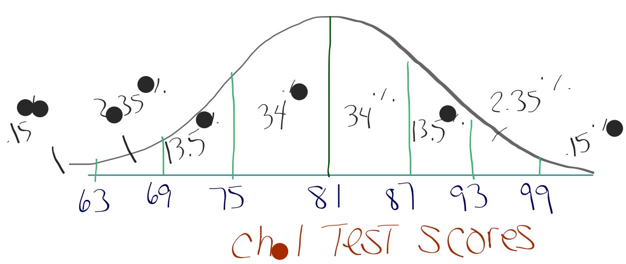
You don't need to show %



b) Using your diagram, what percent of the scores are greater than 81?

50%

c) What percent of the scores are between 63 and 99? 99.7%

d) If there are 50 students in the class, approximately how many students have a score within one standard deviation of the mean ?

Prob that a student is within 1 SD of 81 is 68%

So... 68% of 50 is 34 students

Assignment

- 2.2... 41, 45, 47, 49, 51

  and do page 54....86

  study.... pp. 109-119

+ Take Home LCQ