

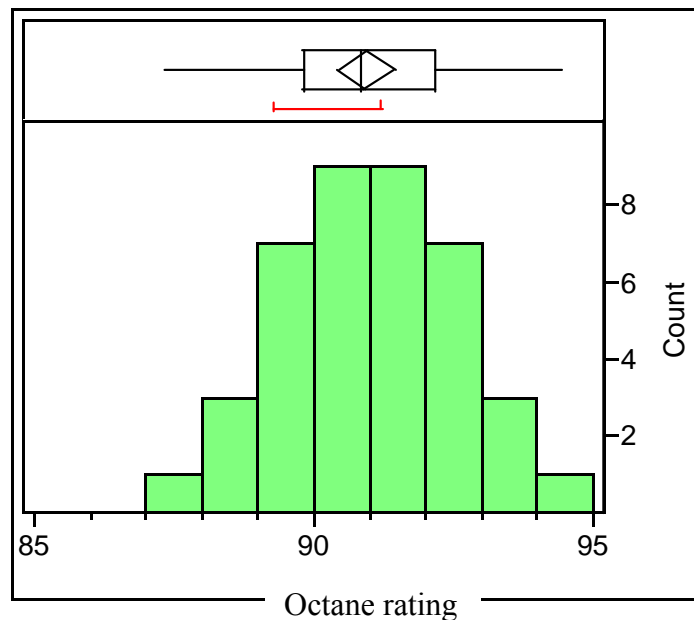
# Statistics 104 - Laboratory 8

## Normal Models

Often a population will have a variable whose distribution can be modeled using a normal model with a population mean  $\mu$  and a population standard deviation  $\sigma$ .

### 1. Octane Rating

Octane rating quantifies the “antiknock” properties of fuel. The higher the octane rating, the less likely your engine will knock. Below is the histogram of octane ratings for 40 gasoline samples selected at random.



- Describe the shape of the distribution. Why is a normal model a reasonable model for the distribution of the population of all octane ratings?
- Use a normal model for octane rating with population mean  $\mu = 91$  and population standard deviation  $\sigma = 1.5$  to find
  - The probability that an octane rating will be less than 89.
  - The probability that an octane rating will be greater than 92.
  - The probability that an octane rating will be between 88 and 94.
  - The value such that 10% of all octane ratings will be less than that value.
  - The value such that 20% of all octane ratings will be greater than that value.
  - The values such that the middle 90% of all octane ratings will fall between those values.

## 2. Body Mass Index

The Body Mass Index is calculated from a person's weight and height and is positively correlated to the amount of body fat. BMI is often used to classify individuals into a Weight Status category.

BMI	Weight Status
BMI below 18.5	Underweight
$18.5 \leq \text{BMI} < 25.0$	Normal weight
$25.0 \leq \text{BMI} < 30.0$	Overweight
BMI 30.0 and above	Obese

It is reasonable to model BMI for males and females using a normal model. Below is information on BMI for males age 20 to 74 and females age 20 to 74 in 1960 and 2000.

BMI	1960		2000	
	males	females	males	females
mean, $\mu$	25.1	24.9	27.9	28.2
std. dev., $\sigma$	5.1	5.4	7.8	7.9

- What is the probability that a female chosen at random in 1960 was obese?
- What is the probability that a female chosen at random in 2000 was obese?
- What is the probability that a male chosen at random in 1960 was overweight?
- What is the probability that a male chosen at random in 2000 was overweight?
- What general trend do you see from 1960 to 2000 in terms of BMI and Weight status?

## Statistics 104 - Laboratory 8 Group Answer Sheet

Names of Group Members: \_\_\_\_\_, \_\_\_\_\_  
\_\_\_\_\_

### 1. Octane Rating

- a) Describe shape and comment on why a normal model is reasonable.
- b) Find the following
- The probability that an octane rating will be less than 89.
  
  
  
  
  
  - The probability that an octane rating will be greater than 92.
  
  
  
  
  
  - The probability that an octane rating will be between 88 and 94.
  
  
  
  
  
  - The value such that 10% of all octane ratings will be less than that value.
  
  
  
  
  
  - The value such that 20% of all octane ratings will be greater than that value.
  
  
  
  
  
  - The values such that the middle 90% of all octane ratings will fall between those values.

