An Overview of Online Statistics 371 in Summer 2013

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1 Course Routine

I am creating this document on February 19, 2013, for the Summer 2013 online offering of Statistics 371, *Introduction to Applied Statistics in the Life Sciences*. For the purpose of this document, I will assume that you are enrolled in the course.

The course will *begin*—though not in the manner of a traditional course—on Monday, June 17 and will end when you complete the three hour in-person final exam. There will be at least two options for the day/time of the final exam, with either one or two on Friday, August 9, and exactly one on Saturday, August 10.

A regular-semester course at UW–Madison is comprised of two 75-minute lectures per week for 15 weeks; a total of 30 lecture periods. Please think about this *30 lecture model* while reading my description below.

There are no video-taped lectures for this course; there are no powerpoint slides accompanied by audio explanation; there are no required textbooks to purchase. Instead, we have *Course Notes* posted online. Twenty-three chapters comprise the *Course Notes*. As a rough guide, one chapter in the *Course Notes* presents the amount of material that would be presented in a 75-minute lecture. Here we see one of the first advantages of our online course over the traditional course I previously taught. In a traditional course every lecture lasted 75 minutes, regardless of how much time I needed; in our online course, some *lectures* present, say, 55 minutes of material, while others present 90 minutes of material. There are four exceptions to our *one chapter equals one lecture* guide; namely, the amount of material in each of Chapters 5, 12, 15 and 16 is, again roughly, appropriate for two lectures. Thus, I designed the 23 chapters of the *Course Notes* to match what I would cover in 27 lectures.

Your (formidable) job in this course is to learn the material by reading the *Course Notes* and, when needed, obtaining help from me, the TA or classmates. I believe that the *Course Notes* will work well for this self-learning, but I can’t really be sure! This entire class is something of an experiment. The TA and I are committed to making sure that you receive enough assistance to succeed in the course, keeping in mind that success will require effort and ability on your part.

The various chapters of the *Course Notes* possess similar formats. First, I present the new material. I prefer to teach via examples rather than vague or difficult abstractions. (Admittedly, abstractions need not be either vague or difficult, but mine frequently are!) As a result, I present one or more examples of the new material—one if the material is easy, more if needed. Next, I usually have a chapter section devoted to computing. Unless you enjoy writing your own computer programs—I can’t please everyone—you will be thrilled to learn that all the complicated computations I require of you can be performed with a collection of easy-to-use websites. The various chapter sections on computing guide you through the use of these
websites. After the computing section, there is a section that summarizes the chapter’s material. After the summary, there is a section of practice problems followed by a section of solutions to the practice problems. The chapter then ends with a section of homework problems.

The examples in each chapter prepare you for the practice problems; the practice problems prepare you for the homework problems; and the homework problems prepare you for the quizzes and final exam; see details later in this document.

When the course begins, you should check Learn@UW at

[https://learnuw.wisc.edu/](https://learnuw.wisc.edu/)
on a regular basis for deadlines, schedules and announcements concerning the course. Three dedicated professionals at the Division of Continuing Studies and I are working on developing our Learn@UW site. As a result, I cannot give you its details at this time. My expectation is that the information I provide in this document will not change.

## 2 Accumulating Course Points

During the semester you will have several opportunities—described below—to earn course points. At the end of the semester your course points are totaled and your course grade is a function of your total course points. The maximum number of course points possible is 190, as described in the following table.

<table>
<thead>
<tr>
<th>Source</th>
<th>Maximum Number of Possible Course Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
<td>120</td>
</tr>
<tr>
<td>Quizzes</td>
<td>60</td>
</tr>
<tr>
<td>Homework</td>
<td>5</td>
</tr>
<tr>
<td>Project</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>190</td>
</tr>
</tbody>
</table>

See below, however, exceptions for which the points possible on homework and the project are increased. Note that approximately 63% of the 190 points come from the final exam. Thus, please do ask me during the semester, “What is my grade so far?”

Let me tell you a bit about the four categories of course points in the above table.

### 2.1 The Final Exam

The final exam will cover the whole course, Chapters 1–23 of the Course Notes. The final exam will be in-person; contact me if this will be a hardship. The exam will be closed book; you need to bring: a calculator with a square root button, writing utensils and your WISCARD photo id. At the final I will distribute approximately 6–8 pages of notes for you to use. As the semester progresses, I will periodically update and post the notes for the final. Obviously, you don’t need to memorize anything that is in the notes.

### 2.2 The Quizzes

There will be 12 online quizzes, two per week for the first six weeks of the course, according to the following schedule:
Week | Quiz No. | Chapters | Must be finished by 11:59 PM on Monday
---|---|---|---
1 | 1 | 1 and 2 | June 24
1 | 2 | 3 and 4 | June 24
2 | 3 | 5 | July 1
2 | 4 | 6 and 7 | July 1
3 | 5 | 8 and 9 | July 8
3 | 6 | 10 and 11 | July 8
4 | 7 | 12 | July 15
4 | 8 | 13 and 14 | July 15
5 | 9 | 15 | July 22
5 | 10 | 16 | July 22
6 | 11 | 17 and 18 | July 29
6 | 12 | 19 and 20 | July 29

Let’s look at week 1 above. After you feel comfortable with the material in Chapters 1 and 2, you should take quiz 1. After you feel comfortable with the material in Chapters 3 and 4, you should take quiz 2. You must complete both of these quizzes before 11:59 PM on Monday, June 24. Late quizzes will not be allowed. I have not created the quizzes yet, nor have we determined all the logistical details. I can say, however, that a well-prepared student should be able to complete a quiz in less than 25 minutes. If we put a time limit on a quiz, it will be much larger than 25 minutes; likely an hour. In other words, I am not interested in whether you work fast.

If you look at the table above, and remember that Chapters 5, 12, 15 and 16 are twice as long as the others, then you will see that each quiz covers two lectures of material. Thus, each quiz is similar to a weekly quiz you might have during a full 15 week semester.

As I have been planning this course, I have been asked frequently: “Bob, why don’t you have one quiz per chapter?” I have two reasons:

1. Taking a quiz in Statistics is—at least a bit—traumatic. I prefer to traumatize you 12 rather than 20 times.

2. More seriously, for the most part the chapters paired in quizzes cover very similar material. Chapter 2 is a continuation of Chapter 1, Chapter 4 is a continuation of Chapter 3, and so on. There are, however, exceptions: Chapters 8 and 9 are quite dissimilar.

Each quiz will be worth six points. I grade in one-half point increments; thus, the possible points on a quiz are 0, 0.5, 1, ..., 5.5 and 6. You may have noticed that

$$12 \text{ (quizzes)} \times 6 \text{ (points per quiz) } = 72 \text{ (points)},$$

not the 60 points listed earlier. Why? Because I will drop your two lowest quiz scores. If you end up being perfect on every quiz and think that dropping two scores is unfair, see Section 3.2.

The questions on the online quizzes primarily will consist of the types: multiple choice, matching and short (one or a few word(s)) answer. Some questions will require some computation. Thus, when you take an online quiz, you should have a calculator with a square root button, writing utensils and some scratch paper available. Also, you may use your notes during the quizzes. You may not talk to your classmates, friends, acquaintances, total strangers, anybody about any quiz until after its deadline—see table above—for completion has passed. At this point I am uncertain about the exact mechanism we will use to provide you with feedback on your work on the quizzes, other than reporting your score to you.
Finally, note that quizzes end after week 6 and Chapter 20. Chapters 21–23 are covered on the final exam, but I want you to have additional study time—without the burden of quizzes—during the final two (calendar) weeks of the course.

2.3 Homework

There will be 20 homework assignments, one each for Chapters 1–20 of the Course Notes under the following schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Chapters</th>
<th>Due at 11:59 PM on Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1–4</td>
<td>June 21</td>
</tr>
<tr>
<td>2</td>
<td>5–7</td>
<td>June 28</td>
</tr>
<tr>
<td>3</td>
<td>8–11</td>
<td>July 5</td>
</tr>
<tr>
<td>4</td>
<td>12–14</td>
<td>July 12</td>
</tr>
<tr>
<td>5</td>
<td>15–16</td>
<td>July 19</td>
</tr>
<tr>
<td>6</td>
<td>17–20</td>
<td>July 26</td>
</tr>
</tbody>
</table>

Make sure you understand the above display. In week one, for example, there are four separate homework assignments and each one is due no later than 11:59 PM on Friday, June 21. Late homework will not be accepted, but, of course, you can always appeal (my dog ate my homework). I want you to submit your homework electronically; if this would be a hardship for you, let me know and we will explore other arrangements. I am sure that we can work this out.

Each week at 12:01 AM on Saturday, the solutions to the week’s homework will be posted. After your homework is submitted, we will give it a very cursory examination and, if we decide that you made a good effort to complete the problems, we will give you one homework point—not to be confused with course points, keep reading. Note that even if all of your answers are wrong, if you made a good effort you will receive one homework point. Indeed, because our inspection of your work will be very cursory, we might not notice how many solutions are incorrect or less-than-ideal. It might be obvious by now, but because we are not going to inspect your homework carefully, we will not be returning it to you. Thus, it will be your job to check your homework against the posted solutions. If you are not able to understand a solution, you may—of course—seek help from me, my TA or a classmate. Indeed, the main reason for my casual approach to homework is that I want to encourage you to work together on homework—but not, of course, on quizzes—without fear that you might be cheating.

At the end of the course, homework points will be converted to course points according to the following scheme:

<table>
<thead>
<tr>
<th>Homework Points</th>
<th>Course Points</th>
<th>Homework Points</th>
<th>Course Points</th>
<th>Homework Points</th>
<th>Course Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–20</td>
<td>5.0</td>
<td>12–13</td>
<td>3.0</td>
<td>6–7</td>
<td>1.0</td>
</tr>
<tr>
<td>17</td>
<td>4.5</td>
<td>11</td>
<td>2.5</td>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td>15–16</td>
<td>4.0</td>
<td>9–10</td>
<td>2.0</td>
<td>0–4</td>
<td>0.0</td>
</tr>
<tr>
<td>14</td>
<td>3.5</td>
<td>8</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.4 Project

You may submit one extra credit project. Details of the assignment are provided in another document. The project report must be submitted electronically on or before 11:59 PM on Thursday, August 1. The
maximum score on the project is five points. Late projects will be accepted, but will lose one-half point for every 12 hours, or portion thereof, that it is late. Thus, for example, there is no reason to submit a project report after 12:01 PM on Tuesday, August 6, because it will lose five points for being five days late.

3 Determination of the Course Grade

I don’t know the exact relationship that I will use to convert course points into a course grade. I can, however, promise that the relationship will be no more severe—see what this means below—than given in the following table.

<table>
<thead>
<tr>
<th>Total Course Points</th>
<th>Course Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>175.0–190.0</td>
<td>A</td>
</tr>
<tr>
<td>165.0–174.5</td>
<td>AB</td>
</tr>
<tr>
<td>150.0–164.5</td>
<td>B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Course Points</th>
<th>Course Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>135.0–149.5</td>
<td>BC</td>
</tr>
<tr>
<td>120.0–134.5</td>
<td>C</td>
</tr>
<tr>
<td>0.0–99.5</td>
<td>F</td>
</tr>
</tbody>
</table>

Here is what I mean by no more severe. If you score 175.0 or more course points, then you will definitely receive an A in the course. I might lower the cut-off for an A from 175.0, but I will not raise it. Similarly, if you score 120.0 or more course points, then you will definitely receive a C or better for your course grade.

3.1 An Example of Poor Numerical Reasoning

A student reads this document and concludes,

The homework and the project combined are barely 5% of the 190 possible course points. Thus, I will not submit them.

The five course points from homework are a reward for keeping up in the course. In order to be successful in the course you will eventually need to learn the material. If you do it in a timely manner, you earn an easy five course points. Also, it is pretty easy to earn at least four course points on the project; typically in my course, a majority of students who submit a project report earn the full five points.

Thus, rather than compute percentages, here is a better way to look at the 10 possible course points you can earn from the homework and project.

1. If you are an eccentric genius who can’t be bothered with trivial matters like homework and project reports, you can still earn an A in the course if you score 175.0 or more on the quizzes plus final exam.

2. If you are not eccentric, then note the effect of 10 extra points in the table above. If your exam plus quizzes points put you in the AB category—between 165.0 and 174.5—then an additional 10 points moves your course grade up to an A! In fact, in many—though not all—cases, 10 course points on homework plus project will increase one’s course grade by one-half of a grade.

3.2 Two Exceptions

Even though I don’t explicitly use the name—think of Lord V in the Harry Potter stories—I view homework and the project as extra credit. With this point-of-view, my system favors stronger students. For example, if you find this course to be easy, then you won’t miss many points on the tests and 10 points of extra credit is
a substantial amount. If, however, you struggle to score 50% on the tests, then you are losing lots of points and 10 additional points are not so meaningful. Thus, I make the following modification to my grading method.

If your total course points, as discussed above, puts you in the BC or C grade range, then I will increase both your homework course points and project course points by 50%; for example, from a maximum of 10 points to a maximum of 15 points. Similarly, if your total course points puts you in the D or F grade range, then I will increase both your homework course points and project course points by 100%; for example, from a maximum of 10 points to a maximum of 20 points.

Let’s look at a couple of examples. Suppose that I use the most severe curve given above, where, for example, the cut-off for a B is 150.0 points. Consider a student with 146.0 points. If at least eight of these 146.0 points come from homework plus project, then at least four points are added to 146.0 (50% of at least 8 is at least 4) and the student’s grade becomes a B.

Let’s again look at the most severe curve, which requires 120.0 points for a C. Consider a student with 112.0 points. If at least eight of these 112.0 points come from homework plus project, then at least eight points are added to 112.0 and the student’s grade changes from a D to a C.

This is the first exception promised in this section’s title.

The other exception is more complicated to explain and possibly won’t affect anyone. I include it for students who are unhappy with my policy of dropping the two lowest quiz scores. I won’t explain the adjustment in great detail, I will just give you one example.

Suppose that consistent Ralph takes all 12 quizzes and obtains 11 fives and a four for his quiz scores. He is credited with 50 course points—his 10 best quiz scores—and throws away 9 out of 12, 75%, on the remaining quizzes. Let’s further assume that Ralph has a rough time on the final and scores 50%—60 out of 120. Now Ralph would no doubt be happy if I added nine points to his score, giving him 69 on the final. Sadly for Ralph, I have made the executive decision that nine points is too many to add. Instead, I will add three points. Three points may not sound like much, but depending on how much extra credit he has earned, it might raise his course grade.

So, why do I give Ralph three additional points? I will describe my reasoning. I am willing to replace 12 of the points on Ralph’s final exam by his dropped quiz scores. Ralph would like me to replace 12 points that he got wrong, but, in the spirit of Statistics, I replace 12 representative points by his nine forgotten quiz points. Because Ralph scored 50% on his final, this means that, on average, he scored six points out of every possible 12. Thus, it is this six points that I replace by nine, resulting in an increase of three points. Of course, I will not make this adjustment if it would decrease Ralph’s final exam score.