Study Session Week of 10/08

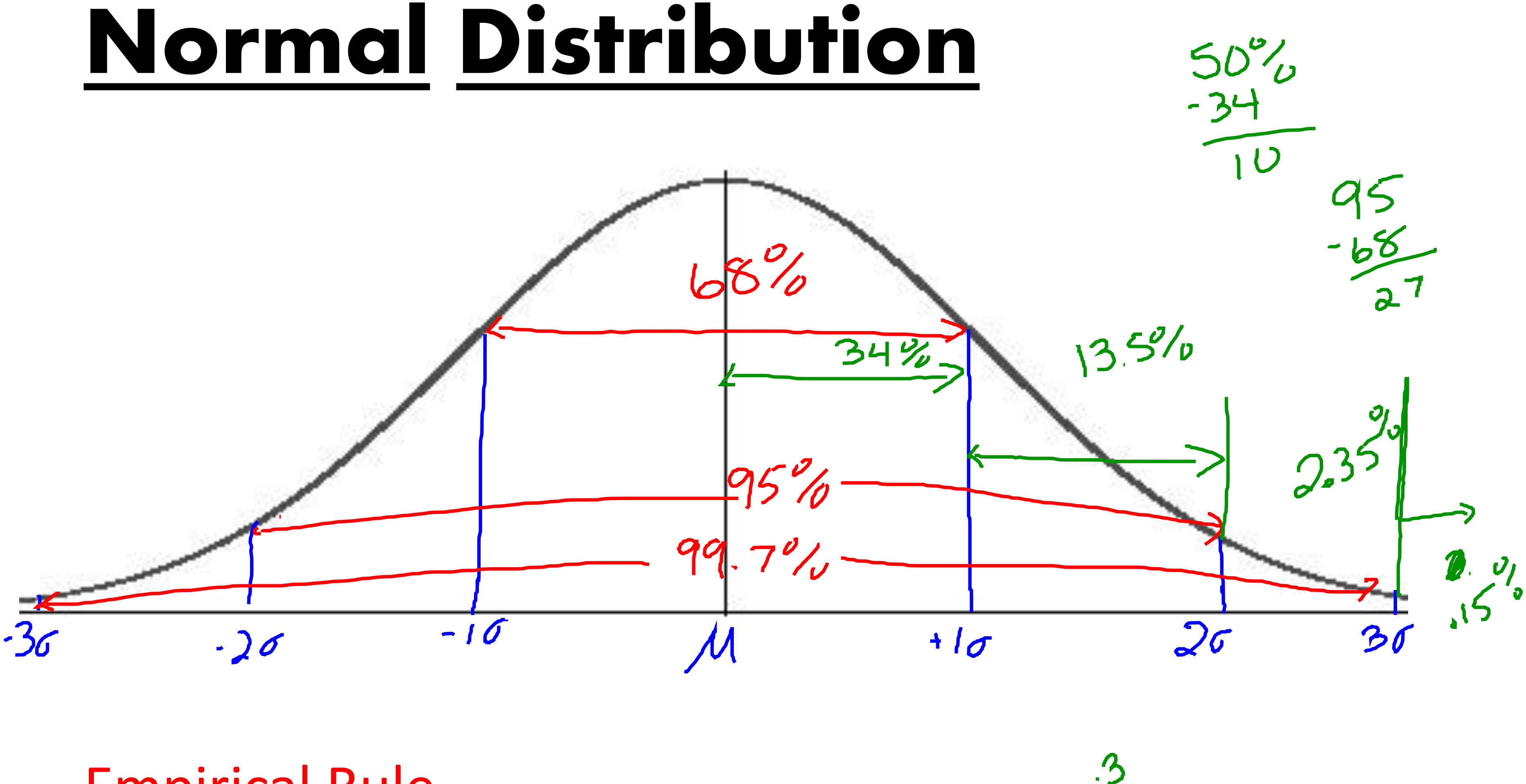
Objectives:

- I will use the empirical rule with the Normal distribution.
- I will calculate a z-score by hand.
- I will use a table to determine percentile

Agenda:

- Review the empirical rule
- Review the z-score formula
- Review percentiles – both meaning and getting them from table.

Normal Distribution

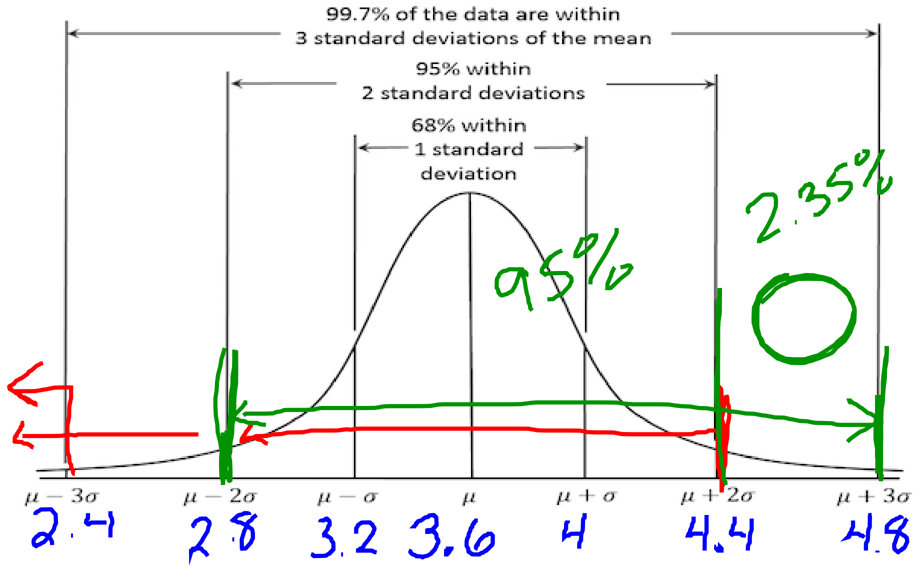


Empirical Rule

- 68%, 95%, 99.7%
- Always write ±3σ from the μ

Applying the Empirical Rule

The weights of adorable, fluffy kittens are normally distributed with a mean of 3.6 pounds and a standard deviation of 0.4 pounds.



- What percent of adorable, fluffy kittens weigh between 2.8 and 4.8 pounds? 97.35%

100
−99.7
.3

- What percent of adorable, fluffy kittens weigh less than 2.4 pounds? 0.15%
- What value corresponds to a 97.5th percentile of kitten weights? 4.4

Multiple Choice #1

The mean income per household in a certain state is $9500 with a standard deviation of $1750. The middle 95% of incomes are between what two values?

(A) $5422 and $13578

(B) $6070 and $12930

(C) $6621 and $12379

(D) $7260 and $11740

(E) $8049 and $10951

(F) 6000 and 13000

Multiple Choice #2

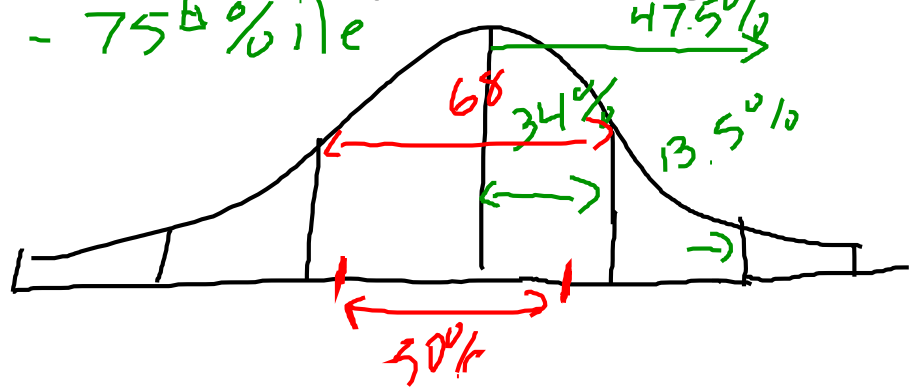
Which of the following are true statements?

I. The area under the standard normal curve between 0 and 2 is twice the area between 0 and 1.

II. The area under the standard normal curve between 0 and 2 is half the area between –2 and 2.

III. For the standard normal curve, the interquartile range is approximately 3.

25th %ile - 75th %ile



(A) I and II

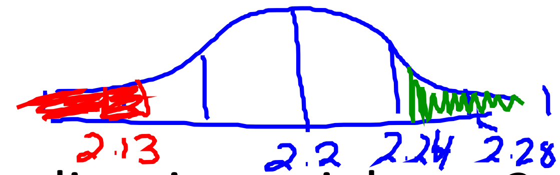
(B) I and III

(C) II only

(D) I, II and III

(E) None of the above gives the complete set of true responses

Z-scores & percentile



Suppose that the wrapper of a certain candy bar lists its weight as 2.13 ounces. Naturally, the weights of individual bars vary somewhat. Suppose that the weights of these candy bars vary according to a normal distribution with mean $\mu = 2.2$ ounces and standard deviation $\sigma = 0.04$ ounces.

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

What proportion of candy bars weigh less than the advertised weight?

$$Z = \frac{2.13 - 2.2}{0.04} = -1.75$$

0.0401 4.01%

What proportion of candy bars weigh more than 2.25 ounces?

$$Z = \frac{2.25 - 2.2}{0.04} = 1.25$$

0.8944 1 - 0.8944 0.1056

What proportion of candy bars weigh between 2.2 and 2.3 ounces?

$\boxed{2.2 \to 0.5}$ $Z = \frac{2.3 - 2.2}{.04} = 2.5$ .9938 0.9938 - 0.5 = .4938

If the manufacturer wants to adjust the production process so that only 1 candy bar in 1000 weighs less than the advertised weight, what should the mean of the actual weights be (assuming that the standard deviation of the weights remains 0.04 ounces)?

Z-scores & percentile

Assume the cholesterol levels of Adult American women can be described by a Normal model with a mean of 188 mg/dL and a standard deviation of 24.

What percent of adult women do you expect to have cholesterol levels over 200 mg/dL?

What percent of adult women do you expect to have cholesterol levels between 150 and 170 mg/dL?

Estimate the interquartile range of the cholesterol levels.

Above what value are the highest 15% of women’s cholesterol levels?

Multiple Choice #3

A trucking firm determines that its fleet of trucks averages a mean of 12.4 miles per gallon with a standard deviation of 1.2 miles per gallon on cross-country hauls. What is the probability that one of the trucks averages fewer than 10 miles per gallon?

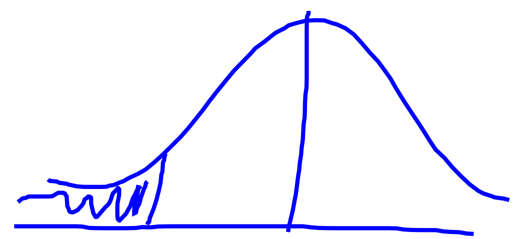
(A) 0.0082

(B) 0.0228

(C) 0.4772

(D) 0.5228

(E) 0.9772



Multiple Choice #4

A factory dumps an average of 2.43 tons of pollutants into a river every week. If the standard deviation is 0.88 tons, what is the probability that in a week more than 3 tons are dumped?

(A) 0.2578

(B) 0.2843

(~~C~~) 0.6500

(~~D~~) 0.7157

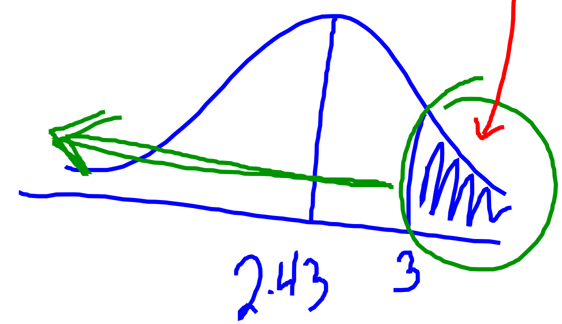
(~~E~~) 0.7422

$\frac{3-2.43}{.88} =$

$Z = 0.6477$

.65

0.7422



1.00 - 0.7422

Multiple Choice #5

An electronic product takes an average of 3.4 hours to move through an assembly line. If the standard deviation is 0.5 hour, what is the probability that an item will take between 3 and 4 hours?

(A) 0.2119

(B) 0.2295

(C) 0.3270

(D) 0.3811

(E) 0.6730