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Dear Teacher

Welcome to this first edition of TI-Time: Maths. TI-Time has entered the electronic age and will be available by email subscription from now on. We've also split it into two issues for Mathematics and Science so you get even more articles that are relevant to your teaching. If you know of colleagues who would like a free subscription, simply send their email address to mhorsburgh@ti.com or complete the form on the TI website at education.ti.com/uk.

In this issue are articles on T³ – Teachers Teaching with Technology – an organisation that works to support teachers in using handheld technology, the first in a regular series of Key Presses, using calculators for control and lots more.

The next edition of TI-Time Maths will take as its theme the use of handheld technology in the teaching of Data Handling and Statistics. If you have been using TI calculators for this part of the mathematics curriculum perhaps you could write something about it and share your experiences? We'll certainly make it worth your while! Or maybe you can contribute to the new regular feature "Key Presses" or suggest other items you would like to see in TI-Time? In any case, please contact the editor Barrie Galpin : barrie@fineshade.u-net.com or 01780-444360. We want to make TI-Time: Maths as useful and interesting as possible and we'd very much welcome your input.

We hope you enjoy this issue of TI-Time: Maths – please let us know if you have any feedback!

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Ros Hyde is the coordinator for Teachers Teaching with Technology™ (T³) in England, Wales and Northern Ireland. Here she describes how T³ works to support teaching with handheld technology.

As the Professional Development Officer for the Mathematical Association, I have been co-ordinating T³ in England and Wales since April 2000. In that time we have offered short sessions at national courses and conferences and run half-day, one-day and two-day courses for schools and colleges, for initial teacher training institutions, for Local Education Authorities and for other organisations.



The courses have been for primary, secondary and tertiary teachers in both mathematics and science and we have also begun to work with ICT departments. Recently the Key Stage 3 Framework for teaching mathematics has led to a particular increase in interest from teachers in training and support for working with pupils in these year groups.

This year, we have run three two-day courses in partnership with Hampshire Local Education Authority and more than 60 teachers in total will have attended these courses. The LEA provided administrative support for these courses which were subsidised by T³ and the schools paid a fee towards the cost of the hotel venue and the TI-83 Plus Silver Edition teacher calculator that each delegate received. This enabled teachers to be equipped to explore the technology and to try out

some activities between the two days of the course and also supported and developed teachers' NOF training.

There has been a long-running working partnership between T³, the L.E.A and the Mathematical Association, which has sought particularly to develop the use of graphics calculators in secondary schools in the county. Hampshire has a long history of projects looking at the use of handheld technology in the classroom. The impact of having trained a significant number of teachers in the county has been noted already and will develop over the coming months as teachers continue to develop the use of graphics calculators in their classrooms.

We have also been particularly pleased to work with whole departments in schools, where a full day's workshop on the use of technology to support the teaching and learning of mathematics can have a major impact on departmental practices.

All T³ courses are workshops, providing teachers with practical hands-on training, support and advice on using handheld technology to enhance teaching and learning. Courses are offered with the following themes:

- Key Stage 3 and 4 mathematics,
- Key Stage 3 and 4 science,
- Cross-curricular mathematics and science,
- Transition from Key Stage 2 to 3.

All courses are tailored to fit the experience and needs of those taking part. T³ trainers are all either teachers or ex-teachers with extensive experience with the technology, so they are able to develop the skills of teachers effectively.

As the technology develops, the training and support offered by T³ develops. We have now begun to offer some training incorporating the use of small programs and applications, as well as the use of TI InterActive!. Applications, in particular, allow us to explore the real power and potential of handheld technology and to extend the use of graphics calculators further.

T³ will pay the fee and travel expenses for a trainer for any group of at least ten teachers requiring training using Texas Instruments technology, principally the TI-83 Plus, subject to suitable arrangements being made. The local organiser of the course takes responsibility for arrangements for the venue (usually a school) and for any refreshments. In a school context this often means that the course is effectively free of charge as any additional costs for venues or refreshments are met by departments or organisations.

Equipment for such sessions is arranged using the TI loan programme and course delegates are offered the opportunity to purchase some equipment at a discount through the TI grant pricing scheme.

We are planning some two-day courses at several locations in England in the autumn. There are also plans to develop further material to support teachers working at Key Stage Three. Please see the T³ webpage (www.m-a.org.uk/pdc/tcubed/) for up-to-date information.

If you would like to arrange some training in your area, please contact me.



T³ England, Wales and Northern Ireland

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Recently Barbara Mason of Wildern School, Southampton attended a T³ course with her Head of Department, Martin Hole. The course was run in conjunction with Hampshire LEA. We asked Barbara about her reactions to the course.

Barbara, how were graphics calculators used at Wildern School before the course?

After our NOF training there was a marked increase in the use of the two sets of graphics calculators in the department. The main drawback before was teachers' own insecurity with the calculators through lack of regular use. So the department developed regular training sessions in after-school workshops. Teachers who had used the graphics calculators recently would demonstrate their use within that lesson and produce a crib sheet for teachers to help them set up the lesson in the future. As we then knew who had tried these lessons, we all had a human to contact when advice was needed!

As a result of this the calculators are now widely used throughout the school at all levels of ability. Some examples are as follows:

Year 7	Creating Christmas cartoon characters by inputting coordinates to lists, setting up windows, switching plots on and off. Finding functions using the table.
Year 8	Use a probability simulation (avoids migraines through noisy dice throws onto tables!) Reflection and rotation using tables and windows. Investigate $y = mx + c$.
Year 9	Use with OHP and motion sensor to study distance/time graphs. Investigate structures of linear, quadratic, cubic, reciprocal graphs
Years 10 and 11	Investigations into sequences of numbers. Structures of graphs and use of zoom functions. Transformation of graphs

This course was billed as for "advanced users", rather than as 'introductory'. How much previous experience did you have of using the calculator?"

Both of us knew how to access and use the STAT functions, the Y=, WINDOW, GRAPH and STAT PLOT functions. We had used these recently and felt confident with our knowledge of these functions. We also had a lot of experience with the use of the CBR motion sensor.

Did you go with worries about whether others would have a lot more/less experience than yourself? If so were the fears justified?

I must admit we were rather wary of the title of the course. We had no idea what an advanced user was! We had been self-trained up to that point and were unsure just how capable we needed to be! Our fears were soon put to rest when Martin was contacted by one of the course organisers, Ros Hyde, and asked to demonstrate his use of the calculator as a tool for GCSE coursework. We felt confident that we would at least know something on the course! Ros and Ron Taylor made us feel at ease and set the whole course up in the context of a learning and teaching experience for all. We were able to show others short cut techniques and learned lots of tricks and ideas ourselves!



This was a 2-day course. How was it structured?

The course was set in the very hospitable surroundings of the Marwell Hotel. On the first day Martin guided us through the "Open Box" and "Tubes" GCSE coursework and how to integrate the calculator into this task. He provided helpful worksheets and examples of students' coursework. We then had a demo of the TI InterActive! package and used it to try out various activities. We also had the chance to examine a range of textbooks.

We were asked to trial some calculator activities in the classroom over the next two weeks and to report back on these in the next session. This provided us with the opportunity to try out some of the ideas we had picked up on the first day and to

update the department on what we had done. Having the second day a fortnight later also provided us with thinking time and an opportunity to clear up some queries that hadn't arisen on the first day.

On the second day we had a very valuable feedback session. Course members presented lessons they felt had been successful and handed out precious worksheets and lesson guides! It was so useful to hear how to use calculators by others who actually use them with 32 teenagers in a classroom – we learned about the pitfalls and handy hints about setting up the calculators and the lessons.

After this session we split into two groups; one to do more with TI InterActive!, the other to follow through a piece of statistical coursework. I chose this second session whilst Martin tried out TI InterActive!. This was one of the main advantages of having two people from the same department there. We covered both areas and supported each other in the subsequent training of the department.

What aspects of the course were most valuable for you personally?

The course served to develop the skills I already had and introduced me to new ones which I knew would be ideal for lessons. For example, I gained invaluable skills in creating graphs and using the TRACE functions to find specific parts and points on the graph. Tips such as how to set up an equation in the table headings, how to transfer data from calculator to calculator, how to archive these to release more active memory, how to change the type of line on the graphs, were all really useful. Working through the statistical project helped us focus on the usefulness of the calculator to create box and whisker diagrams, scatter graphs and histograms.

The TI InterActive! package was especially attractive and its strength as a visually pleasing demonstration tool was only too evident. Just being able to try out ideas and test new functions in an un-pressurized setting, where instant and informed help was available from a wide range of people, was great!

What effect has the course had in school?

As the department were already quite proficient in the basic use of graphics calculators, we used an after school workshop to teach everyone how to transfer data between calculators, to practise the hints outlined above and examine the activities on the APPS menu and the demo games downloaded from the course. In our July ICT Inset day Martin will be using one of the sessions to train everyone in the use of TI InterActive!, which we've bought on the strength of our experience on the course.



At the start of the new term we shall also be using some Inset time to work through the statistical coursework with the whole department so that they feel comfortable with using the calculators in this new context. I expect the calculators will be heavily used during the statistical coursework sessions.

We have also purchased another set of graphics calculators on the strength of the high level of usage and the expanding number on roll. We have developed a booking system for the class sets and many teachers use the OHP screen and their teachers' calculators as starter or demo activities (the games have been particularly popular!).

What next?

We intend to continue to promote the high level of calculator use in the department and to maintain regular workshop sessions to share ideas for lessons and tips for using the calculators and the TI InterActive! package. After all, the children will never gain access to or develop competence with the calculators, if the teachers are not confident with their use or stimulated to use them to create exciting, practical lessons.

Key Presses

The TI-83 family of calculators have so many facilities and functions that some of the most useful ones can sometimes be overlooked. Some of these features can be the key to efficient and confident calculator use, so if you are a new (or not so new!) user you may find it useful to check that you know about the key presses below.

2nd **ENTER**

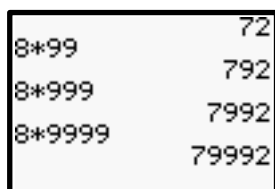
This has to be one of the simplest, yet most useful, commands. On the home screen press **2nd** **ENTER** and you will see the last command you entered appear again and ready for use. You can edit it if necessary and then press **ENTER**.

Here's a very simple example:

Start with a clear home screen and press

8 **⊗** **9** **ENTER**

Now press **2nd** **ENTER** **9** **ENTER** and repeat that key sequence many times.



```
8*99      72
8*999    792
8*9999   7992
8*99999  79992
```

(Can you explain *how* the pattern works? Can you explain *why* the pattern works?)

Have you tried pressing **2nd** **ENTER** **2nd** **ENTER** **2nd** **ENTER** **2nd** **ENTER** ...?

You see the last few minutes of your calculating life passing before your very eyes.

2nd **ENTER** can be useful in the classroom when you are called to help a student who claims to be stuck and who has helpfully cleared the screen so that you can't see what they have been entering previously. Use **2nd** **ENTER** to find out what they have been up to!

I have only recently realised that you can use **2nd** **ENTER** on *any* screen – it will always provide your previous entries from the home screen. This is particularly useful when you're writing a program. If I've been using a series of complicated commands on the home screen, I often decide to string them together into a short program. Once you're in program edit mode you can use **2nd** **ENTER** to save yourself having to enter the commands again from scratch.

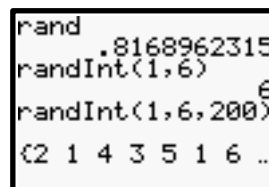
randInt

If you have progressed to the TI-83 from earlier models of the graphics calculator you may not have realised the way the random number generator has developed.

On the TI-82 you only had the command **RAND** to produce a random number from 0 to 1 so you had to work quite hard to simulate, say a throw of the dice.

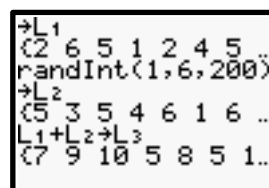
It was much easier to throw a dice with the TI-80 – you just entered **RANDINT(1,6)**. However, what we wanted was to produce lots of dice throws and store them in a list. Again it was possible (using the **SEQ** command), but hard work.

When the TI-83 appeared, **rand** was still there but an optional third argument had been introduced for **randInt** to allow you to produce a list of random integers.

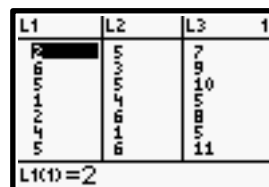


```
rand      .8168962315
randInt(1,6)
randInt(1,6,200)
{2 1 4 3 5 1 6 ...
```

So, 200 dice throws stored in L1 is no problem. Another 200 in L2 and then add the lists together to store in L3 the total scores of 200 throws of a pair of dice. Next a quick histogram and so on....



```
→L1
{2 6 5 1 2 4 5 ...
randInt(1,6,200)
→L2
{5 3 5 4 6 1 6 ...
L1+L2→L3
{7 9 10 5 8 5 1...
```



L1	L2	L3	1
2			
6			
5			
1			
2			
4			
5			
...			
5			
3			
5			
4			
6			
1			
6			
...			
7			
9			
10			
5			
8			
5			
1			
...			

L1(1)=2

Key presses

Continued

DiagnosticOn

Margaret McColm is an Open University Tutor based in Glasgow. Each year since 1996, thousands of adult OU students have studied an introductory Maths course called *Open Mathematics*, which uses a TI graphics calculator as an integral part of the learning process. An important part of the course uses the various regression facilities of the calculator to model data.

Originally the course used the TI-80 which always displayed r , the correlation coefficient, when carrying out a regression calculation. When the TI-83 appeared, by default r and r^2 did not appear on the screen, presumably for the sake of simplicity.

Margaret points out that you can make the calculator display r and r^2 using the command **DiagnosticOn**.

```
LinReg
y=ax+b
a=1
b=-.8571428571
```

```
LinReg
y=ax+b
a=1
b=-.8571428571
r2=.9074074074
r=.9525793444
```

The screendumps here show the effect of using **DiagnosticOn**. And where is this command in the calculator's menus? – it can be found only in the very useful CATALOG menu.

```
CATALOG
DependAsk
DependAuto
det(
DiagnosticOff
DiagnosticOn
dim(
Disp
```

```
DiagnosticOn
Done
```

Over to you...

Do you have a tip to pass on which would help other calculator users? We want to make **Key Presses** a regular feature of TI-Time: Maths so we'd be delighted to publish your hints and suggestions.

Please drop me an email:
barrie@fineshade.u-net.com



image: student version

The TI-83 Plus Silver Edition is the ideal member of the TI-83 family for the teacher. It has all the functionality of the TI-83 Plus but runs faster and has more memory. The Silver Edition comes with fourteen pre-loaded applications and a free TI-GRAPH LINK™ USB cable and software.

In this article Adrian Oldknow describes recent developments in using a TI-83 to control a robot.

At the bottom of all the current TI graphics calculators there is an input/output (I/O) port through which they can communicate with each other, with PCs and Macs, and with other compatible equipment such as the Calculator Based Laboratory (CBL) and Calculator Based Ranger (CBR). The calculator's BASIC-style programming language includes the commands **Send()** and **Get()** to send information to and receive values from the CBL and CBR via the I/O port. The RANGER program, which is built into the CBR, is an example of a program that uses these **Send()** and **Get()** commands.

The original CBL had six built-in ports for use with a variety of sensors and devices. Three of these were analogue ports (Channels 1, 2 and 3) for use with sensors such as those provided: temperature, voltage and light intensity. In addition a sonic port was used for connection to a motion detector, such as the CBR. The other pair were for communication with digital devices. The Digital Input port could receive digital data on four lines (i.e. using 4 bits). The Digital Output port could send 4 data bits to control digital devices.

This gave me the idea for a first attempt for a robotics project – I called it the CBME, or Calculator Based Mars Explorer – a simulation of the Sojourner remote-controlled vehicle used to explore the surface of Mars. I built a chassis from (mainly pre-war!) Meccano parts, and powered it by a 6-volt Meccano motor driven through a gear-train.



The problem was to work out how to switch the motor on and off, and to move between forward and reverse. This required a relay to be programmable via a Haven digital control box designed for primary school D&T work by a colleague, Dr. David Argles.



Thus only two digital output lines were needed: one for on/off and one for forward/back. The other two digital lines were used to sound a buzzer and flash a lamp bulb. So only the Digital Output of the CBL was needed to control the output devices: the motion of the vehicle through the relay and the optical/audio signals through the buzzer and bulb. The analogue inputs were a light sensor attached to Channel 1 and a CBR attached to the sonic port. The CBR would be able to detect how close the robot was to the nearest object.



I wrote calculator programs to work with the CBL in various ways. For example:

```
read the light sensor until the value exceeded a trigger value (simulating the sun rising over Mars);  
then start the motor running forward and read the data from the CBR;  
until the distance from the nearest object is less than 1m;  
then stop the motor, sound the buzzer and flash the light for 10 seconds;  
then start the motor running backwards for 5 seconds;  
then stop.
```

Here are a few lines of the corresponding TI code in the program:

```
:Disp "WAIT FOR ENOUGH LIGHT TO START":0-T
:Repeat T>0.03
::Send({3,0.01,1,0})
::Get(L1):L1(1)-T:Disp T
:End

:Disp "GO FORWARD UNTIL CBR RECORDS < 1M"
:Send({1,0}):Send({1,11,1})
:Send({1,31,1,1}):0-T
:Repeat T<1.00
::Send({3,0.01,1,0})
::Get(L1):L1(1)-T:Disp T
:End

:Disp "OBJECT FOUND, SO HALT"
```

The pictures above show the original CBME – still in running order and using a TI-83.

Unfortunately, when the CBL was replaced by the CBL2, there were no longer separate Sonic, Digital Input and Output ports. So unless you had an old CBL you would have to use Vernier's (www.vernier.com) more sophisticated version of the CBL2, called Labpro, which has the full set of ports.

While the CBME was great fun, the total cost of the kit involved (TI-83, CBL, CBR, digital control box and Meccano parts) was over £300 – and so another, cheaper, approach would be needed to make calculator-based robotics a practical reality for the classroom – preferably one not based around a CBL or CBL2.

The next development came after a tip-off about a firm called Norland Research in Las Vegas (www.smallrobot.com) who had developed their own calculator-based robot for use with a TI-83 Plus. For just \$85.95 (plus \$30.00 postage and packing) you could buy a complete self-assembly kit which produced both digital inputs and outputs for feedback and control.

from the calculator. The front bumper was attached to two pressure pads so that a program could sense whether a pad detected a collision.



The digital I/O was handled by a Programmable Integrated Circuit (PIC) chip mounted on a small card under the robot's chassis. To communicate with the chip, Norland had developed some assembler code called SRBTEST (in ZASM) which was called via the **Asm()** command of the TI-83 Plus. Thus all input and output via the PIC chip was handled via calls to this assembler routine. The code took the latest value as input and returned a result in the variable Ans. The inputs were:

Variable	Value	Effect
F	135	Forward (both motors)
S	000	Stop (both motors)
B	132	Back (reverse both motors)
L	134	Rotate left
R	133	Rotate right
G	64	Go (using latest values)
I	191	Input (read status of inputs)



The two driving wheels were controlled independently by servos which were programmed

The following TI program code illustrates how data is passed between calculator and robot:

```
:135→F:64→G:0→S:191→I:132→B
:Disp "FORWARD"
:F:Asm(prgmSRBTEST)
:G:Asm(prgmSRBTEST)

:Disp "TEST FOR COLLISION"
:7
:While Ans>6
::I:Asm(prgmSRBTEST)
:End

:Disp "REVERSE"
:B:Asm(prgmSRBTEST)
:G:Asm(prgmSRBTEST)
```



The most recent big leap forward is the current version of the Norland Research Calculator Robot, at \$119.90 including p&p (£85.81 in April 2002), but this time it comes ready assembled.



Robot Mark 2 works on the same principles as robot Mark 1, except that now there is no need for the assembler routine to handle the I/O with the PIC chip. Its software now directly decodes the signals received via the **Send()** command, and returns data in a form recognised by the **Get()** command – thus it will work with any TI graphics calculator which has an I/O port and the **Send()** and **Get()** commands. This means that realistic robotics exhibiting feedback and control can be achieved for a price of around £140 and programmed using a simple high-level language.

Communication to the PIC chip takes the form: **Send({xyz,time}):Get(R)** where:

- xyz is a 3 digit number:
- x takes the value 1,2 or 3 and
- y,z take the value 0,1 or 2 given by the following table.

If x = 2 there is no value for “time”, otherwise the value of time is the duration in milliseconds.

x = type of motion	y = left motor	z = right motor
1 = timed movement	0 = forward	0 = forward
2 = move until switch hit	1 = no motion	1 = no motion
3 = either time or switch	2 = backward	2 = backward

Here is a complete program in TI program code to control a Mark 2 robot:

```
:For(C,1,5)
::Send({200}):Get(R)
Repeat five times
Move forward until
switch hit

::Send({122,100}):Get(R)
Reverse for 0.1 s

::Send({120,30}):Get(R)
Spin left for 0.03 s

:End
```



Adrian Oldknow has retired from teaching at University College Chichester and holds a Visiting Fellowship at the University of London, Institute of Education. A member of the T³ steering committee, he is co-author, with Ron

Taylor, of **Teaching Mathematics with ICT** (Continuum 2000, ISBN 0-8264-4806-2) and **Data-capture and Modelling in Mathematics and Science** (BECTa, 1999; downloadable in pdf format from:

vtc.ngfl.gov.uk/uploads/application/datacapture-16796.pdf).

Calculator websites

There are lots of websites providing various types of support for maths in schools with handheld technology. Here is a personal tour of some of the most useful sites around.

Do you know of other websites which support the use of handheld technology for maths in schools? Please let us know so that we can publish the details here.

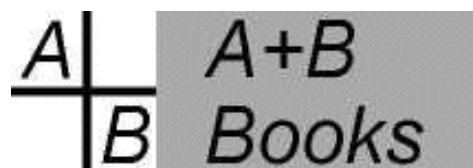


Any tour must start with TI's own site for the UK and Ireland: the home page is at education.ti.com/uk

Clicking on the Teacher World option on the left hand side takes you to education.ti.com/uk/teacher/teacher.html with a range of useful next steps summarised in options printed in blue towards the top of the screen. Some of the most useful are

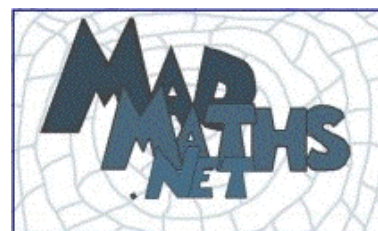
- *Materials, Activities and Newsletters* including an option to sign up for TI-Time and e-newsletters – but if you're reading this you have probably done this already!
education.ti.com/uk/teacher/materials/updates.html
- *Training* takes you to a summary of the current training options including to the various T³ websites.
education.ti.com/uk/teacher/training/training.html
- *Education and ICT* has some very useful material including funding options for handheld technology, the current regulations regarding use of calculators in exams and topical news items on ICT in maths and science education in the UK and Ireland.
education.ti.com/uk/teacher/education/education.html
- *Software* has details of Applications and links to pages on the TI US website where you can download Graph-link software etc.
education.ti.com/uk/teacher/software/software.html

One word of warning about following such links from the TI UK website: if you find yourself on the US website where there is a lot of useful stuff, don't expect to find a link to take you back to the UK site. You'll have to use the *Back* option on your web browser to return to this side of the Atlantic.



If you are looking for printed materials to support the use of graphics calculators, a website well worth visiting is that of **A+B Books**. (*Here I must declare an interest!* Ed.) Alan Graham and Barrie Galpin are A+B Books – a small publishing house if ever there was one. On the website you will find details of and excerpts from both the **Calculator Maths** series of books and also **30 Calculator Lessons for Key Stage 3**. There are also details of special offers, ordering information and forthcoming publications.

www.AplusB.co.uk



Madmaths is the memorable name used by a group of Scottish teachers and their website is of interest to all Maths teachers, not just those in Scotland. If you are looking for investigations, games and programs for TI calculators try www.madmaths.net



Finding real statistical data is not always easy but there are an increasing number of websites from where interesting data can be gleaned. One such is the learning zone of **National Statistics** the official UK statistics site where 12 learning resources provide real data which are used to illustrate important topics in economic and business theory. For example, you can download the number of births and deaths in the UK for most years in the 20th century.

www.statistics.gov.uk/learningzone/default.asp

Loan Programme

The Texas Instruments free Loan Programme helps you find out more about how our educational technology can enhance your students' learning. The Loan Programme is the ideal way for you to get TI products for teacher workshops, in-service training, or to borrow individual calculators so that you and other teachers in your department can evaluate them.

What's available?

The following products are available through the Loan Programme:

- TI-83 Plus
- TI-89
- Voyage™ 200
- CBL 2™
- CBR™
- Vernier probes for the CBL 2
- TI-Presenter™

ViewScreens and teacher calculators are optional; so don't forget to request one if you need it. And if you want posters, transparencies and literature to distribute to workshop participants, just ask.

Borrowing calculators is free and it's easy

Reservations for calculators should be made 4-6 weeks in advance to ensure availability. Please provide the following information in your request:

- Delivery date, address and telephone number
- Quantity and type of equipment you require
- How long you would like the loan for (usually up to three weeks)

The units are packed and sent straight to you. After your workshop, you simply re-pack the cases, affix the address label provided and call for pick-up. Complete instructions are included for each loan.

To book a loan, or for more information, simply contact:



**Texas Instruments
Customer Service Centre**

Tel: 020 8230 3184

Fax: 020 8230 3132

E-mail: ti-loan@ti.com

Or book a loan on-line at education.ti.com/uk

education.ti.com/uk

ti-cares@ti.com

Where to buy TI Technology

You can purchase student units, teacher units, accessories, software and class sets from the following companies:

Comcal (Scotland) Limited

Telephone: 0141 332 5147

Email: sales@comcal.net

Website: www.comcal.net

Jaytex Limited

Telephone: 0161 831 7585

Email: jaytex@freeuk.com

Oxford Educational Supplies Limited

Telephone: 01869 344500

Email: sales@oxford-educational.co.uk

Website: www.oxford-educational.co.uk

Science Studio

Telephone: 01993 883380

Email: solutions@science-studio.net

Website: www.science-studio.net

Shaw Scientific (UK) Ltd

Tel: 0870 241 6938

Email: info@shaweducation.co.uk

Website: www.shaweducation.co.uk

Shaw Scientific Limited (Ireland)

Telephone: +353 (0) 1 450 4077

Email: info@shawscientific.com

Website: www.shawscientific.com

Waterstons the Stationers

Telephone: 0131 553 1154

Email: sales@waterstonsstationery.co.uk

Website: www.waterstonsstationery.co.uk