Because Test 2 is coming up right away, this week we have only one handout.   We will go as far as we can in it on Monday, and then finish it on Wednesday.

Normal Distributions:

Normal distributions are used extensively in the rest of the course.

Recall that, during the last class, we worked with the 68-95-99.7 rule for the normal distribution.   Now we will discuss problems for which that rule isn't enough.

Discussion.   We use the Normal Table in this course to compute areas in normal distributions.   It is Table A in our textbook's tables.   Solutions of problems like these on quizzes or test must have at least one appropriately labeled picture, with correct shading, as a part of the work to be shown.

Complete solutions to these particular problems are posted in the Chapter 3 material in Blackboard, under Normal Calculations.   These are posted so that you don't have to write quickly to take notes on these during class.

1. For a standard normal distribution, draw appropriate pictures and find these

    a. The proportion/percentage of scores below 1.87. (page 2)

    b. The proportion /percentage of scores above 1.87. (page 2)

    c. The proportion / percentage of scores below –1.08. (page 2)

    d. The proportion / percentage of scores between –1.08 and 1.87. (page 3)

    e. The proportion / percentage of scores below –4.31. (page 3)

2. In a normal dist'n with mean 25 and standard deviation 7, draw appropriate pictures and find the proportion of scores below 20. (page 4)

3. Suppose we have a normal dist'n with mean 12.71 and standard deviation 1.83. Draw appropriate pictures and find the proportion of scores between 13 and 20. (page 5)

4. For a standard normal distribution draw an appropriate picture and find the score at the 57th percentile. (page 6)

5. In a standard normal distribution, draw an appropriate picture and find the score that has 95% of the scores above it. (page 6)

6. Suppose we have a normal distribution with mean 12.3 and standard deviation 3.1. Draw an appropriate picture and find the score that has 95% of the scores above it. (page 7)

After class today, and BEFORE CLASS on Wednesday of this week, please solve these problems on the homework, with pictures. Bring them to class on Wednesday. This is very important!
3.31, 3.33, 3.37, 3.45   (These are all part of your Chapter 3 homework assignment.)

Chapter 10.   Distributions. (Probability Models for Distributions)

To start this chapter, think of "probability" as meaning "proportion of scores."

Example 1. A certain online course is designed to teach students to use a rather complicated computer software program. Five training modules are provided.   Students may not need to finish all the modules to pass the mastery test.   They may take a mastery test at any time.   After several years, the company has collected enough data to about the number of units that a student completed before passing the mastery test to consider this a population distribution.

Number of units	1	2	3	4	5
Probability of mastery	0.05	0.09	0.13	0.61	0.12

    a.   What is the sum of these probabilities?   (Is it what you would have expected? Why?)

    b.   What is the probability that the number of units required for mastery is below 3?

    c.   What is the probability that the number of units required for mastery is 3 or less?

    d.   How many modules would you require a person to complete if you wanted the probability of their having mastered the material to be at least 80%?   At least 90%?

Example 2.   A study of a population of high-school boys shows that the distribution of times to run a mile is normal, with mean 460 seconds and standard deviation 42 seconds.   Think about how you would answer these two questions.   Discuss them and sketch a picture or two. Do not carry out the calculations.

    a.   What is the probability that a boy from this population will run the mile in less than 440 seconds?

    b.   What time would it take for a boy from this population to be in the fastest 10% of the boys?

Activity 1.   Describe the essential difference in the distributions in these two examples (modules mastered and time to run a mile) that makes you solve them using such different methods.

Activity 2. In Chapter 10, read the description of discrete models and continuous models and say which of the two examples above illustrates each.

Ideas about probability:

Please relax as you learn about these ideas.   If you can work the previous two examples, that is almost all of what you do to earn credit for problems in this chapter.   But it is useful to learn a bit more about how to talk about / think about probability.

Lecture/Discussion: How does Figure 10.1 illustrate probability as a long-term relative frequency? Discussion in class.

Activity 3: Consider Figure 10.2. (Section "Probability Models")   Consider the experiment of rolling one red die and one green die and recording the outcome. Why is Figure 10.2 the sample space for that experiment?

Activity 4:   Now suppose that you have rolled that pair of dice and just recorded the "score" which is the sum of the faces.   What is the sample space for that?   How do you decide on the probability for each event in this sample space?   (See Example 10.5 if you are stuck.)

Activity 5: Read the four probability rules. (Section: "Probability Rules.") Do Exercise 10.9.

 Activity 6: Read the definition of a random variable. (Section "Random Variables.")   Look back to the rolling dice scenario, in Activities 3 and 4. Can you see that, in activity 4, the variable is the sum? Explain to each other why that is a random variable.   And identify the probability distribution of that random variable.

Lecture / Discussion: There are whole courses devoted to probability. We are just getting enough of an overview here to enable you to learn the standard statistics material.   The two computations you did in Activities 1 and 2 are the main types of problems assigned in this chapter.

Activity 7:   In the time left in class today, work together on these problems.

10.2, 10.3a,10.49, 10.50, 10.51, 10.55

Quiz 6: Due Wed. Feb. 27.   Five problems.   I hope that you will do these by Monday, Feb. 25, and discuss them on the Discussion Board so that you are SURE your answers are correct no later than the end of Monday.

1. Exercise 3.34
2. Exercise 3.36
3. Exercise 10.40
4. Exercise 10.50
5. Look in the ACC data website, in the folder of Mary Parker's data, and find the data "fish_prices." From these data, would it be reasonable to predict 1980 prices from 1970 prices?   Submit your answer to this problem electronically in the Blackboard assignment called "Quiz 6."
a. Give a scatterplot (as part of your main answer) and the equation of the regression line. (Include the output to produce these in the Appendix.)

b. Use both the scatterplot and r^2 to discuss how good you expect your regression predictions to be.
c. Give a residual plot (as part of your main answer) of the residuals versus the explanatory variable. (Include the output to produce this in the Appendix.)   It is not necessary to discuss the residual plot.