

# Notes and Tips for New Instructors at UCSD Physics

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Here are some tips and information for instructors at UCSD, in Physics. They may be especially helpful to new or first-time instructors at UCSD. These notes would have saved me many hours of struggling during my first two quarters teaching at UCSD. If you find them helpful, please let me know at emichels at physics dot you know where.

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## Student Privacy (Required by Federal Law)

Download your class list from Blink, and it becomes your master grading spreadsheet.

It is a felony to post grades by any identifier other than a random quiz code. You cannot use student ID, name, email address, social security number, or anything else.

In my master spreadsheet, I color the **Student ID**, **Name**, and **email** red. I use a separate worksheet called “print”, into which I paste the grades and from which I make the PDF for posting. If I ever see red in my “print” worksheet, or in my pdf, then I know I’ve violated privacy.

Because of this, *we should discourage Math Placement from putting student names by hand into quiz code fields*, since this puts private information into a public data field. It is too easy to accidentally post the “quiz codes” which inadvertently include student names. In principle, this violates the law.

More on communication policies: <http://adminrecords.ucsd.edu/ppm/docs/160-3.html> .

### Email and Privacy:

When emailing about grades, absences, or any other private topic, instructors *must* use the student’s official UCSD email address to protect his privacy, because anyone can make up a gmail/hotmail/yahoo account to masquerade as a student.

When discussing non-private topics, such as course material, any email address is fine.

## Course Startup Checklist

Before your first lecture, consider the following preparations. Some steps are described in more detail later:

1. **Three months before class:** order any custom edition of the textbook. This gives the students the best price. Remember that the bookstore adds 33% (25% margin) to the publisher’s price; the students see this marked-up price.
2. **Several weeks before class starts:** Be sure you are the instructor of record listed on the Schedule of Classes. You need this to request TED sites, podcasting, etc.
3. Be sure your TA is 50% = 20 hr/wk (and not less).
4. **A week before class starts:** Request a TED site. Give the TA “TA: Course Builder and Grader access”.
5. Post syllabus on TED, and send it to OASIS (if needed). Select on the left Customization, Tool Availability, disable “Course Messages” and “Email” from students. In Full Grade Center, delete the “Weighted Total” column, and probably the “SectionID” column. Hide the “Total” column from students (see below). Add a test student: Course Tools, Add Test Student.

6. Create any other online course site, e.g. Mastering Physics from Pearson Publishing. Make your TA a “grader”.
7. Request course reserve for text from the library. Give library a copy of the text, if needed. At your request, they will return it at quarter’s end, with significant wear. Go to <http://libraries.ucsd.edu/resources/course-reserves/submit-a-course-reserve.html> (or <http://libraries.ucsd.edu>, and follow the links for Instructor resources). Or ask the Science and Engineering reference desk.
8. Request podcasting at <http://podcast.ucsd.edu/Agreement/>.
9. Test any equipment before classes start: especially your computer, and its video and audio connection to the room system.
10. Reserve a room for your office hours, for when they won’t all fit in your office.
11. Install and test iClicker software. It doesn’t always work.
12. Request your demonstration equipment for the first week.
13. Prepare at least 1.5 lectures of material (so you have cushion).

## Teaching Assistant

I send an email to my TA at the beginning of the quarter, similar to this:

Hello, Mr./Ms. xxxx.

I’m told you will TA my class this coming quarter. Glad to have you. If possible, I’d like to meet with you before class starts. I’m here today (Monday), Tuesday, and Wednesday. Can you meet me one of those days?

Until then, I’d like to mention a few things quickly:

My main focus is on helping the students learn effectively. I will need your help for that.

Please use email to send me files, and do not give my contact information to anyone, any third party or web site, outside of students in the class. Do not use any web services for file sharing, and do not give them my email address. Note that free file sharing services do NOT meet UCSD’s requirements for security of private information.

It’s best to call me on my cell: 619-890-0519; my office is SERF-317 (3<sup>rd</sup> floor, north hall), 858-822-2018. Please send me your office location, office phone, a cell phone number, if you have one, and what your Physics Tutorial Center hours are. I will give your email, office location, office hours, and Tutorial Center hours to the students. Some TAs query the class before choosing their office hours.

If you can, I’d like you to introduce yourself to the class the first day (Monday). If you can’t make then, let’s do it as soon as possible.

Throughout the quarter, I’d like you to do these things (with my estimated maximum hours per week in parentheses):

- Conduct a Discussion session for 1 hour per week. The Discussion session is on the Schedule of Classes. (2 = 1 preparation + 1 session)
- Conduct a Problem session for up to 2 hours per week. The department will schedule the Problem session in the first week of classes. (2)
- Have office hours: 2-3 hours/week. Please let me know by start of class when you can have those, and where. They can be in the Tutorial Center outside of Tutorial Center hours, but must be elsewhere during Tutorial Center hours. (3)
- Post HW solutions (2)

- I also need you take each quiz before I finalize it, so we can compare our answers. If we disagree, we discuss our results until we reach consensus. (1 hr/2 weeks)
- Help proctor the quizzes. Afterward, you will collect all the Scantrons, feed them through the reading machine, and keep them throughout the following quarter. You send me the Scantron response file. I wrote my own grading program that relieves you of the need to make answer sheets. (You can read about it on my web page.) I will probably run this grading program myself, and make an Excel chart for each exam. If students have some urgent reason to see a Scantron, they will work that out with you for a time convenient for you. (1)
- Post quiz solutions (2)
- I believe the department requires you to work 2 hours/week in the Tutorial Center. (2)

This adds up to an estimated maximum of 14.5 hrs/week.

Rarely, a student will insist on seeing his Scantron form after an exam. You will keep all the Scantrons. The burden is on the student to work out a time that is convenient for you. The student must search through the stack for their own form, but because of the sensitivity of exams, you must oversee their effort to make sure it is proper.

Though you don't need to, if you are interested, you can see my full set of instructor notes at [http://physics.ucsd.edu/~emichels/instructor\\_notes.pdf](http://physics.ucsd.edu/~emichels/instructor_notes.pdf).

Please feel free to talk with me about anything. Thank you.

## OSD: Office of Students with Disabilities

Based on my conversation with OSD representatives: Any student must meet with you before or during the first week of class, and [you together determine whether the student's accommodations can be accepted for your class](#). OSD is very supportive of instructors and the integrity of classes; you are not required to lower your standards for the class. For example, some AFA (Authorization For Accommodation) letters allow for up to 2 days extra time for homework assignments. However, the Math department posts solutions to HW immediately after it is due, and therefore never allows that particular accommodation. Also, every individual request for extra time should be worked out with you ahead of time. Students are not permitted to miss a deadline, and then claim they are entitled to an extension (as happened with me).

Most OSD accommodations are for either 1.5X or 2X time for exams. Others I've seen are for larger font on the exam, and extra time for some homework.

More on OSD TBS (To Be Supplied later).

## Grading

I use Excel for my master grade list, because the calculations we use in Physics exceed the capabilities of any online grading system I've seen (e.g., TED). I download homework scores from Mastering Physics to my Excel workbook. I then upload all grades from Excel to TED so the students can see their grades.

UCSD has + and - modifiers only for grades of A, B, and C. Grades of D and F cannot have + or -.

**Class average:** A Vice Chair for Education in the physics department suggested making a B- be the class average. I generally make the class average be the dividing line between B- and C+, but reduce the lower cut-line for a C-, so that only a small fraction of students get D or less. Note that for students required to take physics classes by their majors, they must get a C- or better to "pass". D or lower does not satisfy their major requirement. Another professor recommends giving ~25% A's, ~50% B's, and ~25% C's, with only a few D's and F's. For a symmetric distribution, this would give a class average grade of B, which seems a little high to me. Note that I've never seen a symmetric distribution; especially for large classes (>~ 150 students) there is a long tail at the low end, which lowers the class average grade. This makes the two grading methods above produce fairly similar results. In 2014, the average "GPA" for a lower-division physics class over the last 7 years was ~2.8.

**Grade change:** It is possible to change a grade after final grade submission, for up to (I think) one year. For unknown reasons, however, UCSD does not allow changing a letter grade to an I (incomplete). This means you should post grades on the course web page by the day before final grades are due, and require students to submit grade questions before final grades are due. Many student questions that require time to resolve might be better handled with an I, since D or F grades may prevent some students from enrolling in the next quarter.

On the course web page, before the link to the posted final grades, I put: "I choose the grade cuts considering many factors. After that, grades are calculated, not negotiated. To be fair to everyone, the spreadsheet calculates grades. Final grades are already submitted, and as required by UC policy, can only be changed in the event of clerical error. Please do NOT ask me to change your grade."

**Egrades:**

- Login at [eGrades.ucsd.edu](http://eGrades.ucsd.edu)
- For detailed information about eGrades, please see the eGrades Page: <http://blink.ucsd.edu/instructors/academic-info/grades/egrades.html>
- If you would like assistance please contact [eGrades@ucsd.edu](mailto:eGrades@ucsd.edu) or (858) 534-3144

Academic Records Registrar's Office

**Posted grades:** For final letter grades, I recommend you do *not* post the final total numerical scores or percentages. This only invites complaints and arguments from students. Inevitably, lines between grades must be drawn, and two students may differ by only a fraction of point, but one gets a C+, and the other a B-. It's an imperfect world.

## Grade of Incomplete

Occasionally, a student will request an Incomplete grade. (There is a 7-sentence policy on Incomplete at <http://senate.ucsd.edu/manual/Regulations/SDRegulation500.pdf#IGrade#500b>.) You get to decide whether to grant it or not. Often, a student getting an incomplete will miss the final exam. It is typically not feasible to create an entire, separate final exam for one or two students. [I have been informed that the following procedure is deprecated by UCSD policy, but I know of no feasible alternative.] Therefore, the physics department sometimes has the student take the next quarter's final exam with the next quarter's class, at the standard time. Then you must incorporate that grade into the student's work in your class. I typically send the student an email such as this:

You are currently passing my class, which is a requirement for receiving an Icomplete grade. I will allow you to take an incomplete (I) for now for Physics 2B (Winter 2014??). If you do not take my final exam this quarter, you must complete the course by taking one of the regularly scheduled Physics 2B final exams at the end of next quarter (Spring 2014??). Note that such an exam will likely cover somewhat different material, and have different policies on exam conditions, but I will figure it into the rest of your grades from my class.

It is your responsibility to arrange to take the standard, end-of-quarter final exam from a physics 2B instructor next quarter. You will take it with the rest of next quarter's class. You must arrange that with next quarter's instructor, taking into account your final exam schedule for next quarter, and that of next quarter's Physics 2B final exam. Let me know when you have done so. I will arrange to get your score from the instructor, and update your final grade. Note that if you do not contact me or do not complete the course by the end of next quarter, UCSD will automatically change your grade to F. I have no say in that policy.

Please direct any policy questions to your college, as I am unable to answer policy questions.

To help clear up any disputes, you should save all correspondence with the student for at least two full quarters after the end of your class.

## Academic Integrity/Cheating

Rarely, someone will attempt to cheat. I've had students lie about turning in a whole quarter's worth of homework, and about taking the final exam when they didn't. Please contact the Academic Integrity Coordinator at [aic@ucsd.edu](mailto:aic@ucsd.edu) (currently Tricia Bertram Gallant), or Michael Anderson if you have any questions. Both have significant experience in such matters, and good tips for what you can do. I'm also willing to talk with you, though the others are more qualified.

Sometimes students look around too much during an exam, but do not appear to be cheating, or it is not clear that they are cheating. On the spot during the exam, I remind them to keep their eyes down, or up at the ceiling, but not to look around. If I think someone *might* have been cheating, I require them to sit up front for the rest of the exam, and for all future exams. I often use an email such as this:

Some students look around a lot during exams, and most often this is an innocent habit. However, I must move such students up front, so I can properly monitor the rest of the class. Please sit in the front row for all subsequent quizzes and the final exam. Thank you for your cooperation.

Providing such an explanation helps avoid an angry response from the student, which serves no one.

After you report suspected cheating to the Academic Integrity Coordinator, the student's Dean will meet with the student, and report to you the result, including any penalty imposed by the Dean. However, you must choose the penalty for the student's course grade. There is no rush to decide the course penalty. Because of the way grading is adjusted for overall class performance (i.e., "curved"), I usually cannot decide the final penalty until all grades for the course are in, including the final exam. I sent the following email once to a student who had cheated, but cooperated and admitted it to his dean:

I spoke with your dean today about your Quiz 4 behavior. She mentioned that you were concerned that I might fail you outright, and I want you to know that I have decided not to do that. We cannot say exactly what the final response will be until after the final exam. Therefore, it is to your advantage to do your best on the final exam. I will give you more information as soon as it is available. I hope you will make the most of your educational opportunities in the future.

## Other Issues: Podcasting, Prerequisites, Student Info, Class Roster

**Podcasting lectures:** It is a big help to students if you podcast your lectures, including "video" (your computer projection). It's free and trivial: just fill in a simple form with ACMS (Academic Computing and Media Services). Search for "ACMS podcast lecture" in Blink, or go to <http://podcast.ucsd.edu/info/>. Not all rooms can podcast your video (e.g., slides). Check which rooms you get, and request one with video.

**Waiving Prerequisites:** From Dr. Paar (Vice Chair of Education at the time):

Date: February 28, 2012 6:03:17 PM PST

To:

Cc:

Subject: Prerequisites

Dear Colleagues,

There are a number of students who request a waiver for not having satisfied the Math prerequisites for Physics 1 and 2.

It is the prerogative of the instructor to waive prerequisites but I want to caution you against doing it routinely. The waiver is intended for students who satisfy the prerequisites but the registrar's records do not show that when they attempt to register for the course. This may happen for example when students have taken prerequisites elsewhere and there are delays in transferring credits to UCSD's registrar. The waiver is not intended to help students who have poorly planned their curriculum or who have failed the prerequisite.

Please do not grant a waiver without a satisfactory reason. Routinely granting a waiver often leads to a student doing poorly in the course. The student will then often blame the course or the instructor or even worse: the Physics discipline as being “difficult”.

**Student information:** As an instructor, you have full access to a UCSD student’s information on record: academic history, grades, GPA, home addresses, guardians and their contact information, emergency contact information, etc. It is unlikely you will ever need any of this.

**Class Roster:** For clickers, you’ll need a roster with their student IDs. As of 1/2011, you need your business systems password, which may be different than your UCSD email password (UCSD is always changing their password systems). You also need your class section #. From the UCSD web page, choose the Faculty & Staff drop down menu, student class info (<http://blink.ucsd.edu/instructors/index.html>). On the right you see student/class info toolbox and second down is class lists.” Fill in your section, choose “Standard,” then click “download”. Open the file to make sure it has all the fields (my first copy had no PIDs, which are student IDs). [I don’t think you need this any more; ELM 2/2014: If you use clickers, also download a TED format version which you will convert to the iclicker roster.]

## Other Excel Tips

See also the section on Quiz codes, under Quizzes and Exams elsewhere in this document.

To auto-fit multiple column widths: select the columns (from the top), and right click the right edge of any selected column in the column label row (next to the column letter).

Don’t paste or sort any grades by hand. Excel can do it all automatically:

**VLOOKUP( ):** You can use this to get a grade from an unsorted table of grades, for example, by looking up the Student ID, or quiz code, or whatever you want. If you use scangrade (I highly recommend it), use **VLOOKUP(SID, Am:Fn, 6, 0)** to get % score by SID.

**Histograms:** In practice, there is a better way to generate histograms than the Excel FREQUENCY( ) function. Use the COUNIF( ) function:

TBS??

The Excel function FREQUENCY( ) generates the bin counts for a histogram. The help is somewhat unclear. It is an “array function”, so you have to enter it in a special way. First, put your bin boundaries in a range of cells (FREQUENCY counts values <= the boundaries). Type in the FREQUENCY function in the formula bar, select the range of cells you want the bin counts to occupy, and press CTRL+SHIFT+ENTER. Now you have the bin counts from which you can make a histogram.

## iClickers

**4 weeks before class starts:** be sure the bookstore and Patty Hey know you’re using clickers. You’ll need a ‘roster.txt’ file with comma separated “last-name, first-name, student-ID”. From the Excel WebCT format roster, delete the unused columns. Move the PID column to after the first-name column (use “cut”, then “Insert cut cells”). Save as a roster.csv file, then rename it to roster.txt, for the iGrader program.

### Most common FAQs I’ve gotten:

(1) I can’t read my iClicker ID; how do I find it out? Run iClicker.exe, and either:

(a) Use the “lend iClicker” function in iClicker software (I haven’t seen this work).

OR (b) Choose “Settings and preferences”, Polling Session, and check Response Grid: show response grid. Then start a poll. Every iClicker ID is shown when the student pushes the button, and changes color for each subsequent button push. You can easily find my IDs quickly this way. Be sure to set back to “Do not show response grid” when you’re done.

(2) Can I share my iClicker with someone in another class?

From <http://iclicker.com/dnn/SupportCenter/FAQs/tabid/179/Default.aspx> :

Students

Download All Student FAQs

Basics

1. Why is a clicker required for my class?
2. How do I turn on my i>clicker?
3. What if I bought a used book and the bookstore only has i>clicker remotes in new book packages?
4. How long will my batteries last?
5. How do I change my batteries?
6. What if I forget to turn off my i>clicker?
7. Will my i>clicker remote work in other classes?
8. Can I share my i>clicker remote with my roommate/friend?  
Yes, as long as you are not taking the same class at the same time.

For TED and iClickers: <http://acms.ucsd.edu/units/iwdc/iClickers.html>.

**iClicker.exe bug:** The new iClicker v6.2.4 crashes on my computer before 3 questions have been answered. iClicker confirmed that they've seen this on other computers. I work around this by running the old iClicker.exe v5.5.2 and iGrader, but I must use the new iGrader/UCSD system to download the clicker registrations from TED. This means:

- I need both versions of iClicker and iGrader on my machine, but that is no problem. They only need to be copied to any directory; they don't need to be "installed."
- However, you need to "create" your course in both versions of iClicker.
- To move the registrations from TED to the old iGrader, update the registrations with the *new* iGrader per the Blink/TED/iClicker instructions. This will create a file called something like RemoteID\_Copy\_1\_31\_2014\_17\_04\_28.csv in ...iClicker\iclicker\_v624\_Win\iclicker Win v6.2.4\Classes\your course name\SessionData\. It will also give you a message with an incorrect filename, gb\_export.csv; ignore that.
- Copy the RemoteID\_Copy\_... file to the same place in the *old* iClicker directory tree, but call it RemoteID.csv. The old iGrader will now recognize the registrations.



## **Textbook**

It is the instructor's responsibility to choose the textbook (at least, for the 2-series and higher). In lower division physics, you typically use a subset of a big, comprehensive physics book. The whole hard-cover book would cost ~\$300, but the UCSD subset usually sells for ~\$110. To get the subset, you must have the publisher print a Special Edition just for UCSD. If such a subset has already been printed by a previous instructor, your job is much easier: you can order more of that book by referencing its ISBN (International Standard Book Number).

If your subset is new, you must arrange with the publisher to create the subset you want. The publisher will give it a new ISBN, which is globally unique. Also, for a subset of a standard book, see if you can get the "Answers to selected problems" included for your chapters. Usually, the answers get forgotten about in book layout, and do not appear in the custom book.

See below if you also use "Mastering Physics" (MP) from Pearson Publishing, because they offer discounted combination book/MP access.

## **Mastering Physics (from Pearson Publishing)**

I create the course, and let it ask for student IDs, which is the default. (I once used email addresses for identification, but that provided no benefit, and is more error-prone).

Be sure to change the Homework Grading and Presentation settings, and check the "Use the above settings as defaults ..." box in the lower right.

For my Physics 2B class in Fall 2016:

\$66	From Pearson: Mastering Physics alone, no book.
\$116	From Pearson: Mastering Physics, including an eBook of the full Knight 4 <sup>th</sup> ed text, valid for two years.
\$133	From UCSD bookstore: Mastering Physics, plus the paperback custom excerpt of Knight for 2B.

## **TED**

I used TED for the first time in Spring 2012. These are notes to myself for getting started. TED gets revised regularly, so some of these instructions may be out of date now. Consult <http://acms.ucsd.edu/faculty/ted/index.html> for current information.

Thanks to Chad Kishimoto and Aleks Diamond-Stanic for their substantial help with TED.

### **Getting Started with TED**

There are probably only 3 things you need to get started (directions below): Add your TAs/Graders/Co-teachers (as TA: Course Builder & Grader access), Announcements, and Content. You probably also want to disable "Course Messages" and "Email" from students, and have them just send email, as usual. Also, in the Grade Center/Full Grade Center, delete the "Weighted Total" column, and hide the "Total" column from students (with "Edit Column Information," and set "Show to Students" to "No." Then you can set "Hide column" so it doesn't annoy you, either.

**Announcements:** Announcements can be permanent, or time limited. Create them with (on the left) Home Page, (in the announcements pane) More announcements, Create Announcement. **Annoyance:** you probably want to turn off the date-restriction for most announcements, otherwise TED complains when you try to submit the announcement.

**Content:** Post a PDF with (on the left) Content, Build Content, File.

It's not obvious if you can make the syllabus appear automatically when students login.

**Course Messages and Email:** You probably want to disable “Course Messages” and “Email” from students, and have them just send regular (non-TED-based) email, as usual. TED-email allows students to spam the whole class. If you leave messages enabled, some students will try to use it, and you will never see their messages. To remove it from Students, select on the left Customization, Tool Availability. There will appear a long list of tools, in alphabetical order. Find “Course Messages” and “Email” uncheck the “Available” box.

## Other Common TED Features

**Test Student:** You can create a test student with “Course Tools, Add Test Student.” This allows you to login as a student and see what the TED page look like to students.

**Homework:** You assign online questions by making a “test.” Check “display link” or else it will appear, but inactive, on the course page. Don’t let it make an “announcement” for you, because it will say “test” when you post it (rather than “homework”), and the students will freak out.

To deploy a “test”, go to “Content”, “Assessments”. Edit the “display link” option from the Content page, click the drop down on the right, Edit test options. Edit a test description from Content, drop down, edit test, drop down on right of Test Canvas, Edit.

**Computer Scientific Notation:** TED has a bizarre bug where a numeric “answer” that uses exponential notation must use a capital “E”: 7.2E8, and *not* 7.2e8. In the latter case, TED silently discards the exponent, and incorrectly turns the number into 7.2. Oddly, this does *not* happen in the “range” field, which correctly accepts either “E” or “e”. This may fool you into thinking the bug is fixed, but as of 4/2013, the bug persists.

**Downloading and uploading grades:** First, you probably want to delete TED’s “Weighted Total” column, since it is completely meaningless, and misleads students. If you leave it up, you will get email from students asking why their “Weighted Total” grade is wrong. Similarly, you want to hide the “Total” column (different than “Weighted Total”) from students, since it is also meaningless, and will generate time wasting email for you. Inexplicably, TED does not allow you to delete the “Total” column, but you can hide it from students. In the drop down by the column title, choose Edit Column Information; then section 3 Options has a “hide from students” radio button. Note that choosing “Hide Column” from the drop down hides the column from *you*, not from the students.

(The following appears fixed as of 11/2013: TED has another bizarre bug where it puts junk at the beginning of the grades \*.csv file. This shows up as junk in the “Last name” column in Excel. You *must* remove this junk before uploading back to TED.) “The unique identifier used for each student is the student’s user name” [<http://help-archives.blackboard.com/Blackboard-Learn/9.1/SP08/EN-US/NAHE/Instructor/index.htm>], such as “emichelsen”. To upload, you must include the “username” column as downloaded from TED. It’s best to upload only new columns, without including any unchanged columns; this eliminates the chance of accidentally overwriting existing columns.

**Instructor Help is different than Student Help:** TBS

## TED Tips & Tricks

These are from a TED help page from c. 2013.

### File Security on TED: 'Unavailable' Files Are Not Secure

When you post a file or create a folder on a Content Area (e.g. the Content or Information pages), you have an option to make it "Unavailable". This removes the file from what students see on the content page, but does not prevent students from accessing the file via other methods. Thus, making files "Unavailable" should only be used as a convenience to help students focus on files that are relevant at a particular time or under particular circumstances.

... our advice is: If students accessing a file would cause problems (e.g. answers to the final exam), **don't post it on Ted.**

## Running the Scantron Machine

As of summer 2016, the Physics Department owns, maintains, and operates its own Scantron machine. As of this writing (11/2016), it is compatible with the Chemistry Department's machine. The two departments can help each other with any outages.

The Scantron software, ParScore, is often awkward and inefficient to use. I have developed work-arounds that make it much easier. In particular, certain problems require the operator to take time-consuming or impossible steps before proceeding. The most common are a missing Test Form or incomplete student ID. If you can't supply the missing information (and how can you supply a missing Test Form?), you must remove the response sheet and literally process it by hand at a later time.

My goal in using the Scantron is to scan all sheets, regardless of errors, as quickly as possible. I can then deal with any student errors on my own time in Excel. Of course, I penalize students one question for any error; following instructions is part of the exam. I get around ParScore's limitations in two ways:

- For a missing Test Form, I enter 'E'. This does not exist on our Scantron forms, but ParScore accepts it. ParScore requires I enter an answer key for Form E, so I enter dummy answers. It doesn't matter what they are, because the score will be invalid anyway.
- For any errors in Student ID: I retain as much information as I can, and use a lower case 'n' for any missing characters. Remember to have students use 1 for 'A' and 7 for 'U' in their student IDs. Note that ParScore allows you to not upload any roster, and then you can check 'auto-enroll' to have ParScore enter all the scanned student IDs into the file. I highly recommend this.

In my case, I use the 'testmake' and 'scangrade' utilities, so all my ParScore answer keys are dummies. Scangrade is much easier to use, and provides better statistics than ParScore. I then export just the raw response file from ParScore to my own computer. Scangrade reads and grades the raw response file (see Scangrade elsewhere in this document).

## testmake: Automates Randomized Test Generation

testmake takes a text input file of multiple choice questions and answers, and produces multiple versions (“forms”) of the test, called Form A, Form B, etc. Each form has the questions, and answer choices, in random order. testmake also produces answer keys in a file, which can be used by scangrade.exe for grading the Scantron answer files.

You create your input file with a simple text editor, or Word (saved as text). The testmake output is text, which can be LaTeX if you want, or can be copied and pasted into word processing programs, such as Word. [That’s how I use it.].

### New version 2.0

- Can calculate numeric answers and decoys using arbitrary arithmetic expressions that you provide.
- Can use your numbers, or create random ones according to your specifications.
- You can use the same numbers on each form, or have it create different numbers on each form.

### Using Testmake: Introduction

An example testmake command is:

```
testmake quiz1.txt >quiz1_mix.txt
```

By default, testmake creates 3 forms of the test, but you can override that with a number on the command line:

```
testmake quiz1.txt 4 >quiz1_mix.txt
```

A simple testmake input file looks like this:

```
A 150 gram swallow drops a coconut from 50. m. How long does it take to hit
the ground, in s?
3.2
10.
32
1.0
2.7

A train leaves UCSD at 10 am. It travels for 1 hour to LA. At what time
does it arrive?
11 am
11 pm
10 pm
12 pm
not enough information
```

The input questions must not be numbered; testmake provides numbers for the output questions, and provides letters for the answer choices. The above input produces the following output:

```
Form A
1. A 150 gram swallow drops a coconut from 50. m. How long does it take to
hit the ground, in s?
A) 3.2          B) 10.          C) 2.7          D) 1.0          E) 32

2. A train leaves UCSD at 10 am. It travels for 1 hour to LA. At what time
does it arrive?
A) 11 pm       B) 11 am       C) 10 pm       D) not enough information E) 12 pm
```

## UCSD Physics Instructors Notes

Form B

1. A train leaves UCSD at 10 am. It travels for 1 hour to LA. At what time does it arrive?

A) 11 am    B) 12 pm    C) 10 pm    D) 11 pm    E) not enough information

2. A 150 gram swallow drops a coconut from 50. m. How long does it take to hit the ground, in s?

A) 1.0    B) 32    C) 10.    D) 3.2    E) 2.7

Form C

1. A 150 gram swallow drops a coconut from 50. m. How long does it take to hit the ground, in s?

A) 32    B) 10.    C) 3.2    D) 2.7    E) 1.0

2. A train leaves UCSD at 10 am. It travels for 1 hour to LA. At what time does it arrive?

A) 11 am    B) 12 pm    C) 11 pm    D) 10 pm    E) not enough information

If you request only one exam, the “Form x” separator is omitted, so you can include the output directly into a word processing file, without any hand editing. For example:

**testmake quiz1.txt 1 >quiz1\_mix.txt produces:**

1. A 150 gram swallow drops a coconut from 50. m. How long does it take to hit the ground, in s?

A) 3.2    B) 10.    C) 2.7    D) 1.0    E) 32

2. A train leaves UCSD at 10 am. It travels for 1 hour to LA. At what time does it arrive?

A) 11 pm    B) 11 am    C) 10 pm    D) not enough information    E) 12 pm

You must create the input text with the correct answer for each question given first. testmake generates the answer keys from those. A keys file looks like this:

```
# seed = 1389893143
keya:DCBCB CEDAB
keyb:DABEB DDADC
keyc:CADED BDEAB
keyd:BBADC BDEEC
```

Lines that begin with “#” are comments. The seed is a pseudorandom generator initializer that you can use to reconstruct the keys file if you accidentally lose it.

**Platforms:** The previous version runs on Windows, Linux, and Mac. V2.0 exists for Windows, but needs only to be compiled to run on Mac and Linux. It is written in ANSI C++, so should port easily to other platforms.

**Figures:** testmake manipulates only text, which can be pasted into Word, Latex, or any other text-based processor. You handle your figures separately, any way you want. I put my figures in the front of a Word document, and label them Figure 1, Figure 2, etc. Then I reference the figures by number in the questions.

### Using testmake: Creating the Input File

The input file is text, and follows this format:

- Each question must be a single line, with no line breaks. This is the default format from MSWord when you save the file as ‘text’. Most text editors (e.g., Windows Notepad) can also do this easily.
- You must put the correct answer immediately after the question on a separate line.
- You may have as many decoy responses as you wish after that, each on a separate line.
- End the question with a blank line, or the end of the file (or a “.end” directive)

## Using testmake: Calculated Responses

testmake can automatically calculate the correct and decoy answers based on your numbers, or based on random numbers chosen from your specifications. You code your input text file a special way for such calculations. For example:

```
A bird has a mass of [m=5] g. What is its weight, in N?
.= m*1e-3*9.81 # convert to kg, then w = mg
.= m*9.81      # decoy: not in kg
.= m*1e-3      # decoy: no gravity
.= m/9.81      # decoy: not in kg, divided instead of multiplied
none of these
```

The square brackets in the question define a variable ‘m’, and give it a value. The value can be any arithmetic expression (e.g. “ $2\pi$ ”, or “ $\cos(30)$ ”). The “.= ” at the beginning of an answer tells testmake that the answer is a formula. testmake evaluates the formula, using the current values of the variables. As before, an answer that doesn’t start with “.= ” is just text. Thus the above question produces:

```
# seed = 130414859644788785

1. A bird has a mass of 5.00 g. What is its weight, in N?
A) 0.0491      B) 49.1      C) 0.00500      D) 0.510      E) none of
these
```

testmake formats all computed numbers as 3 significant digits. Normally, you edit out the “# seed” comment when formatting your exam text.

Now that you have a question with variables and computed responses, you can easily change the number in the question, re-run testmake, and all the responses are updated for the new numbers. For example, if you change the mass of the bird to 6 g, and re-run testmake, you get this:

```
# seed = 130414861468226285

1. A bird has a mass of 6.00 g. What is its weight, in N?
A) 0.612      B) 0.00600      C) none of these      D) 58.9      E)
0.0589
```

Notice that sometimes, you must hand-edit the result to eliminate unwanted line breaks. You would edit the above to be:

```
1. A bird has a mass of 6.00 g. What is its weight, in N?
A) 0.612      B) 0.00600      C) none of these      D) 58.9
E) 0.0589
```

In your calculated formulas, you can use most standard functions: sqrt, sin, cos, tan, sind (sin in degrees), cosd, tand, asin, acos, atan, atan2, log, exp, log10, etc. (The full list is below.) For example:

```
An amplifier has a voltage gain of [g=5]. What is its gain in dB?
.= 20*log10(g)
.= 10*log10(g)
.= log10(g)
.= log10(g*10)
none of these
```

produces:

```
2. An amplifier has a voltage gain of 5.00. What is its gain in dB?
A) 6.99      B) 1.70      C) 14.0      D) 0.699
E) none of these
```

testmake also includes some standard constants: pi, e, qp, me, mp, etc. See below for a full list.

### Multiple calculated results in a single response

Some questions require the student to compute two numbers. For example:

```
An amplifier has a voltage gain of [g=5]. What is its power gain, and gain
in dB?
.= [g^2] and [20*log10(g)]
.= [g] and [10*log10(g)]
.= [2*g] and [log10(g)]
```

```

.= [10*g] and [log10(g*10)]
none of these

```

Note that the computed responses now include square brackets. testmake treats each square bracket as a separate expression to be evaluated. The result is this:

1. An amplifier has a voltage gain of 5.00. What is its power gain, and gain in dB?  
 A) 5.00 and 6.99                      B) 25.0 and 14.0                      C) 10.0 and 0.699  
 D) none of these                      E) 50.0 and 1.70

### Using testmake: Debugging Your Formulas

Sometimes, your formulas will not produce the expected result, and you need to fix them. To help you do this, you can specify the “inorder” option to testmake, so all the questions and answers are in the order they appear in your input file. Then you can track down the errant formulas:

```
testmake quiz1.txt 1 inorder
```

When you specify “inorder,” testmake does not append to the “keys” file, since all the answers are “A”.

### Using testmake: Generating Random Numbers

You generate random numbers by simply using a random number function in your expressions. The most common random generator is “ranr(low, high, step)”, which picks a random value from “low” to “high”, in steps of “step”. For example, ranr(2, 10, 2) picks a random value of 2, 4, 6, 8, or 10. ranr(1.0, 3.0, 0.2) picks a value from 1.0, 1.2, 1.4, ... 2.8, or 3.0. For example:

```

A bird has a mass of [m=ranr(3, 9, .5)] g. What is its weight, in N?
.= m*1e-3*9.81
.= m*9.81
.= m*1e-3
.= m/9.81
none of these

```

might produce:

1. A bird has a mass of 7.00 g. What is its weight, in N?  
 A) 0.00700                      B) 0.714                      C) 68.7                      D) none of these  
 E) 0.0687

If you run it again, it will (probably) produce something different:

1. A bird has a mass of 3.50 g. What is its weight, in N?  
 A) 0.0343                      B) 34.3                      C) none of these                      D) 0.00350  
 E) 0.357

testmake generates the random numbers only once, and then generates all the forms from that one set of numbers. If you want to generate different numbers for each of form A through D, you run testmake 4 times. However, to keep the keys file correct, you must tell testmake which form you are making. For example:

```

testmake quiz1.txt 1 >quiz1_mix.txt
testmake quiz1.txt 1 form=b >>quiz1_mix.txt
testmake quiz1.txt 1 form=c >>quiz1_mix.txt
testmake quiz1.txt 1 form=d >>quiz1_mix.txt

```

The keys file then looks like this (note there is a different seed for each test form):

```

# seed = 130414879782601285
keya:AAAD
# seed = 130414879783382535
keyb:AGIA
# seed = 130414879783851285
keyc:AGBI
# seed = 130414879784320035
keyd:CADB

```

## Using testmake: Variables and Expressions

There are two kinds of variables in testmake: local, and global. Local variables are defined only for the one question in which they are declared. Local variables cease to exist at the end of that question (which includes its answers). This is to avoid accidentally using a variable from a previous question in a response to a new question (which happens a lot).

You define global variables with the `.eval` directive used before any question:

```
.eval twopi=2*pi, qe=-qp
```

The variables “twopi” and “qe” are now defined for all future questions.

Note that an “expression” can be a list of expressions, separated by commas.

You can create temporary *local* variables for your convenience. For example:

```
A right triangle has legs [a=3] m and [b=4] m. What is the smaller of the
two acute angles, in deg?
.eval r=sqrt(a^2 + b^2)
.= asind(a/r)
.= asind(b/r)
.= asin(a/r)
.= asin(b/r)
none of these
```

In this case, the variable ‘r’ is local, because it is declared within a question/answer sequence. It is deleted after this question. Testmake converts this into:

```
1. A right triangle has legs 3.00 m and 4.00 m. What is the smaller of the
two acute angles, in deg?
A) 53.1          B) 0.644          C) 0.927          D) none of these
E) 36.9
```

**Precedence:** local variables take precedence over global ones, when local variables are in scope. This insures questions are somewhat independent of their environment. All variables override any predefined constants of the same name.

**Functions:** As of 4/12/2014, the functions supported are:

```
abs, sin, cos, tan, asin, acos, atan, atan2, sind, cosd, tand, asind, acosd,
atand, exp, log, log10, sqrt, ranu, rang, ranr, parr.
```

**Constants:** Predefined constants are:

```
{"pi",M_PI },
{"e", M_E },
{"kb",1.38066e-23 },// Boltzmann's constant, J/K
{"qp",1.60219e-19 },// proton charge, C
{"NA",6.022e23 }, // Avogadro's number
{"ke",8.99e9 }, // electric force constant k_e, Nm^2/C^2
{"e0",8.8542e-12 }, // epsilon_0
{"mu0",M_PI*4e-7 }, // mu_0
{"c", 299792458 }, // speed of light, m/s
{"h", 6.6262e-34 }, // Planck's constant
{"me",9.1095e-31 }, // electron mass
{"mp",1.6726e-27 }, // proton mass
{"inf",1.23e+308 }, // big number
```

## Using testmake: Errors

testmake prints errors for invalid input files: undefined variables, invalid expressions, etc. You must check your console for errors after running testmake.

For each question, testmake compares all the values of the computed responses. If any two responses are within 10% of each other, testmake issues a warning. You probably want to change such a question.



## scangrade Program

scangrade simplifies Scantron grading. Features:

Saves time for the Scantron operator, the TA, and the instructor:

- Easy to use. Works with existing Physics Department practices (quiz codes or not). Provides more information than Math Placement does, and much easier to use.
- Your grading spreadsheet can use the scores with no hand editing: student IDs start with 'A'.
- Supports multiple Test Forms and their keys simultaneously. No need to sort Scantrons.
- Open output file directly in Excel (\*.csv)
- The scores spreadsheet includes all answer keys, to document exactly how everything was graded.
- All the Scantron information is retained; nothing is discarded arbitrarily. Every response sheet produces an output line, either with a score or an error message. Nothing is left out.
- Supports 3 forms of answer keys: bubbled-in answer sheets, command line, or key files (can be generated automatically by 'testmake').
- Supports skipped questions, and questions with multiple answers.
- Can override the answer sheet from the command line; instantly regrade with corrections.
- Full statistics: per Form scores, aggregate score, and per question responses.
- All errors are logged to the command line, and in the spreadsheet
- Option to put Exam Number (aka "Quiz code") column first in spreadsheet
- I am willing to make upgrades, as needed.

Since scangrade.exe can accept a key on the command line or in a separate file:

TAs need not ever bubble in a key sheet by hand.

It's easier for TAs to use scangrade.exe to grade the \*.TXT file themselves, than it is to make a key sheet, and have Math Placement grade it. That's less work for everyone. Furthermore, testmake.exe automatically creates the answer keys, which feed directly into scangrade.exe, so there's no chance of a transcription error.

Eric L. Michelsen wrote a scangrade program that is easier to use, and produces more appropriate output, than the Math Placement (very old) grading program. One of the goals of scangrade is to give control back to those actually teaching, and away from the Scantron bureaucracy.

scangrade runs from the command line, with simple options that do not require answering any questions. For example, to grade a Scantron file which includes an answer key (the blue (bold) is operator input; the rest is computer output):

```
C:\Temp>scangrade quiz1.txt >quiz1.csv
```

Note that scangrade sends its output to the console, unless you redirect it to a file with the '>' directive. Note also that you can combine multiple test versions into one spreadsheet, with the '>>' directive, which means "add this output onto the end of an existing file":

```
C:\Temp>scangrade quiz1A.txt >quiz1.csv
C:\Temp>scangrade quiz1B.txt >>quiz1.csv
C:\Temp>scangrade quiz1C.txt >>quiz1.csv
```

The combined file will have 3 sets of header rows, but those are harmless. Note that VLOOKUP works fine, even with header rows included in the search table. Also, to publicly post students' results, you must eventually sort by quiz code, which will put all the header rows out of the way.

Scangrade converts any Student ID that begins with a digit '1' through '9' to start with the corresponding letter of the alphabet. If you use Student IDs (which I recommend), have your students code their Student ID as 9-digits, using '1' for 'A', and '7' for 'U' (other letters can be easily added). Note that Physics typically uses the "Exam Number" field for quiz codes, but if you use Student IDs, students can leave Exam Number blank.

**Answer keys:** Scangrade accepts, but does not require, scanned answer sheets. Any scanned sheet with a Student ID of "0000000000" (10 zeros), or Exam Number of "000", and which precedes all student sheets, is taken as an answer key for its Test Form. Answer keys must come first to avoid manipulation by students. Scangrade accepts keys for all forms simultaneously, and so does not require the sheets to be separated by Test Form. All forms can be graded together.

I do *not* recommend you hand-edit the Scantron response file in any way. (If you do, you must comply with the Scantron file format, which mandates a space every 10 characters in the key string.)

To skip a question (i.e., don't count it), leave the answer sheet blank, or use a "--" for command-line keys.

To specify your own key from the command line, to either override the scanned key, or eliminate the need for a key sheet (example is for Test Form B):

```
C:\Temp>scangrade quiz1.txt keyb:CDDCAEBDAB >quiz1.csv
```

Keys can include any number of spaces for readability, by including the option in quotes:

```
C:\Temp>scangrade quiz1.txt "keyb:CDDCA EBDAB" >quiz1.csv
```

If you use 'testmake', or if you want to put your answer keys in a file, use "option file" (optf) on the command line:

```
C:\Temp>scangrade quiz1.txt optf:quiz1.keys >quiz1.csv
```

where the file 'quiz1.keys' might look like this (keys can include spaces for readability):

```
keya:ABCDE EDCBA
keyb:CDDCA EBDAB
```

**Altering answer keys:** Suppose you want to change the answer key for question 24. The following command accepts the given key sheet, but then modifies it by changing the answer to question 24 to B, for Test Form C:

```
C:\Temp>scangrade quiz1.txt altC:24b >quiz1.csv
```

**Multiple correct answers:** Suppose you want to allow an *additional* answer to question 24, in addition to the key answer. The following command accepts the given key sheet, but modifies it by adding an alternate allowed answer, B, to question 24 for Test Form A:

```
C:\Temp>scangrade quiz1.txt altA:24+b >quiz1.csv
```

You can specify as many alterations (or other command line options) as you need. A quiz1.keys file might look like this:

```
keya:ABCDE EDCBA AABBC CDDEE EEDDC CBBAA
alta:24+b
keyb:CDDCA EBDAB BADBE ACDDC ACEDB ECADB
altb:12+c
```

scangrade eliminates the need to separate the response sheets according to Test Form, since it accepts simultaneous keys for all the Test Forms, and grades each response sheet according to its indicated Test Form.

If you're going to grade your own Scantron files (e.g., with scangrade), then when you submit your Scantrons to Math Placement for scanning, write "Text files only" on the Scantron request form.

**Platforms:** The current version runs on Windows, Linux, and Mac. It is written in ANSI C++, so should port easily to other platforms.

The graded spreadsheet looks similar to this, and includes any error messages:

	A	B	C	D	E	F	G	H	I	J
1	Input file = scan.txt				scangrade v. 0.1	Apr 10 2011 14:50:50				
2					Time =	Sun 04/10/11 15:04:08:08				
3	Scanned key:	A					CDDCA EBDAB			
4	alta:2b						b			
5	<b>Student ID</b>	<b>Tform</b>	<b>Exam#</b>	<b>Order</b>	<b>Raw Score</b>	<b>% Score</b>	<b>Responses</b>	<b>Scoring</b>		
6	C33	A	333	1	6	60	CDDBA EBDDE	cXcXc cccXX		
7	A09201905	A	234	2	6	60	EDDAA EBDAD	XXcXc ccccX		
8	A08634725	A	345	3	0	0	DEBAE ACACE	XXXXX XXXXX		
9	A08979876	A	123	4	4	40	CBDDA DDECD	cccXc XXXXX		
10	A09028765	A	351	5	6	60	ADDEA BBDAB	XXcXc Xcccc		
11	A95157654	A	222	6	4	40	ADDBE EEDAC	XXcXX cXccX		
12	A07566543	A	987	7	7	70	CDDCA BBDAB	cXccc XcccX		
13	A08645432	A	876	8	4	40	ADAAA EBECB	XXXXc ccXXc		
14	A08764321	A	765	9	8	80	CDDCA EEDAB	cXccc cXccc		
15	A08843210	A	654	10	5	50	CDBDA EBBAD	cXXXc ccXcX		
16	A09111234	A	543	11	6	60	CDDCA EBECB	cXccc ccXXX		
17	A08742345	A	432	12	6	60	CDDCA DEDAD	cXccc XXccX		
18	A08734566	A	321	13	8	80	CDDCA EBBAB	cXccc ccXcc		
19	A08864567	A	456	14	6	60	CEDEA DEDAD	cXccc XXccX		
20	A08845678	B	567	15	no	key	CDDAD EEAAA			
21	A08786789	D	678	16	no	key	DDCA EEDAC			
22	A08677890	A	789	17	4	40	CDABE EEDAA	cXXXX cXccX		
23	2 form mismatches									
24										

In Excel, use **VLOOKUP(SID, Am:Fn, 6, 0)** to get % score by SID (see “Excel Tips” above).

You may want set columns G and H to Courier New font, so everything lines up nicely.

## Command Line Options

You may specify as many options as you want. The key options each allow controlling up to 4 separate keys, one for each Test Form A, B, C, and D.

**keya:** specifies the answers for form A. Use ‘-’ to skip a question. Similarly for **keyb;**, **keyc;**, **keyd:**.

**alta:** specifies an alteration to an answer for form A. Follow it with the question number, and the new corrected answer: **alta:3D** (more examples above). To allow an additional correct answer, give the question #, ‘+’, and additions answer: **alta:3+D**. Similarly for **altb;**, **altc;**, **altd:**.

**cols:x** specifies the “exam number” column be first (this is often used for “quiz codes”).

**optf:<filename>** specified a file to read with options in it, one per line. You (or ‘testmake’) can put answer keys in such a file, along with any other options, such as alternate answers.

## Excel Touchups

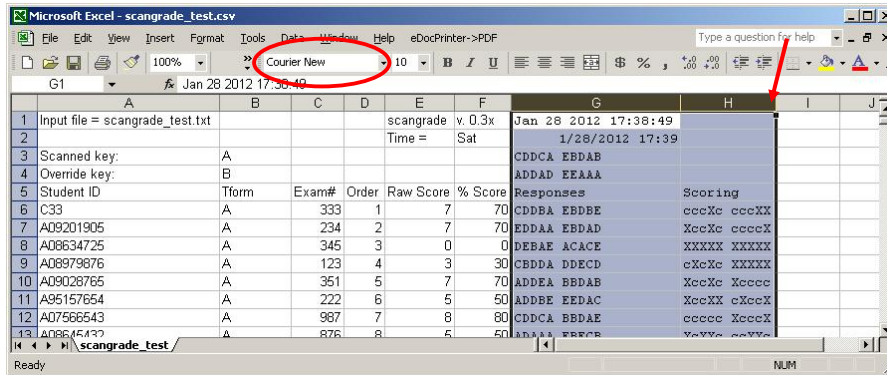
There are 3 quick things you’ll want to do when you load the \*.csv file into Excel:

1. Change the font of the “Responses” and “Scoring columns to Courier (fixed-width).

2. Automatically set the column widths to fit the data.
3. Right align the statistics.

**Change the font of the “Responses” and “Scoring columns to Courier New (fixed-width)**

Select the two columns as shown below, and choose “Courier New” from the Font drop-down box.

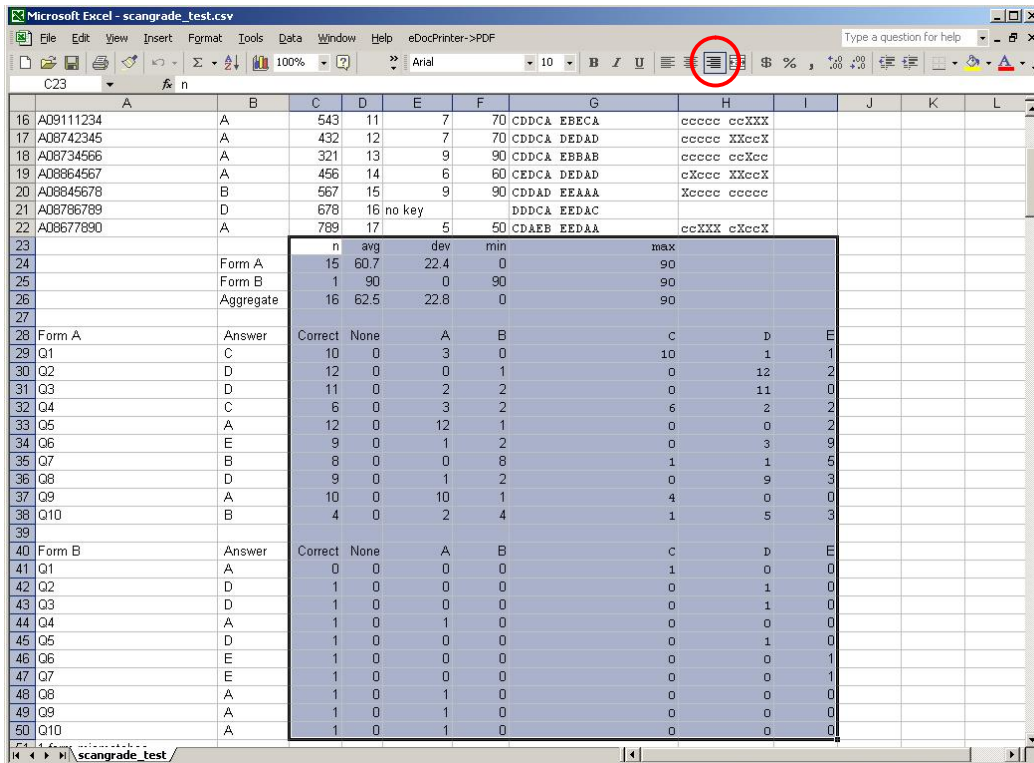


**Automatically set the column widths to fit the data**

With the two columns still selected as shown above, double-click the right edge of a column header.

**Right align the statistics**

Select the statistics rectangle as shown below, and click the “right-align” box on the toolbar.



You might also want to make the header rows bold, for easier reading.

**File Formats (for Technical Experts)**

Ordinary users can ignore this section. It describes the file formats.

## UCSD Physics Instructors Notes

The input file format is fixed by the Scantron scanning system. For form # X-1018640PAR-L, it looks like this:

```
# Lines beginning with '#' are comments you can add.
0000000000,A,111,CDDCAEBDAB
333      ,A,333,CDDBAEBDBE
109201905 ,A,234,EDDAAEBDAD
108634725 ,A,345,DEBAEACACE
```

There are 4 fields, and they are fixed width. The “response” field has 54 characters, padded with blanks, and spaces added between every 10 columns; it therefore has room for 50 responses.

You don’t need to worry about it, but the \*.CSV source of the example spreadsheet looks similar to this:

```
"Input file = scan.txt",,,,scangrade,"v. 0.1","Apr 10 2011 14:50:50"
,,,,"Time =",Sun,"04/10/11 15:03:57:57",
"Scanned key:",A,,,,,"CDDCA EBDAB"
"Override key:",B,,,,,"ADDAD EEAAA"
"Student ID",Tform,Exam#,Order,"Raw Score","% Score",Responses,Scoring
"C33",A,"333", 1, 7, 70.000,"CDDBA EBDDBE","cccXc cccXX"
"A09201905",A,"234", 2, 7, 70.000,"EDDAA EBDAD","XccXc ccccX"
"A08634725",A,"345", 3, 0, 0.000,"DEBAE ACACE","XXXXX XXXXX"
...
"A08864567",A,"456", 14, 6, 60.000,"CEDCA DEDAD","cXccc XXccX"
"A08845678",B,"567", 15, 9, 90.000,"CDDAD EEAAA","Xcccc ccccc"
"A08786789",D,"678", 16,no,key,"DDDCA EEDAC"
"A08677890",A,"789", 17, 5, 50.000,"CDAEB EEDAA","ccXXX cXccX"
"1 form mismatches"...
```

## Quizzes, Exams (and Quiz Codes)

**Reproduction:** In Physics, Patti Hey (the “course coordinator”) makes the quiz copies. Send her PDF’s ~36-48 hours in advance. In the first week of class, send Patti your quiz days for the whole quarter, so she can hire proctors. You’ll get ~5 proctors for 250 students.

Have the students fill out their names and IDs *before* coming to the quiz, so they’re not rushed. This reduces errors, which always helps *you*.

**Scantrons:** See [mathtesting.ucsd.edu](http://mathtesting.ucsd.edu) for important information about Scantrons. The Scantron operator has to manually inspect the results for sanity, so it helps greatly if your students leave no questions blank. Blanks may indicate machine failure, and the operator must check them by hand for validity. Students should always guess, and for a deleted question, have them fill in ‘A’.

The ancient program Math Testing uses to grade the Scantron files is very labor intensive, and not at all appropriate for us. It cannot give you both Student IDs and quiz codes; you must choose one or the other. Also, the student IDs and quiz codes are in a bad format, that requires you to manipulate them in Excel for automatic lookup. Eric L. Michelsen wrote a much better grading program, called SCANGRADE.EXE, which saves time for the Scantron operator, the TA, and the instructor. Scangrade writes the answer key, and any modifications made to it by the operator, to the output file, so you have a permanent record of everything used to grade exams. Scangrade output files can be used directly in Excel, with no hand modifications. You can get Scangrade from Eric, along with full documentation. If you choose to use Scangrade, instead of the old grader in Math Testing, just ask for “text files only” when you turn in your Scantron sheets to Math Testing for reading. Both Scangrade and the old program produce files which can be loaded into Excel.

The index number to charge to for scanning is PHYINSP. As described earlier, I highly recommend requesting “No corrections” in the “special instructions” section of the scanning request form.

**Testmake and Scangrade:** Eric L. Michelsen also wrote a program, TESTMAKE.EXE, which takes a set of questions with multiple choice answers, and scrambles them randomly to produce different versions of an exam. It produces the answer keys, which can be fed directly into Scangrade. TAs need not bubble in answer sheet Scantrons.

It is much easier on everyone if you use Excel to generate pseudo-random quiz codes (described below), and use Word (or similar) email merge to email them to students. Then students need no longer fill in Quiz codes on Scantrons. This greatly reduces errors, and makes it much easier to find and fix them when they occur, almost always without needing to ruffle through any Scantrons. After the first quiz, penalize your students for any Scantron errors, to encourage their diligence in filling them out properly.

Do not enter grades by hand into Excel. Instead, learn the VLOOKUP function; it will make your life much easier. The Excel MATCH, and INDEX functions may also be useful.

### Athletic or Other Off-Campus Exams

The policy for UCSD athletes who must miss a quiz (per Hans Paar as Vice Chair of Education) is for the coach to administer the quiz as closely as possible to the class quiz time. I once had a University of Arizona faculty member administer a final exam for a student who left early to do research. The coach/faculty is responsible for keeping a sealed envelope containing the quiz, for proctoring the quiz, and for safeguarding the completed quiz. Patti Hey can help arrange this. Michael Anderson says that anything you work out with the coaches is acceptable. I did it over email, using the following:

You have asked for special consideration for your athletes, *names-go-here*, to take my Physics 2C quiz on *date, time*. The Physics Department is proud to support our students’ extra-curricular activities. However, due to a recent incident of cheating by athletes on the road, we have had to tighten our policy. To be fair to all students in the class, and to avoid any appearance of favoritism, the Department has requirements for such special consideration.

## UCSD Physics Instructors Notes

As the responsible UCSD employee, you must accept the following responsibilities:

1. I will email you the exam the day before, which must remain secret both before and after the student takes it.
2. You must give the student the exam as close as practical to the above time that all other students will be taking it. This includes having the student take the exam on a bus or other conveyance. We understand this imposes a burden on the student, but we have been forced to require this because of cheating.
3. You must not allow communication with classmates either to or from the student between the time of his/her taking the exam, and the official exam time.
4. The student is given 50 minutes to complete the exam. There are no notes or books allowed, only a simple calculator. The exam includes all information the student needs.
5. After the student completes the exam, you must photograph the Scantron answer sheet so that all responses are clearly legible, and email that photograph to me immediately after completion of the exam.
6. Furthermore, we still need the paper exam response for our permanent records. You must seal both the exam sheet and the student Scantron answer form in an envelope; you must sign the envelope across the seal.
7. You, and not the student, must deliver the envelope with the exam to Patti Hey, in Mayer Hall Addition, on Monday, or if that's not possible, as soon as possible. The student must not have access to the envelope before or after the quiz.

Please note that every student in my class is allowed to miss one quiz without penalty, to allow for such unavoidable absences.

Also note that any significant deviation from this procedure will result in a grade of zero for the student, equivalent to having missed the quiz.

Please let me know if you accept these responsibilities. If not, please do not look at or store any attached exam.

Thank you for your cooperation.

### Final Exam Tips From Hans Paar

When he was Vice Chair of Education  
From: Hans Paar  
Sent: Monday, June 04, 2012 16:08  
To:  
Cc: Paar, Hans  
Subject: Physics 1 and 2 finals

Dear colleagues,

I have wanted to write this e-mail for a long time and I finally sat down and wrote it. It is based upon the accumulated evidence of rather strange happenings in finals. Here it is...

I strongly recommend that for the final you collect student IDs. For that to work you have to announce that in each class this week and put it on the class' webpage.

Bring a printout of the registrar's class list to the final exam.

After you collect IDs count them, count the number of students listed on the registrar's list, and count the number of students in the room.

Resolve any discrepancy. If someone forgot their ID ask them to be identified by a few cohorts in the class.

Order the IDs alphabetically and check them off one by one on the registrar's list. This takes one TA more than an hour.

Near the end of the exam students come down to hand in their final and obtain their student ID in return. A few at a time is ok. If it becomes too many and is disruptive to the students still working announce that everybody must remain seated until the end of the exam. This happens usually about 10 minutes before the end.

When time is up ask everybody to remain seated and let one row at a time come down to hand in their finals in return for their student ID. If you control the number of students coming down at one time you avoid a large number of students crowding the two TAs that are returning the IDs. Students will be discussing the answers they chose to put down or marked on the Scantron. The entire room coming down at once can lead students to make "corrections" on their Scantron while they are waiting for their ID. They may also grab their ID without handing in their final or Scantron.

While this is going on other TAs have to supervise the students who are still seated to make sure they stopped working.

After the room is cleared count the number of finals or Scantrons in your possession and compare with the counts at the beginning of the final. Note any discrepancy. If a student did not hand in their final (and grabbed their ID) you will know immediately that it happened rather than be notified a week later by a student that you "lost" their final or Scantron. You will be able to say that you did not lose any final or Scantron but that it was not handed in.

## Before the Final Exam

I send an email to my proctors (Patti Hey can identify them for you), similar to this:

You are listed as the proctors for my Physics 1B final exam tomorrow at 11:30am in York 2622.

I had a problem with academic integrity at a previous final exam, so I use a thorough method for verifying the integrity of the exam. I have discussed this method with Dr. Paar, the Vice Chair of Education.

Please arrive early: we will be collecting a student ID from every student before class. I will ask one of you to alphabetize them while the rest of us monitor the exam. After they are alphabetized, I will compare each photo to my photo class roster, to verify enrollment.

I will bring a printed class roster. As each student turns in a Scantron, you must find their ID, compare it to the student's face, and mark the student's name on the roster. After all students have left, we will count the Scantrons to make sure it matches the number of marked names on the roster.

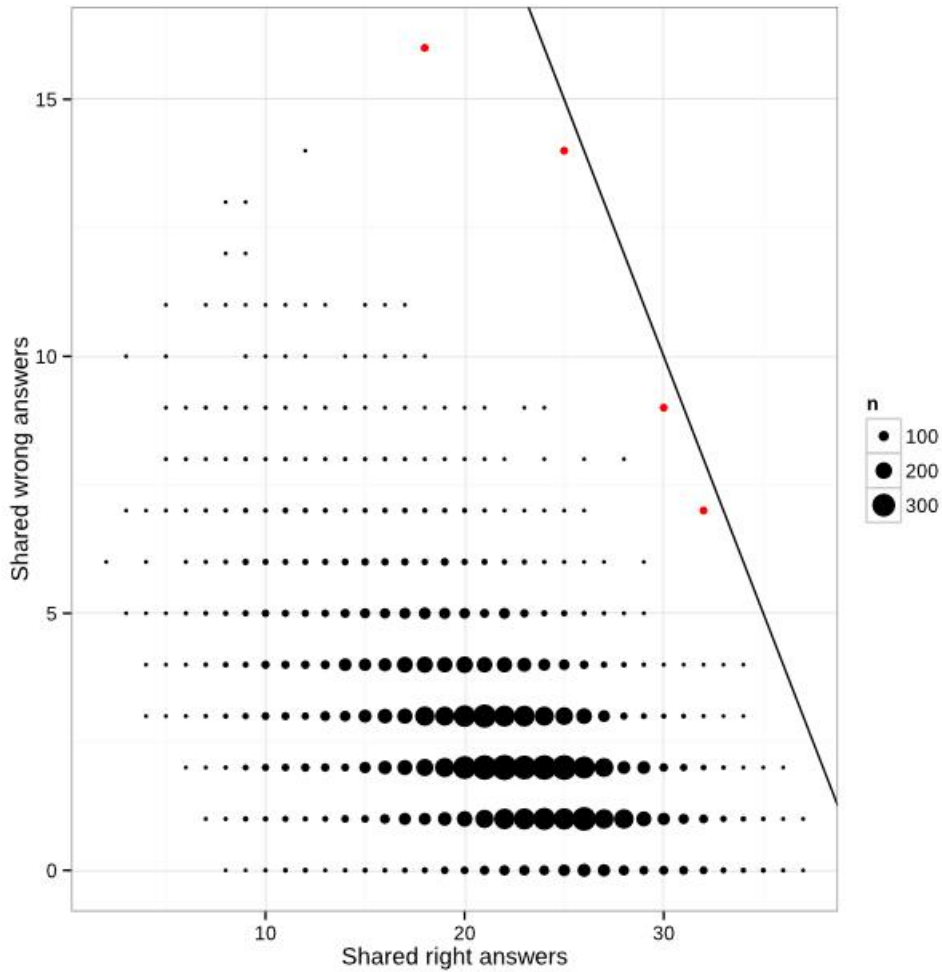
Please let me know immediately if you have any questions. Thank you for your cooperation.

## Catching Cheaters

<http://jd-mathbio.blogspot.ca/2015/02/finding-cheaters-using-multiple-choice.html>

"The line corresponds to forty total shared answers (two students having identical test papers). This did not happen. But there were four points near the line that looked like clear outliers to me:"





### Obsolete Method for Computer Generated Quiz Codes

With TED, we don't need quiz codes. This section is retained in case the concept has other uses.

**Assigning computer-generated quiz codes:** With TED, you do not need quiz codes (see TED section later). If you do use quiz codes: To assign quiz codes, instead of using quiz-code sheets on your first quiz (as was done in the old days), it is much easier to electronically generate them in your grading spreadsheet, and email the quiz codes to your students. On the Scantrons, have students use their 9-digit student ID (use 1 for the initial A), but *post* grades only by quiz code. This benefits you greatly: if the students don't know or mis-enter their ID on the Scantron, it's their problem, not yours. If a student mis-enters his student ID, he won't corrupt another student's grade. He hurts only himself, and you never have to riffle through Scantron sheets. (In contrast, if you use quiz codes on the Scantrons, and a student mis-enters his quiz code, it corrupts *another* student's grade, and *you* are responsible for fixing it. This may mean digging through Scantron sheets.)

It is easy to use an Excel formula (below) to generate a pseudo-random sequence of 400 numbers from 101 to 500. **It guarantees no repeats**, but I usually include an Excel column to check for repeats anyway, in case I mistype the formula into Excel. This sequence is based on 401 being prime. In fact, any prime number  $p$  will do, and the no-repeat sequence length is  $p - 1$ . On a separate "Qcode" worksheet, paste all student names and IDs, with column headings in Row 1. Next to them, start an Excel column (say in C2) with any number in the sequence range, and use the following formula for up to 400 random numbers:

$$\boxed{C3} = \text{MOD}((C2-100)*37, 401)+100$$

The multiplier 37 is arbitrary, and you can use most any multiplier  $> \sqrt{p}$ , so that it does not generate an obvious pattern. (E.g., 2 would be a bad choice.)

By default, the email merge uses a 1 decimal place format, so your integer quiz codes come out ugly: "127.0". You can fix this by making another column, say column C, which converts the quiz codes from numbers to text:

D2 =TEXT(C2,"0")

Note that if you now add or remove any rows in the grade spreadsheet,  
you will destroy the quiz codes you've already assigned.  
You must "freeze" them in place, in case you add or drop any student rows.

You freeze them by copying the computed column from your Qcode worksheet, and pasting it into your master grade sheet; when you paste, an option panel pops up. From it, choose "Values only", and the pasted formulas will be replaced by hard-coded numbers. They are now frozen.

The "Qcode" worksheet should look like this:

	A	B	C	D	E	F
1	PID	Student	Qcode	Qalpha	Email	
2	A00000001	Able, Baker	127	127	able@test.com	
3	A00000002	Charlie, Dog	297	297	Charlie@test.com	
4	A00000003	Easy, Fox	171	171	easy@test.com	
5						
6						
7						

**Using Word mail-merge:** Use the Word email-merge wizard to construct your email message to students. Use your grade sheet, built on the class list downloaded from Blink. To email-merge, you must put student names, email addresses, and quiz codes on the same worksheet. Put column headers in row 1.

My email was this (the double-brackets must be field codes, not ordinary text):

Please do NOT reply to this email.

<<Student>>, your secret quiz code is: <<Qcode>>

Your grades will be posted and identified by this quiz code, so keep it secret to protect your privacy.

On exams, for added protection for your grade, you may bubble in your quiz code on the Scantron.

Save this email all quarter, to be sure you have access to your quiz code.  
-Eric L. Michelsen, instructor

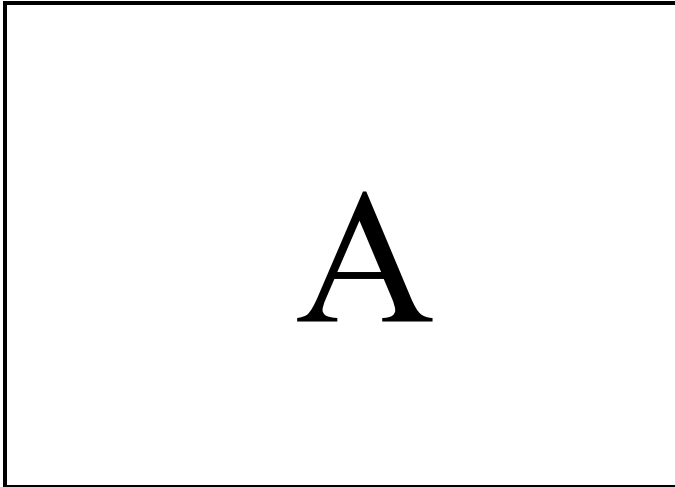
When you send the email with mail-merge, it will ask you for a subject line, and I put the course number there, e.g. "Physics 1B quiz code".

**Sending the emails:** In Word, choose Tools, Letters and Mailings, Mail merge wizard. In Microsoft Word/Outlook 2003, you must use HTML email format, because of a bug in email merge. I don't know if it's fixed in later versions.

## ***Final Exam Forms***

Printing templates (below) for the student IDs at the final exam makes it easier to alphabetize the IDs, and multiple people can work on it at once. First, I sort them by first letter of last name onto the template, then I have a proctor sort each letter-stack alphabetically. I take each letter in turn, and compare the photographs to those in the online class photographs.

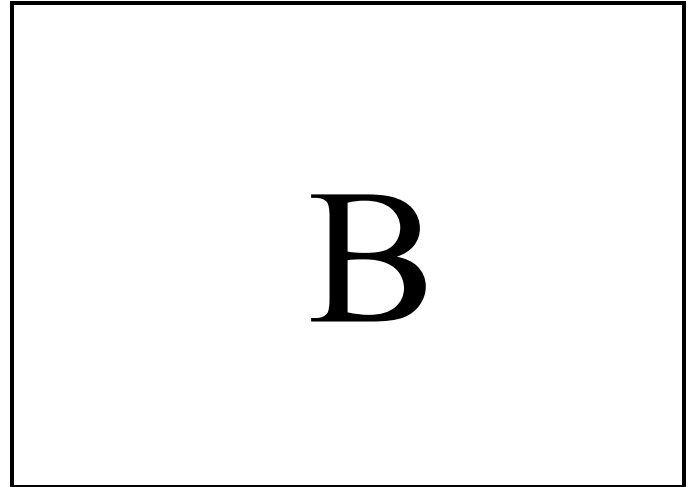
A Last name A



A A A A

A Last name A

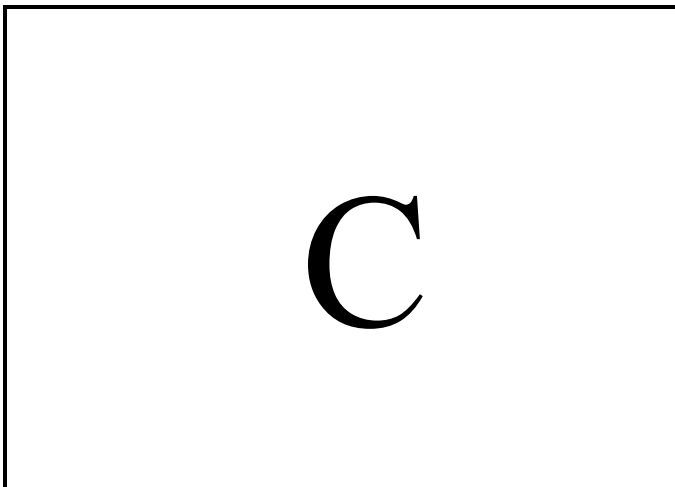
B Last name B



B B B B

B Last name B

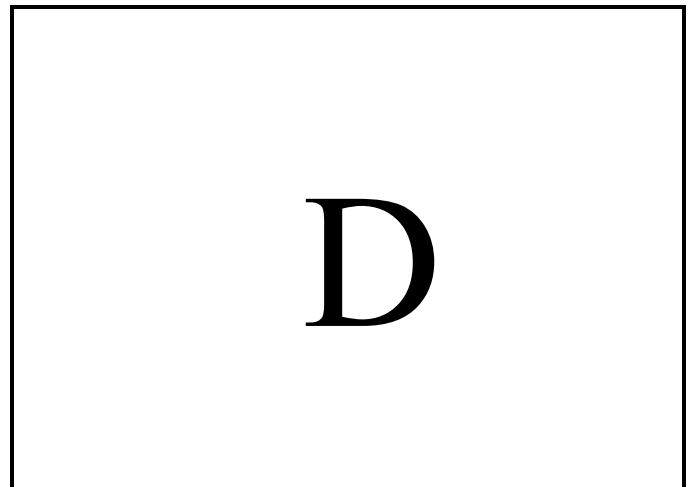
C Last name C



C C C C

C Last name C

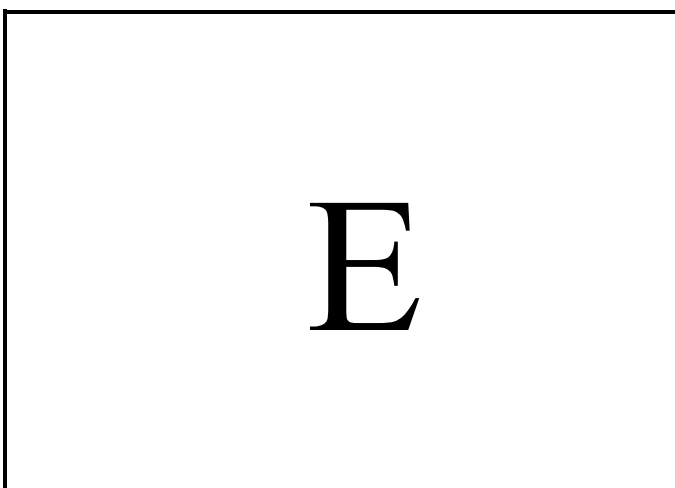
C Last name C



D D D D

C Last name C

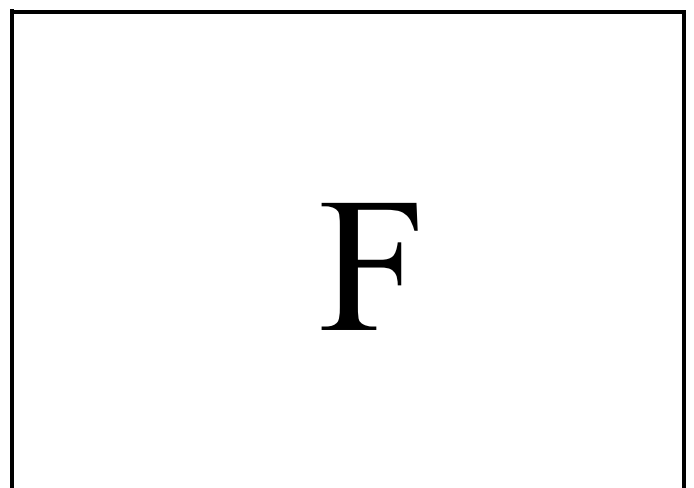
E Last name E



E E E E

E Last name E

E Last name E



F F F F

E Last name E

G Last name G

G  
G  
G  
G

H Last name H

H  
H  
H  
H

I Last name I

I  
I  
I  
I

J Last name J

J  
J  
J  
J

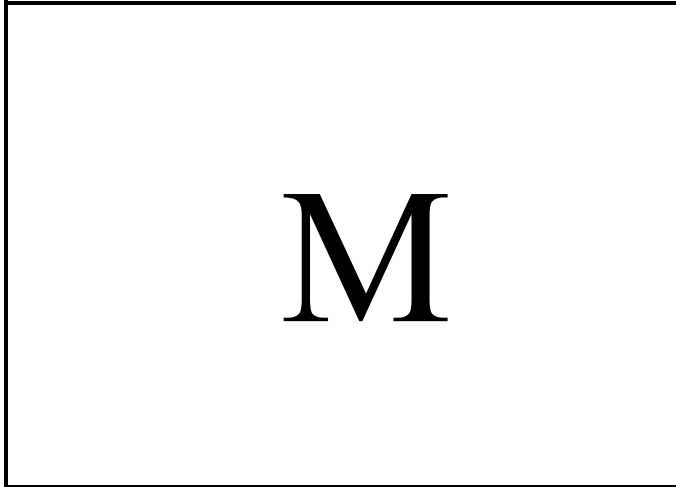
K Last name K

K  
K  
K  
K

L Last name L

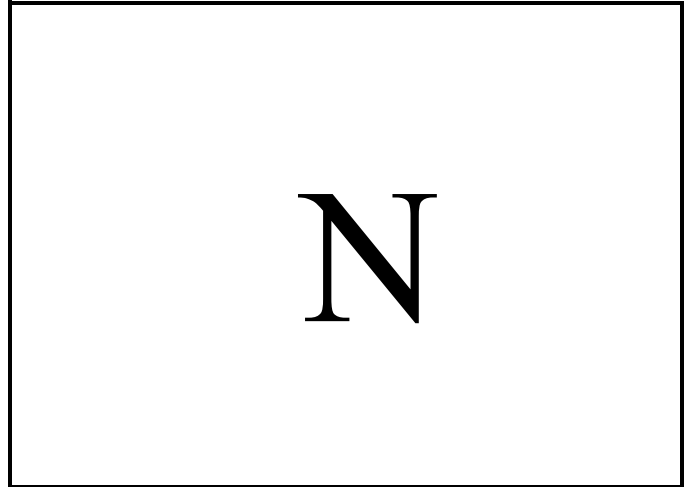
L  
L  
L  
L

M Last name M



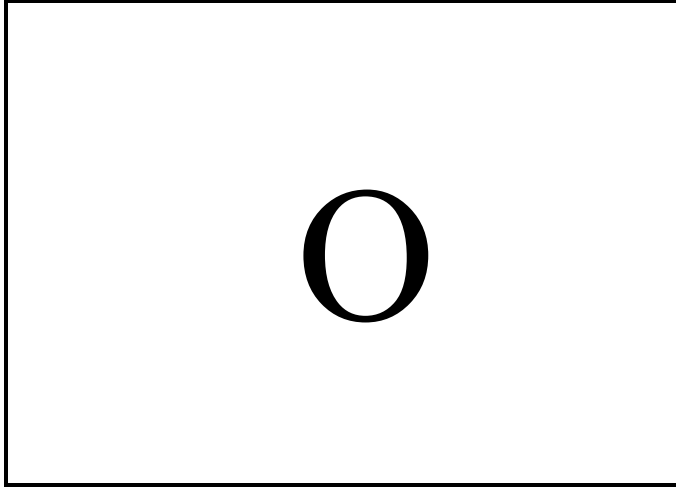
M M M M

N Last name N



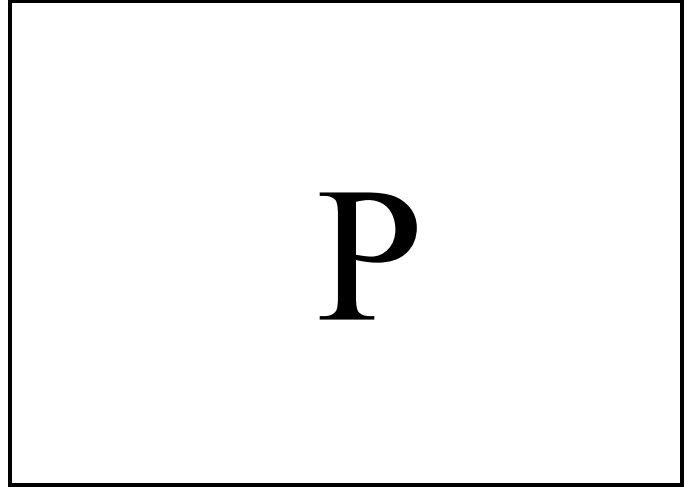
N N N N

O Last name O



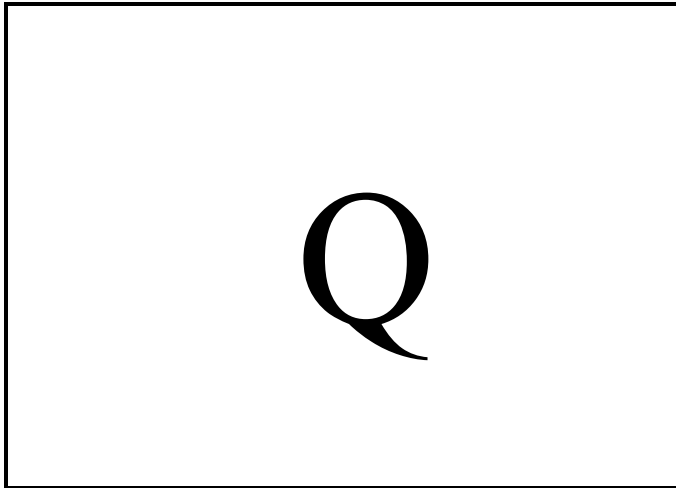
O O O O

P Last name P



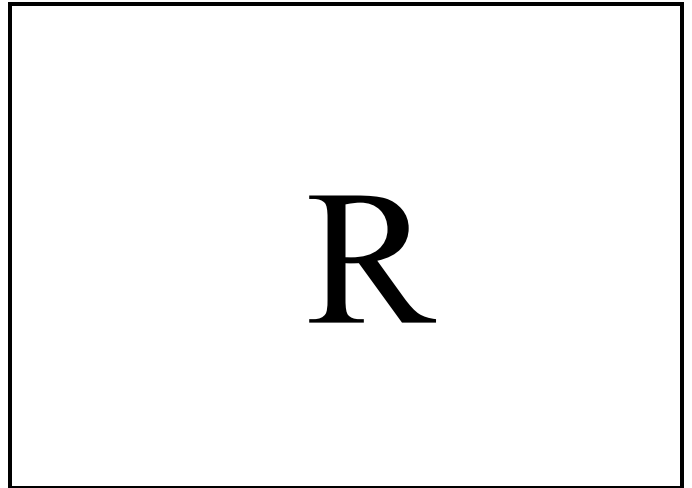
P P P P

Q Last name Q

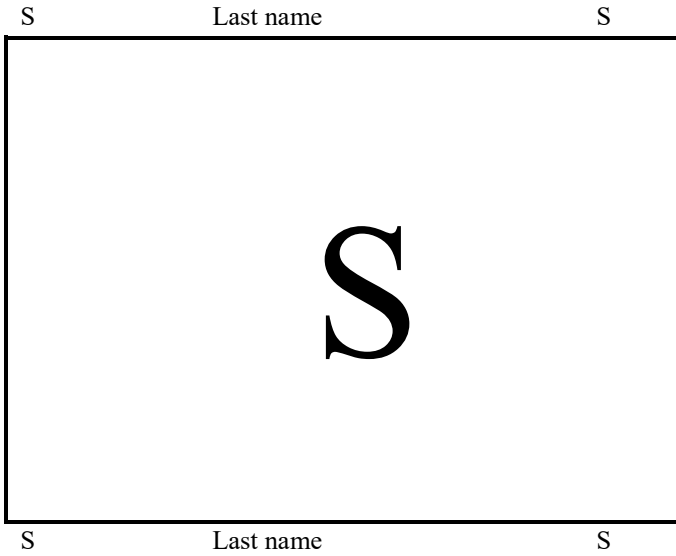


Q Q Q Q

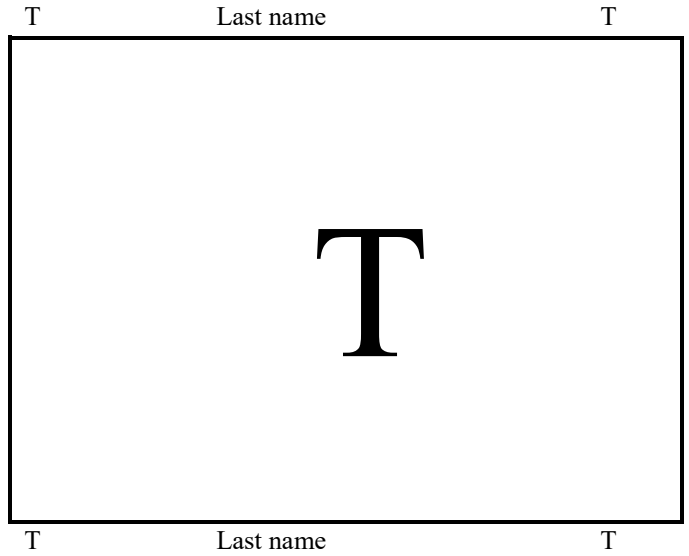
R Last name R



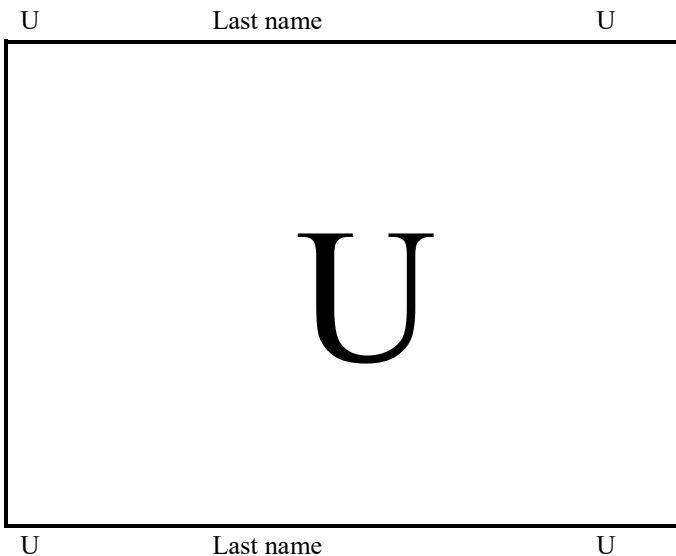
R R R R



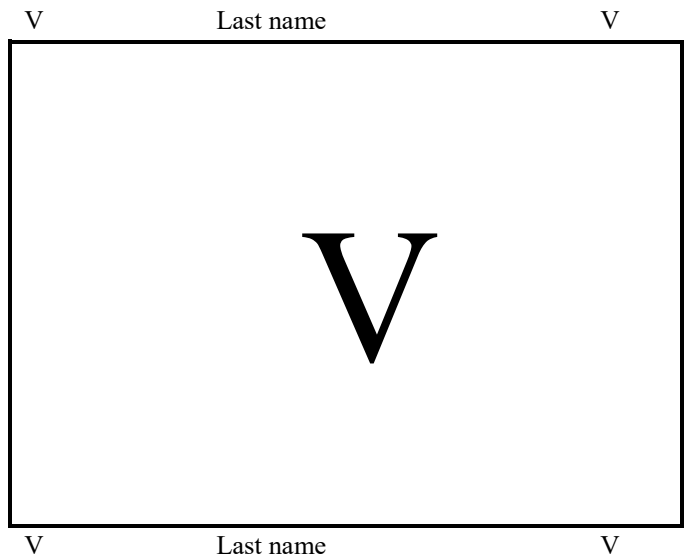
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S



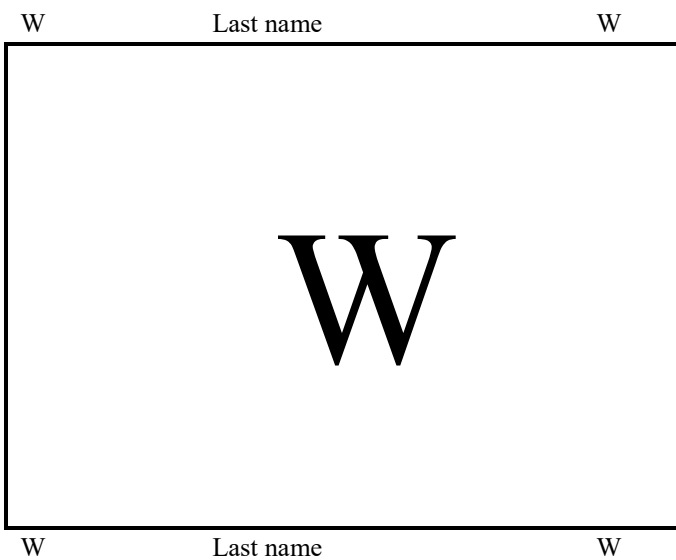
T  
T  
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T



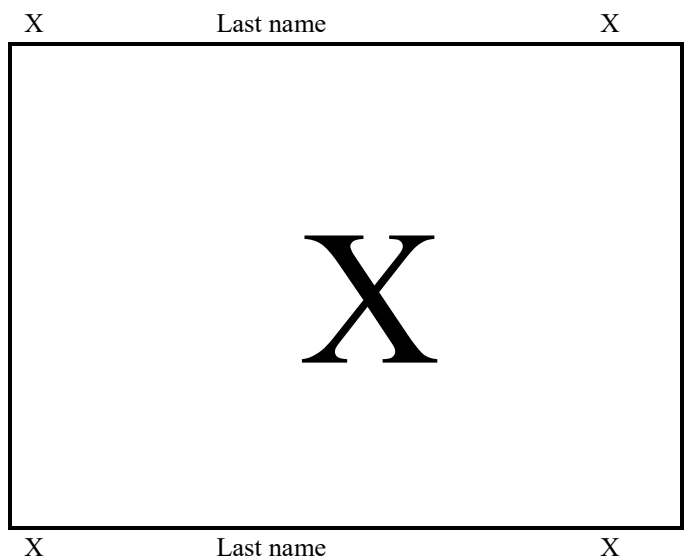
U  
U  
U  
U



V  
V  
V  
V



W  
W  
W  
W



X  
X  
X  
X

