

# Problem Set 6: The Normal Distribution and Standardized Scores

## Problem 1

Environmental Protection Agency (EPA) fuel economy estimates for automobile models tested recently predicted a mean of 24.9 mpg, and a standard deviation of 6.2 mpg for highway driving. Assume that a Normal model can be applied.

1. Draw the model for auto fuel economy. Clearly label it, showing what the empirical rule predicts.
2. In what interval would you expect the central 68% of autos to be found?
3. About what percent of autos should get more than 31 mpg?
4. About what percent of cars should get between 31 and 37.2 mpg?
5. Describe the gas mileage of the worst 2.5% of all cars.

## Problem 2

The Virginia Cooperative Extension reports that the mean weight of yearling Angus steers is 1152 pounds. Suppose that weights of all such animals can be described by a Normal model with a standard deviation of 84 pounds.

1. How many standard deviations from the mean would a steer weighing 1000 pounds be?
2. Which would be more unusual, a steer weighing 1000 pounds or one weighing 1250 pounds?

## Problem 3

Above we suggested that the model  $N(1152, 84)$  for weights in pounds of yearling Angus steers. What weight would you consider to be unusually low for such an animal? Explain. (Note: We specified what the cut-off for unusual was in the slides.)

## Problem 4

Again using the normal for weights of Angus steers,  $N(1152, 84)$ , what percent of steers weigh:

1. Over 1250 pounds?
2. Under 1200 pounds?
3. Between 1000 and 1100 pounds?

## Problem 5

Using the same Angus steers model,  $N(1152, 84)$  what are the cutoff values for...

1. The highest 10% of weights?

2. The lowest 20% of weights?
3. The middle 40% of weights?
4. What weight represents the 40th percentile?
5. What weight represents the 99th percentile?

## Problem 6

Companies that design furniture for elementary school classrooms product a variety of sizes for kids of different ages. Suppose the heights of kindergarten children can be described by a Normal model with a mean of 38.2 inches and standard deviation of 1.8 inches.

1. What fraction of kindergarten kids should the company expect to be less than 3 feet tall? (*Note the change in units here!*)
2. In what height interval should the company expect to find the middle 80% of kindergarteners?
3. At least how tall are the biggest 10% of kindergarteners?

## Reflection/Feedback

Feedback: Any feedback on today's class? What would you like to change/improve? Anything I should stop doing or continue doing? Other concerns?