Attend the 38th National Convention in Sacramento, CA

Mu Alpha Theta Newsletter

Fall 2007

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News from the President

A new year for Mu Alpha Theta has begun. This past summer, more than 600 students and teachers met in Tampa, Florida for the annual Mu Alpha Theta National Convention. The activities included competitions, speakers, chalk talks, social mixers and a trip to Busch Gardens. This was a chance for students across the country to meet, make friends and enjoy the excitement of competition. Next summer the National Convention will be held in Sacramento, California and the online convention packet is now available for download. If your chapter has never attended a convention or has not been in the last three years, apply for a Convention Grant to help finance the trip. Look at **www.mualphatheta.org** under **National Convention** for more information on **Attending Free**. The 2009 convention in Knoxville, TN will be held from July 19 – 24 and 2010 will be in Washington, D.C., July 25 – 29, so you start making your plans now!

This year we are again offering The Mary Rhein Memorial Scholarship for $5000 and up to ten Mu Alpha Theta Scholarships for $4000 each. This past year, seven $4000 scholarships were presented to outstanding graduating seniors who made an impact on their Mu Alpha Theta Chapter. The selection was made from over 60 very worthy students.

The Andree and Kalin awards are $2500 each and the criteria and applications are also online. Check on the Mu Alpha Theta's website to download the applications for these scholarships and awards.

Has your chapter participated in the **Rocket City Math League** and/or the **Log 1 Contest**? If not, these **free** math competitions are a perfect way for your students to have a chance to compete with other Mu Alpha Theta members without leaving their own school. The information about these contests is available at **www.mualphatheta.org > Contests,** with links from the home page.

Mu Alpha Theta is working on new activities for students that would like to participate but not necessarily take part in competitions. Check this newsletter for new and exciting offerings for students.

The Mu Alpha Theta website has information on all aspects of Mu Alpha Theta, as well as links to other interesting math sites. As a sponsor or member, you should try to visit it often.

If you have any questions, or suggestions about ways the National Mu Alpha Theta Organization can assist you with your chapter, please feel free to contact me at **maokid1@msn.com**. I would be delighted to hear from you.

Grace Mutz

Join us in historic Sacramento, CA!

The 38th Mu Alpha Theta National Convention, hosted by Thom Morris from Berkeley Preparatory School in Tampa, FL, will be held July 13-18, 2008, in Sacramento, California. Participants will be staying at the Holiday Inn right next to Old Sacramento and one block from the California State Capitol.

The registration fee will be $575 before April 1st and $625 after. The registration fee includes convention activities, t-shirt, lodging at the hotel, admission to Raging Waters and all meals. All registrations must be postmarked by May 15, 2008. For more info and to download the registration packet, visit our website at www.mualphatheta.org > National Convention.

National Office Update from Kay Weiss

The National Office is usually staffed from 9:30 am – 6:00 pm central time, Monday through Friday. The office will be closed on most major National holidays and during the winter break from December 24 – January 6. We do not take a spring break, since this is usually our busiest time of the year. If you have orders needed before January 8, please make sure to get them to the office before December 23, so we can mail them before we close for the holidays.

During the year, orders entered by email or through the online system are usually mailed the day they arrive. Orders sent by regular post or fax are handled as time permits, but are usually sent within 48 hours of arrival in the office. If you are mailing an order, please realize that the United States postal service has slowed delivery of first class mail considerably since rates changed last May. An envelope mailed by first class can take up to a week to arrive and a first class order mailed from the office can take a week to arrive back to you. Please keep this in mind when submitting orders. Orders over 13 ounces will be mailed by Priority Mail at no extra charge for arrival that averages three to four days. For $10, we will send orders by Two-Day Fed Ex delivery, for $15 we will overnight an order and for $20 we will get it to you the next morning. Fed Ex orders must be in the office by 4:30 pm so they are available for pick up that day.

This past summer, in celebration of Mu Alpha Theta's 50th Anniversary, we commissioned the making of **"Inside Mu Alpha Theta**" DVD by Red Bay Studios. The 30 minute film reviews the history of our organization and highlights the Huntsville National Convention. If you are looking for a good way to interest students or parents in the organization, showing the film may be just the thing. Copies are now available for $15.

Last year, we republished our "Math and Music, Some Intersections," our Monograph by Joan Reinthaler. The book is selling for $6 and would make a nice gift for someone you know that enjoys both subjects.

If you ever have any questions, comments or suggestions, just call us or email. Both Tara and I are here to help in any way we can.

Order Service Fee Begins This Semester

Beginning in this fall semester of 2007, the National Office will begin charging a $15.00 service fee for certificate orders with more than twenty names that are not submitted electronically either through the website or by email. This will include orders submitted by mail and by fax. When names are submitted to the National Office through mail or fax, office staff must enter them into the system by hand, which can be a very time consuming process and increases the chance of spelling errors.

Names can be submitted online when a sponsor places an order online. For large orders, it is often easiest to "cut and paste" names from an existing spreadsheet or word processing document. *Remember: If your chapter is paying for an order by check, you can still place your order online. Just select "Purchase Order" as your payment option and enter the number of your check as the purchase order number.*

Some chapters prefer to submit their new member names by email. To do this, group your names by **year of graduation**, and include them in the body of your email or attach them to the email in a spreadsheet or word processing document. Email your list to matheta@ou.edu

If you have questions about the online system or the ordering process, email the National Office at matheta@ou.edu or give them a call 405-325-4489.

Free Texas Instrument Calculators

Mu Alpha Theta has again purchased TI 84 Plus Silver and TI 89 Titanium calculators to give away!

We will provide up to six calculators to a school to give away as prizes at competitions you are running. Sponsors may also give calculators as prizes to their own outstanding students as a reward or auction them off to raise money for their club. Preference will be given to schools that have not received free calculators in the past. **If you want some, just email Kay Weiss with your request today at matheta@ou.edu!**

New Mu Alpha Theta T-Shirts!

We've come up with a new design! See our latest shirt online at www.mualphatheta.org> Chapter Resources > Merchandise. It's a light yellow shirt with dark blue lettering and a weathered look. Shirts will sell for $10 each. Let us know what you think.

Mu Alpha Theta teams up with The Actuarial Foundation

Project Math Minds is an opportunity for high school members to get a taste of what it is like to work as an actuary and become eligible for scholarship money. Participants will complete a project using actuarial mathematics that an actuary might be asked to address on the job. The top five to seven projects will be eligible for a scholarship. At least 3 scholarships ranging between $1000 and $5000 will be awarded. Instructions, rules, data, and guidelines for submission can be found at: http://www.actuarialfoundation.org/youth/math_minds.html. Projects are due February 1, 2008 and volunteer Actuaries are available to help! We would love to see students from all over the country participating in the project. The finished project would also be appropriate to enter in your local Science and Engineering Fair for further possible prizes!

The 2008 Tampa, FL National Convention

The 2008 Mu Alpha Theta National Convention was held at the Grand Hyatt Tampa Bay Hotel from July 16-21. **The Sweepstakes Award this year was won by Buchholz High School from Gainesville, FL.** Vestavia Hills High School from Vestavia Hills, AL came in second and Cypress Bay High School from Weston, FL came in third. Karaoke Night was a real hit. Our thanks to Christine Brzycki and Dave Macfarlane from Palm Harbor University High School for a smooth running and fun convention.

THANK YOU TO RETIRING SPONSORS

The following teachers have retired as Mu Alpha Theta Sponsors during the past school year. Our thanks to these dedicated teachers:

Huntsville High School, Huntsville, TX: Suzanne Huber; Silo High School, Durant, OK: Connie Thomas; Abbeville High School, Abbeville, LA: Pat Lavino; Carl Sandburg High School, Orland Park, IL: Sharleen Smith; Lenoir City High School, Lenoir City, TN: Christine Haire (5 years); Wheeler High School, Marietta, GA: Kathryn Fishman (4 years); Walker High School, Jasper, AL: Luajuana Brasfield; Starmount High School, Boonville, NC: Carole Groce; Cannon School, Concord, NC: Kathy Mathis (11 years); Vestavia Hills High School, Birmingham, AL: Kay Tipton and Dianne Teer; Beavercreek High School, Beavercreek, OH: Dolores Williams; and Bartlett High School, Bartlett, TN: Jackie Wooten.

East Anchorage High School, Anchorage, AK: Julie Smith; Rutherford High School, Panama City, FL: Karen Harrell; Harrison High School, Kennesaw, GA: Barbara Sichta (5 years); Lakeside High School, Hot Springs, AR: Lou Skrodenis; L.D. Bell High School, Hurst, TX: Amie Tennyson.

STUDENTS

Mu Alpha Theta Scholarships

Mu Alpha Theta will offer up to ten $4000 Scholarships to outstanding graduating High School seniors or graduating Two-Year College student members who have an interest in continuing their study of mathematics, applied mathematics, or math education. We are looking for students that have served their active Mu Alpha Theta chapter or other mathematics students, in some way. The 2008 application is now available on our website at www.mualphatheta.org > Scholarships. All applications must be postmarked by **March 15, 2008**.

The Mary Rhein Memorial Scholarship

The Mary Rhein Memorial Scholarship was named in honor of Mary Rhein, a mathematics teacher and chapter sponsor from Ohio who was a leader in the National Mu Alpha Theta organization for 22 years. Mu Alpha Theta is offering this $5000 Scholarship to a graduating High School senior member of an active Mu Alpha Theta chapter who has shown loyalty and dedication to their Mu Alpha Theta chapter, enthusiastically participating in local projects with evidence of service in the area of mathematics. They should also be an outstanding mathematics student who has participated in local, regional and national competitions. Applications are available on our website at www.mualphatheta.org > Scholarships and must be postmarked by **February 1, 2008**.

Congratulations to Pratik P. Shah from Lincoln High School in Tallahassee, FL, this year's winner of the coveted 2007 Kalin Award, presented at the Tampa National Convention.

Congratulations to Samuel Irvin Kornicks, Shinjini Bakshi, and John Imbrie-Moore, our 2007 Science Fair winners! All three winners were Freshmen in High School. Samuel attends Vero Beach High School in Vero Beach, FL and his project was entitled: "Quantitative Evaluation of Cancer Cell Complexity, a Study of Fractal Morphometry. Shijini attends Pennbrook Middle School in North Wales, PA and her project was "Potential Pandemic: H5N1 Influenza, a Mathematical Study. John attends Charlottesville High School in Virginia and his project was "Mathematical Modeling of the Speed of Evolution in Asexual Populations. Each student received a $1000 prize for their winning project.

The Drexel University Mu Alpha Theta Scholarship

Drexel University is pleased to announce a new scholarship open to members of the Mu Alpha Theta Mathematics Honor Society. Drexel will offer five (5) scholarships in the amount of $10,000 each to students who meet the following criteria: 1) Attended the Mu Alpha Theta Summer Convention during the summer after their junior year and 2) Placed as a top individual scorer in the Mu Alpha Theta mathematics competition.

To be considered for a Drexel University Mu Alpha Theta Scholarship, an application for admission along with high school transcripts, SAT or ACT scores, and letters of recommendation, must be on file with the Admissions Office at Drexel University by January 15, 2008. Along with a completed scholarship application indicating your intention to apply for this scholarship, please enclose an essay/personal statement illustrating what your experience in Mu Alpha Theta has brought to you and how it has affected your own career goals.

The scholarship application should be sent directly to the Mary Catalfamo, Scholarship Coordinator and Assistant Director of Undergraduate Admissions, by **January 15th, 2008**. Decisions concerning the Drexel University Mu Alpha Theta Scholarship will be made by March 15th, 2008.

The Drexel University Mu Alpha Theta Scholarship is renewable for each year of the recipient's undergraduate degree program, providing he/she is enrolled in a full-time-day undergraduate program at Drexel and maintain a 3.0 cumulative grade point average at the end of each academic year. The Drexel University Mu Alpha Theta Scholarship is applied to annual tuition only. It is not applied to room and board, annual fees, or partial tuition rates. Applications are available now at www.mualphatheta.org > Scholarships.

Drexel is also offering a contest for prospective students that could lead to a scholarship at the school. For information and the preliminary round test, visit www.drexel.edu/coas/math/contest. The deadline for this contest is **October 23, 2007**.

From the National Student Delegate President:

As the most recently elected Student Delegate President, I'd like to wish you all a warm ***aloha***, in hopes that this newsletter finds you in the midst of an exciting and productive school year.

I am honored to work alongside a wonderfully talented executive board this year: Vice-President Sue Zheng (F.W. Buccholz High), Secretary Katherine Johnson (Louisiana School for Math, Science, and the Arts), and Parliamentarian Lily Huong (Bearden High). This extraordinary group has proved extremely cooperative and supportive, and my thanks go out to their sponsors and chapters for allowing them to be a part of the Student Delegation this year.

After a two-week break immediately following the national convention in Tampa, the Student Delegation began work for the upcoming year. We got to work forming three standing committees: Communications, Recruitment, and Sponsorship. **The Communications Committee**, headed by David Yakobovitch (Stoneman Douglas High), has begun designing and drafting the Student e-Newsletter (not to be confused with the Mu Alpha Theta Newsletter) which we currently plan to distribute and post on the Mu Alpha Theta site by November. As the editor of his school's newspaper, David brings extensive experience in communications, as well as graphic design. **The Recruitment Committee**, lead by Malavika Balachandran (McKinley Senior High), is currently hard at work drafting new ideas to maximize interest and awareness in Mu Alpha Theta across the country. Malavika is President of the Louisiana Mu Alpha Theta Student Delegation, and her excellent leadership skills are evident, and greatly appreciated, in her newest position as Recruitment Committee chair. Last, but not least, the **Sponsorship Committee**, chaired by Michael Kotarinos (Palm Harbor University High) has already made tremendous progress in its goal of seeking out more corporate sponsors for next year's national convention. We will have Michael and his committee to thank for our excellent corporate support at next year's convention, as he diligently researches outside donors. Also, Vishaud Persaud (Fort Myers Senior HS) and Allen Liao (Baton Rouge Magnet HS) have stepped up to spearhead various ad hoc committees for the relaxation and enjoyment of all competitors at next year's convention. We were able to collect some great ideas for student activities at this past convention, but please feel free to have your student delegate submit any additional suggestions or concerns to me personally.

Mahalo to all chapters whose delegates have volunteered to serve on a national committee. I am thrilled to have the opportunity to serve as your Student Delegate President, and I look forward to a great year and a wonderful convention in '08. See you all in Sacramento!

Ciera Cummings
Kamehameha Secondary School

The Rocket City Math League is a free international math contest open to all middle, high school, and two-year college students enrolled in Pre-Algebra through Calculus and above math courses. It is administered by the students at **Grissom High School** in Huntsville, AL. Participants are placed into one of four categories based on the level of math courses they are enrolled in. Each division will be given three 12 question tests lasting 45 minutes.

Tests are administered during any one day within the testing period, as determined by the each sponsor. Contest materials will be mailed to each school and the team sponsor will make copies and administer the tests during the designated time periods. Testing dates for the 2007-2008 competition are Round One: November 12-16, 2007, Round Two: January 21- 25, 2008, and Round Three: Feburary 18-22, 2008.

The top 25 students in each division will win a trophy and the top 10 schools in each division win a plaque. Mu Alpha Theta will provide other prizes, as well, including copies of the book *Count Down* by Steve Olsen and TI Graphing Calculators.

For more info, visit our website at www.mualphatheta.org > Contests > Rocket City.

The Log 1 Contest is an excellent opportunity for schools to participate in a mathematics competition similar to the National Convention contests. Schools compete against other schools from across the country and the world, while staying right at their home school.

The 2007-2008 Mu Alpha Log 1 Contest will again be run by the **Mount Rainier High School Math Team** in Des Moines, WA.

The 2007-2008 contest will consist of three rounds. The first round will consist of three Topic Tests covering the topics of "Geometry", "Applications", or "Logarithms and Exponents"; topics appearing at multiple levels at the 2008 National Convention in Sacramento. Each Topic Test will consist of fifteen open-answer problems to be solved without a calculator in thirty minutes.

The second round of the contest will be a Ciphering Test consisting of ten one-problem rounds of general open-answer problems to be solved without a calculator.

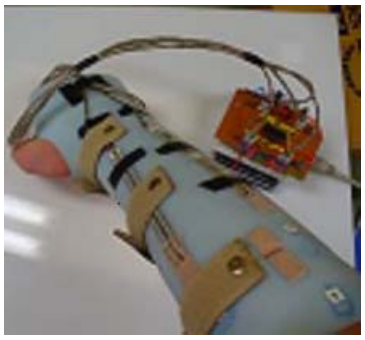
The third test will be a 15-problem, 30-minute, individual test of general mathematics knowledge. Problems, to be solved without a calculator, range from easy to difficult, to provide confidence and challenges to all students. Problem selection and scoring will be the same as the topic tests.

The top ten individuals in each division in each region will receive a plaque and the next fifteen will receive a certificate. The top ten schools in each region will receive plaques.

This year, for the first time, the Mu Alpha Theta Educational Foundation will offer a Convention Grant to the top school in each region. The Grant includes two free registrations to the Sacramento Convention and up to $500 in reimbursed travel expenses. Other prizes will be awarded randomly to participating schools. To register or for further information, see http://log1.wamath.net.

Summer Grants Impact Student Learning

Each year, Mu Alpha Theta offers student grants of up to $2000 to work on a mathematical research project or attend summer mathematics courses not available at their high school or Two-Year College. This past year, Jeremy Blum completed his work on a prosthetic hand with his mentor, Dr. Peter Kyberd of the Institute of Biomedical Engineering at the University of New Brunswick in Canada.



Jeremy Blum's intelligent prosthetic hand, developed with a grant from Mu Alpha Theta.

During the summer, Yuehan Huang of Vestavia Hills High School studied at the Program in Mathematics for Young Scientists (PROMYS) at Boston University along with Timothy Hudson Harper from the Alabama School of Fine Arts. Jacob Trentmann of Washington High School in Washington, MO studied in the Jackling Introduction to Engineering program for high school students at the University of Missouri in Rolla, MO. Finally, Emil Guliyev of Clarkstown High School South in West Nyack, NY worked at the Hampshire College Summer Studies in Mathematics program. Congratulations to all our Grant recipients.

If you are interested in applying for a grant, apply at any time. The application can be found at our website under Scholarships >Summer Grants.

The L'Anse Creuse High School North chapter of Macomb, Michigan had a "surprise" birthday party for Mu Alpha Theta at the end of the school year. Members received notification of a mandatory meeting, but when they arrived they were greeted with balloons, pizza and a large birthday cake. Our officers decorated the cafeteria in the colors of Mu Alpha Theta and we gave door prizes which we purchased on the Mu Alpha Theta website (t-shirts, bags, etc.). A great time was had by all!

AnnMarie Duncan, Chapter Sponsor

THE MATHEMATICAL LOG Now Posted Online!

Students, want to try some great mathematical puzzles, read interesting articles about mathematics, see what students were doing in math clubs around the country in years past? Mu Alpha Theta published The Mathematical Log from 1958 through 2002. These Logs are now being posted online at our website, www.mualphatheta.org > Mathematical Logs. There are hours of activities and puzzles for you and your chapters to look at and try your hand solving. How about making copies of something of interest to share with your Mu Alpha Theta friends! More Logs are being added periodically and we hope to have all issues back to 1958 posted by the end of the school year.

SPONSORS

GOVERNING COUNCIL NEWS

Each year the Governing Council of Mu Alpha Theta meets during the National Convention and in Norman, OK at the National Office in January or February. The Governing Council is the Board of Directors of both Mu Alpha Theta and our Educational Foundation. It is composed of a President, Past-President or President-Elect, a Secretary-Treasurer, four Regional Governors, four Representatives from the national mathematics organizations NCTM, MAA, SIAM, and AMATYC, and the Executive Director of our organization, Kay Weiss. Members of the Governing Council are responsible for all financial and organizational decisions for our non-profits. At the summer meeting, the following decisions were made:

- The First Annual MAθ/AMATYC Two-Year College Mathematics Competition will be held at Manatee Community College in Bradenton, FL, October 26, 27, 2007. Both Mu Alpha Theta and AMATYC will provide financial support.
- The Educational Foundation will provide a Convention Grant to the top scoring school in the Log 1 Contest in each region. Each Grant includes two free registrations to the Sacramento National Convention and up to $500 in transportation reimbursement.
- In support of the American Mathematics Competitions, Mu Alpha Theta will offer top scoring schools a free charter and a waiver of up to ten new members to schools starting new chapters.
- Mu Alpha Theta and its Educational Foundation will offer up to $45,000 in scholarships, up to $20,000 in student grant funds, up to $10,500 in student awards, up to $2,150 for the Rubin chapter award, and will raise its sponsor awards to $6,000 during the 2007-2008 school year. Mu Alpha Theta will also continue to subsidize the Log 1 Contest and the Rocket City Math League and provide up free TI Graphing Calculators to active chapters that request them. The Foundation will continue to offer Convention Grants to new schools attending the Sacramento National Convention.
- A Nominating Committee, headed by Past-President Mary Emma Bunch, will be set up to find candidates for President-Elect and Governors of Region I and II for the Spring Election. Anyone interested in running for these offices should contact Mary Emma.

Sponsors,

Please make copies of this newsletter for your students or post where they can read it. There is a flyer attached advertising the Actuarial Foundation Project Offer. Please copy in color and post! We are counting on you to help us advertise our award, grant, and scholarship opportunities for your students.

Thanks, Kay Weiss

Additional Andree Award to be Presented

Beginning with the 2007-2008 school year, Mu Alpha Theta will **award two Andree Awards** to students who plan to teach mathematics. Each award will provide a **$2500** prize to each winner. One award will continue to be given to a high school senior member of an active Mu Alpha Theta chapter, and now an additional award will be presented to a former member of Mu Alpha Theta who is an undergraduate in college studying to become a mathematics teacher. Each chapter may nominate one student for each of these awards. The application is online at our website under Awards > Andree and is due by February 1, 2008.

Mu Alpha Theta wishes to thank Miami Springs Senior High School for making and donating a wonderful wall hanging to the National Office. The wall hanging was a joint effort by several students, teachers and a parent of the Miami Springs Senior High Mu Alpha Theta chapter. They went all out for Mu Alpha Theta's 50th anniversary last year, using the occasion as their scrapbook and their spring banquet theme. They had been collecting gold fabric, ribbons, paint, etc., and decided to make the wall hanging for the National Office to commemorate the golden event. On the hanging, the Mu logo was done in gold, quilted fabric, each square represents one year in the history of Mu Alpha Theta. They researched the history of the organization and recorded one important event in each square for each of its fifty years. Some of the squares were blank if they were unable to find anything written about those years. The school suggested that anyone with additional historical information for the missing years send it along to the National Office so they could fill in the blanks.

Data Handling

Attached to the Fall Newsletter is an article by **Alan Catley** of Tynemouth College, (alan@catley.org). Alan has 30 years experience teaching Math, first in a High School and more recently in a Sixth Form College in the North East of England. He continues to develop efficient strategies to enhance the subject at all levels. In recent years he has established a reputation for enthusiastically delivering training to teachers in the UK and around the world to help them to get to grips with making the most out of technology in the teaching and learning of Mathematics. Alan's most popular course is specifically on the uses of the Autograph computer algebra system for teaching. (Please note that the article makes some references to the British educational system, which may be unfamiliar to you.)

Data Handling

Aimed at ages 13 to 16 (i.e. our Key Stage 4)

By Alan Catley

One of the key things that I have experienced when teaching data handling and statistics in recent years is that it makes for far more meaningful experiences when teaching 'theory' if learners are involved in working with real data. So, I would encourage teachers to incorporate resources such as 'Census At School' (http://www.censusatschool.ntu.ac.uk/) and the use of the computer program 'Autograph' into the teaching and learning of statistical topics.

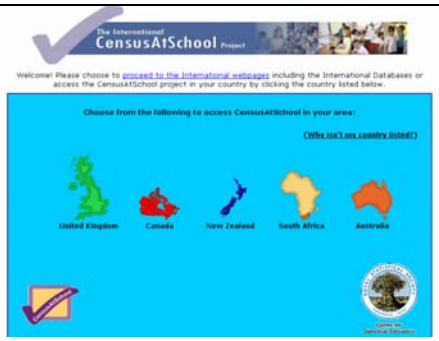


Fig 1. Census At School is 'multi-national'

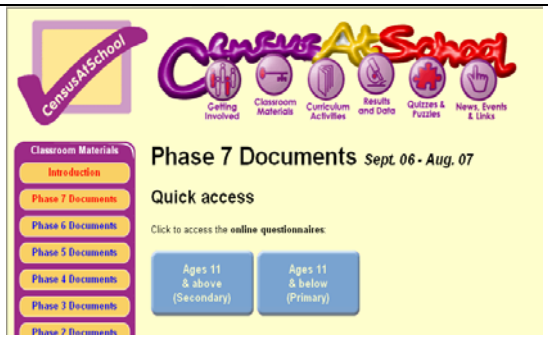


Fig 2. Access to all documents and the 'on-line' questionnaire is very easy

The starting point for all my courses in recent years has been getting students to complete the current 'phase' CensusAtSchool questionnaire. With Level 1 learners, completing a paper copy of this was the focus of a complete lesson, which involved accuracy of measuring and double checking recorded values (in an attempt to eliminated nonsense data!). With a group of S1 students completing the questionnaire was a 10 minute job at the end of a Pure Math lesson prior to commencing the statistics module.

Once students had completed the paper copy they were instructed to complete the 'one-line' version of the questionnaire at www.censusatschool.ntu.ac.uk. There was no need for me to use lesson time to do this as all students have internet access (if not at home or via school/college then they could use the public library). Once the whole group had completed the on-line questionnaire it only requires a quick e-mail to CensusAtSchool to retrieve the spreadsheet containing all the data responses for an individual class. This data can then be used to cover large 'chunks' of the syllabus – by discussing appropriate hypotheses with my class. This has proved to be miles better than teaching, for example, scatter graphs and correlation using fictitious 'text book' examples. To add further interest we looked at random samples requested and retrieved from the CensusAtSchool database drawn from different areas of the country. This provoked much interest by comparing these to their own responses using statistical techniques relevant to the course being followed.

Phase 7 has just been launched (September 2006 – see fig. 3) which includes questions about topical issues, mode of transport to/from school, a few personal measurements (we had great fun and a 'lively' learning activity using the height and bellybutton data) and a 'reaction time' test. Previous phases each had different questionnaires but data (as well as copies of the questionnaire) can still be retrieved from the website.

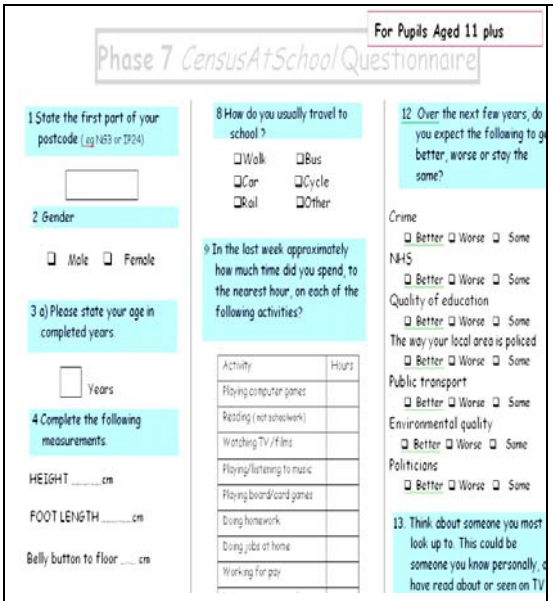


Fig 3. Part of the current 'questionnaire'

	A	B	C	D	E	F	G	H	I
1	yeargroup	region	gender	age	height	footLength	wristCirc	thumbCirc	bellyButton
2	Year 9	West Midlands	F	13	153	23	160	50	97
3	Year 9	South	F	13	161	22.5	150	53	98
4	Year 8	South	M	12	160	32	150	60	80
5	Year 9	South East	F	13	160	24	155	62	92
6	Year 9	North West	F	14	171	23	150	60	103
7	Year 9	South East	F	14	160	23	160	80	99
8	Year 9	East Midlands	F	13	90	32	120	20	50
9	Year 9	North West	F	13	148	22	135	60	100
10	Year 10	West Midlands	M	14	151	24	150	50	97
11	Year 9	East Midlands	F	13	165	27	180	65	135
12	Year 8	South East	M	13	200	23	190	23	50
13	Year 9	East Midlands	F	14	159	23	136	53	93
14	Year 9	West Midlands	F	13	120	24	129	47	70
15	Year 9	North West	F	13	160	22	150	50	102
16	Year 7	South	M	11	152	22	160	40.5	90

Fig 4. A section of a 'random sample' from the CensusAtSchool database (this is from Phase 5)

Below are some examples of how I used the data.

Example 1 – Pie Charts

One of the questions on the Phase 5 questionnaire was "Have you ever smoked a cigarette?" with 4 possible responses: Never □ Once or twice □ Few times □ Many times □

With 24 students in my 'Level 1' class (these were 16 year olds with, at best, a grade F at GCSE) 12 responded with 'Many times'! As well as discussing the health issues, we considered the proportion of the pie chart these 12 would occupy,- which proved surprisingly straight forward for them! Calculating angles for the other responses was a little more demanding on my students but there is absolutely no doubt that the fact they were 'in tune' with what they were doing made for much greater understanding of the skills required. Taking a sample from the South West of England and producing a similar diagrammatic representation enabled them to conclude that they 'smoke too much'!

Example 2 – Working with single variable data

Tests on 'reaction times' can be used to promote understanding of the application of appropriate diagrams such as bar graphs/histograms, box plots, stem plots and also calculation of relevant statistics such as means, medians and quartiles. The Phase 7 questionnaire has an on-line reaction time test that has a bit of a 'sting in the tail'! Try it . . . did you get a surprise at the end? Will this affect results?!

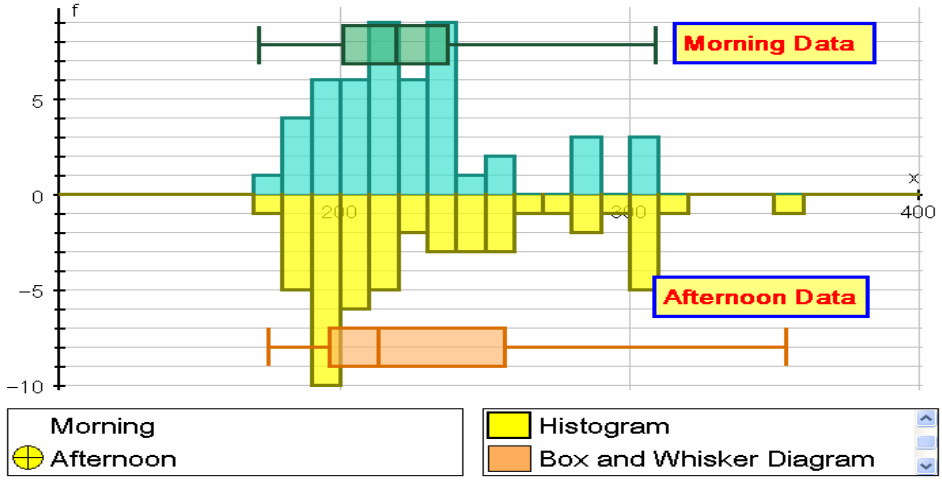
Now, if you want a hypothesis that will motivate the lads try this . . . "Women have faster reaction times and hence they are better drivers"

Rather than test out these two hypotheses here let us take the example I used in class . . . "reaction times are quicker early morning than they are later in the day" (I hasten to add that I thought this to be the case but when canvassing the opinion of a class of 16 year olds in preparation for a lesson on scatter graphs they unanimously disagreed – stating that they 'don't get going till well after lunch'! So we have an argument to be settled and Fig.5 shows a sample of data I asked the class to collect ready for settling this argument. (This data was collected using a simple 'React Timer' available from www.outwareeduaction.co.uk although similar data can be obtained from CensusAtSchool)

Fig. 5 (opposite) shows some of the data collected by students. Morning was defined as before 9:30 and Afternoon after 3:30. Students were asked to test their reactions 6 times before they began recording and then to record the next 7 tests. The middle 5 of these were then added to the class Excel spreadsheet by the students. Note how we attempted to get 'reasonable' data that hopefully gave a fair reflection of reaction times. Discussing the appropriate diagrams and calculations required to draw suitable conclusions was interesting . . . some suggested that we should plot a scatter graph from the data but I for one could not see how this could help!

	A	B	C
1		(Times in millisecs)	(Times in millisecs)
2		Morning	Afternoon
3	Chris	194	187
4		214	191
5		203	209
6		193	210
7		218	189
8	Emma	230	250
9		219	245
10		224	289
11		237	246
12		212	354
13	Mark	254	301
14		238	272

Fig. 6 (below) shows how Autograph has been used to quickly display some of the diagrams that may be appropriate. These diagrams were explained to the students through the classroom projector and then hidden to allow students time to work on producing the diagrams by hand from the raw data. Actually the diagrams weren't hidden completely – I used the 'zoom' facility on Autograph to leave the left hand whisker of one of the box plots on the screen!



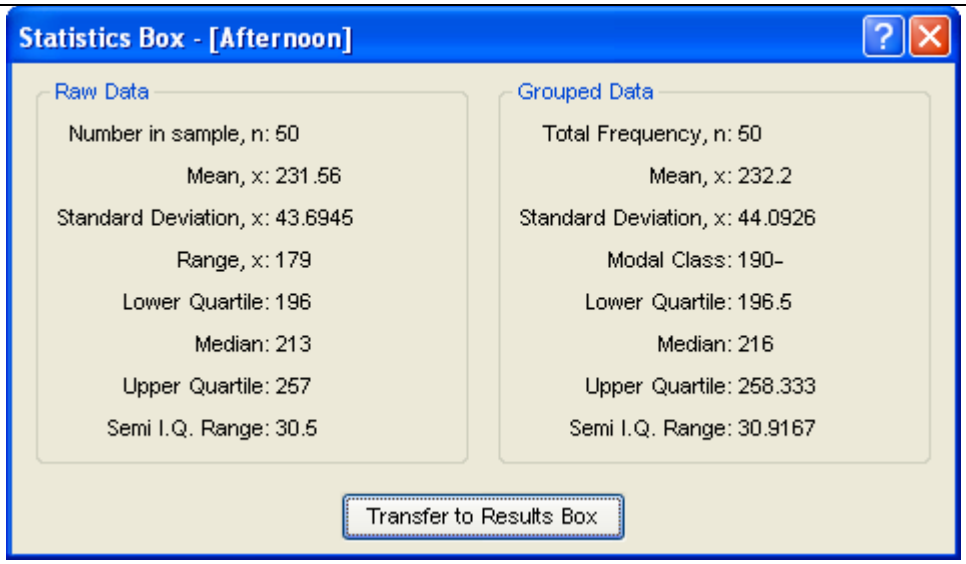


Fig 7. The Statistics Box feature of Autograph shown here can be used to display the relevant statistical values – comparing the Raw Data and Grouped data as shown. This is useful if the two possible box plots have both been displayed (good discussion about **why** they are different and that **only** the Grouped one will match the Cumulative Frequency Diagram which is drawn from Groups). Of course this information should only be displayed once the learners have a clear understanding of how to calculate these values by hand – i.e. the students have done the 'donkey work'!

Fig 8. (Opposite) Autograph also has a 'Stem Plot' option which allows the Stem and Leaf Diagram to be displayed and discussed. Once again this can be revealed at the appropriate time in the lesson to confirm (or otherwise) student 'handiwork'

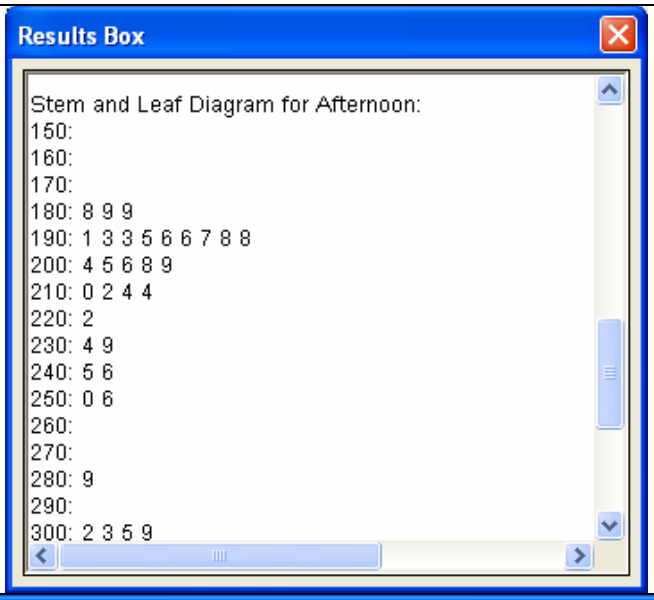
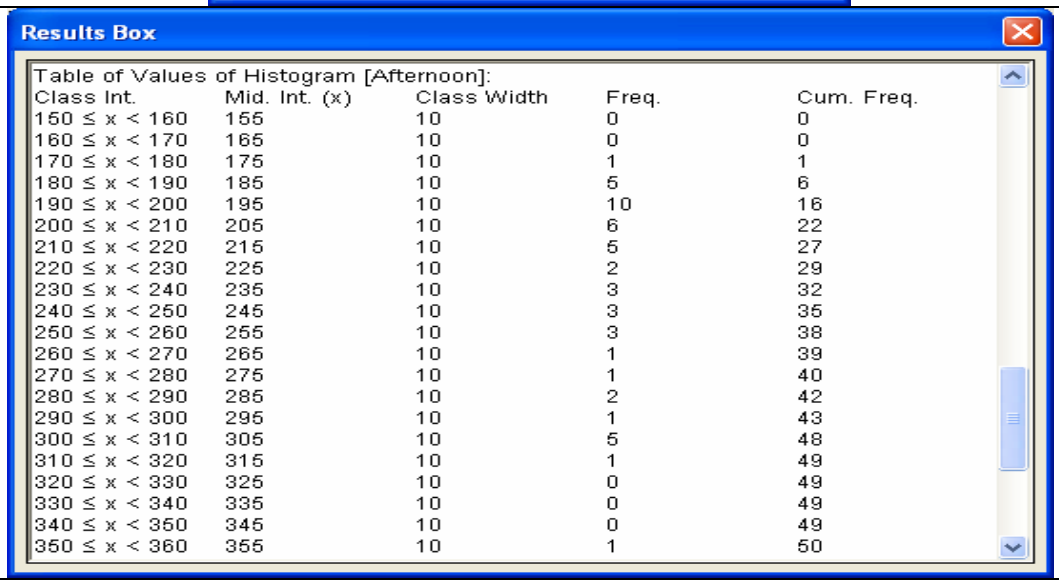


Fig. 9 (Opposite) The 'Results Box' also has the option to copy and paste the Grouped Data into Word and convert this to a 'table' within Word (highlight the rows and use the 'Convert Text to Table' option). This feature can usefully be employed to discuss with students techniques such as how to estimate the mean, median and quartiles for grouped data. These 'long hand' calculations performed by the students can then be confirmed (or otherwise) by looking at the Results Box (see Fig. 7)



Example 3 – Scatter Graphs and Lines of Best Fit etc. for 2 variable data

Let us go back to the 'suggestion' that women are better drivers. There is some data that has been available for GCSE coursework investigations that compares the performance of learner drivers on taking the Driving Test (see Fig.10). The data comes from 4 different instructors and includes only six variables. We won't go into the gender issue in this article (I left that to the students to sort out using appropriate evidence and techniques) but one would assume that the more lessons attended then the fewer minor mistakes are made on the test. Try writing on the board the following hypothesis: "The more lessons attended the more minor mistakes made" and see if any reaction is forthcoming as students write this down? My class didn't seem to think anything strange about this statement at first so it had me wondering what was going on in their minds during 'note taking'!

	A	B	C	D	E	F
1	Gender	No. of 1 Hour Lessons	No. of Minor Mistakes	Instructor	Day	Time
2	F	20	14	A	Fri	9.00
3	M	20	11	A	Fri	9.00
4	M	20	19	A	Fri	9.00
5	F	16	17	A	Fri	9.00
6	F	15	11	A	Mon	9.00
7	F	23	5	A	Mon	9.00
8	F	10	1	A	Thur	9.00
9	M	9	9	A	Wed	9.00
10	F	15	11	A	Wed	9.00
11	M	15	9	A	Fri	10.00
12	M	25	4	A	Fri	10.00
13	F	30	12	A	Fri	10.00
14	M	20	8	A	Mon	10.00

Fig 10. Driving Test data – there are 4 instructors and over 300 candidates in total.

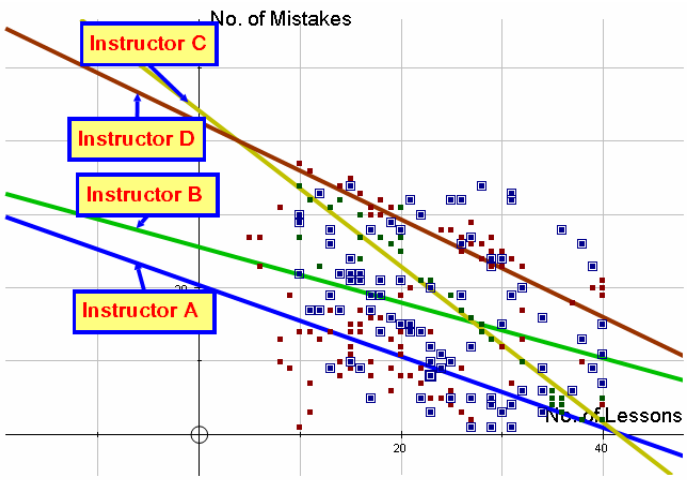


Fig 11. Here Autograph has been used to compare the performance of the Instructors by considering an appropriate correlation. All data from 4 separate data sets are shown.

In order that students might understand the theory of Scatter Diagrams it is a good idea to simplify to, say, just 5 points (I've actually done the following using just 3 points!). Starting with a blank graph page I get the students to choose the points (see Fig.12). We discuss possible 'correlation' and then think what might be a 'best fit' line and/or correlation coefficient. Fig. 12 shows how a 'movable' line can easily be added that passes through the 'centroid' (mean x, mean y) point. Rotating this line and then adding the 'residuals' as squares provides a lovely animation to help students understand the concept. With S1 students I like to get them to calculate values such as the correlation coefficient and regression line equation for their chosen points before using the 'Results Box' to confirm (or otherwise!) their answers. I then ask for suggestions on how we might achieve a correlation coefficient of zero (or 1?!).

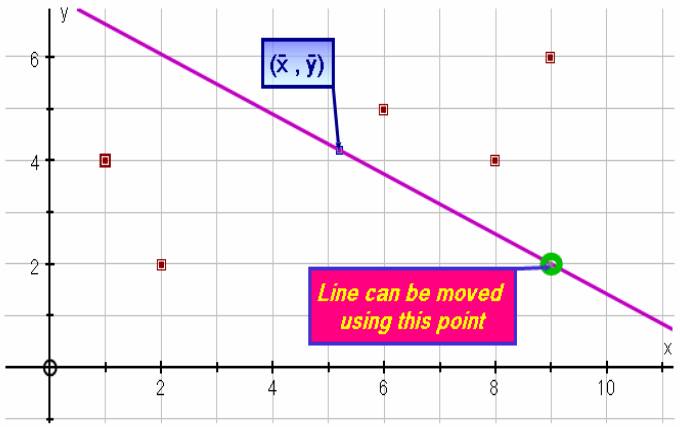


Fig 12. A data set consisting of 5 points (chosen by 5 students) and a movable line that can be animated to promote discussion

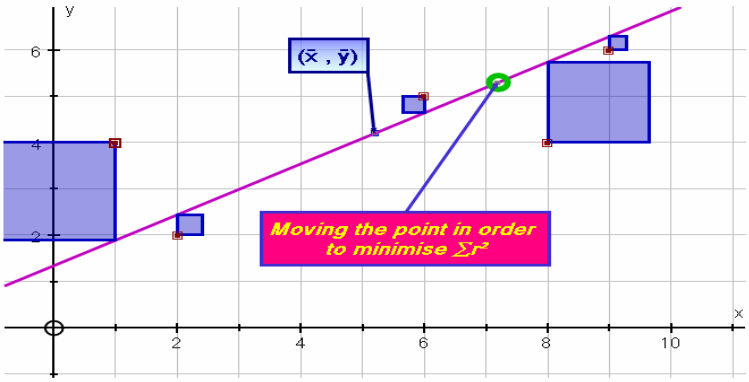


Fig 13. The 'square residuals' can be visualised to help understand the concept of 'line of best fit'.

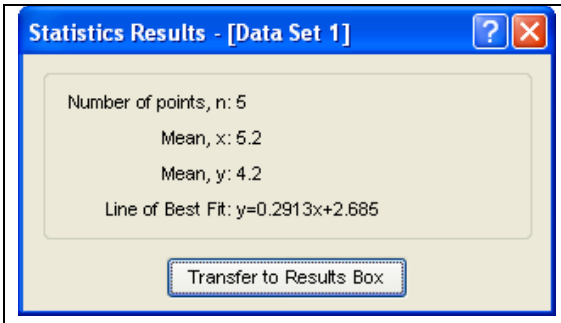
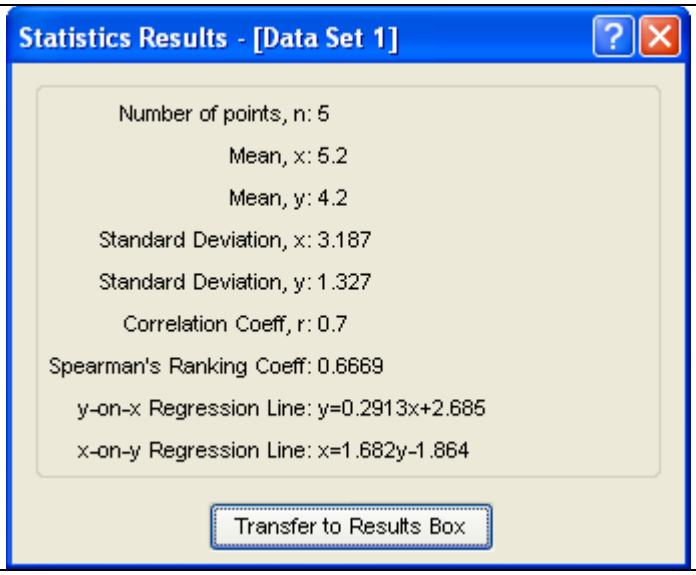


Fig. 14 shows the information in the 'Results Box' which changes dynamically on moving a single data point. Above is for Standard Level – Advanced Level (opposite) is too complicated for lower level learners!



The above example was put to good use with my 'resit' GCSE group, some of whom were under the impression that a line of 'best fit' merely had to have the same number of points on each side! The dynamic visualization certainly put misconceptions to rest.

There are many other ways in which I have used 'real' data to make the teaching and learning of Data Handling and Statistics a far more meaningful and 'fun' experience for both teacher and learners. For a simple and meaningful way to get real data into your classroom check out how to 'Get Involved' at www.censusatschool.ntu.ac.uk and have fun. Previously I used to find teaching Statistics a little tedious (perhaps why I preferred teaching the Mechanics option at A/level?) but not any more!

If you would like copies of lesson plans, worksheets and spreadsheets relevant to this article then these can be obtained by e-mail from alan@catley.org as can details of 'on-site' training opportunities available to help teachers make constructive use of technology in the mathematics.