

(n) sight

SUMMER 2010



In this issue:
**MATHS, AN ARTIST
AND THE HIGH LINE**
BART'S PARTS
WHAT /STI-NSPIRE?

Watch the TI-Nspire
introductory video
and download trial
Teacher Software from
nspiringlearning.org.uk

 **TEXAS
INSTRUMENTS**

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Welcome...

Welcome to the summer edition of (n)sight, a termly magazine that shares inspiring ideas between practitioners who are using TI technology to improve teaching and learning.

In this edition:

Maths, an artist and the High Line Page 2

Walking through a public park or looking at art may not often bring mathematics consciously to mind but, of course, it is never far away. In this article the focus is the mathematics (and the TI-Nspire!) used by a British artist in constructing a public work of art in New York.

What is TI-Nspire? Page 6

Just what is it about TI-Nspire that makes it such a uniquely accessible and powerful tool for mathematics learning? Jenny Orton explains what TI-Nspire is for her.

Bart's Parts Page 8

Another unlikely-sounding fusion of ideas is described in this article. Peter Ransom is a fan, both of TI-Nspire and of The Simpsons and this article describes how his two enthusiasms came together in his classroom.

Screensnap competition Page 11

Your chance to win your own personal TI-Nspire Teacher bundle by matching the screenshots against those that can be found on the Nspiring Learning website.

In the next edition...?

Could you contribute an article or share a classroom activity? If so, the editor would like to hear from you...

Please email barrie.galpin@zen.co.uk

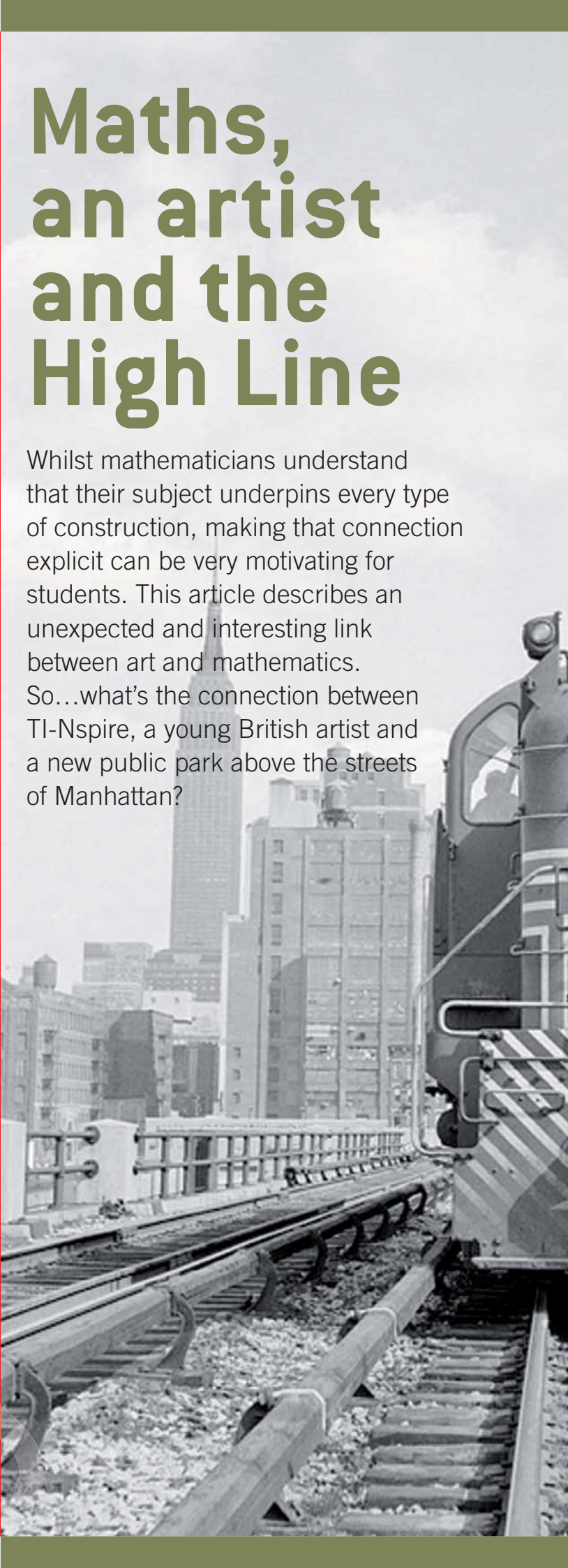
News in brief:

- Have you visited the new Nspiring Learning website? This virtual resource centre for all things TI-Nspire includes free classroom-ready activities, templates and resources, video tutorials, downloads, community links and more. Visit nspiringlearning.org.uk to find out more.
- Upgrade your TI-Nspire handheld Operating System for free and download a 90-day trial of the TI-Nspire Teacher Software at nspiringlearning.org.uk.

Cover photo: Jason Mandella

Maths, an artist and the High Line

Whilst mathematicians understand that their subject underpins every type of construction, making that connection explicit can be very motivating for students. This article describes an unexpected and interesting link between art and mathematics. So...what's the connection between TI-Nspire, a young British artist and a new public park above the streets of Manhattan?





Let's start with the elevated park in New York. Known as the High Line, an elevated railway was built in 1930, lifting freight traffic 30 feet above the congestion of Manhattan's largest industrial district. After 50 years the railway closed and the raised tracks gradually became derelict... but wonderfully green! After 20 more years a community group called Friends of the High Line saved the structure from demolition and plans were approved to turn this elevated green space into a 2.5km-long public park.



And the British artist? Since completing an MA at Goldsmiths in 2001, Richard Galpin has specialized in dynamic and fantastical works derived from his photographs of cityscapes. Using only a scalpel he intricately scores and peels away the emulsion from the surface of the photograph erasing much of the original image to leave fragments that make a new picture in the mind of the viewer. Having developed an international reputation, in 2009 Richard was commissioned to create a piece of public art for the High Line.



Richard conceived a work that would be a development of his previous two-dimensional erasure techniques. Since this work would be mounted in front of the actual cityscape, he realized that his usual photographic fragments could be replaced by fragments of the actual view. A white screen with carefully crafted holes would allow the viewer to recreate the artist's vision, in which the 3-dimensional aspects would be captured in a 2-dimensional space.

This is what the viewing station would look like....



...and this gives an impression of what would be seen

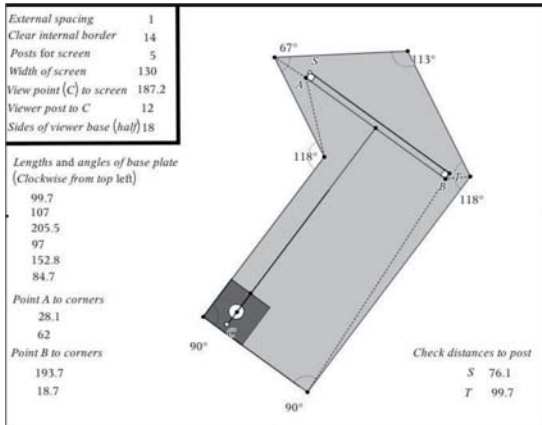


However, it would be crucial to erect the screen and the viewpoint in exactly the right places in order for the visual dynamic to work. Very careful measurements, calculations and design would be required.

And that's where the maths and TI-Nspire comes in! Richard's father, Barrie, has been part of the team developing mathematics materials that draw upon TI-Nspire's unique ability to carry out dynamic geometry constructions and trigonometry especially, using the handheld, in unusual and outdoor situations. He realized that it would be possible to construct a TI-Nspire document that could provide a mobile tool for Richard to use when taking the original photograph: if the camera is placed in a particular place, looking in a particular direction then the implications for the design of the screen, the viewing station, and the supporting base could be immediately determined by the TI-Nspire's dynamic geometry features.

And so a collaboration between artist and mathematician, who also happened to be son and father, began.

So version 2 of the design was produced, incorporating different parameters. The non-square corner meant that the distance of A from the rail would be difficult to measure so a change was made so that the measured distances of A and B from the corner would determine the angle of the screen. TI-Nspire allowed point S to be dragged parallel to one of the rails and the resulting possible configurations would be displayed. This meant that the artist could measure distances in the field and slide point S until those distances were displayed on the screen.



The next day the artist visited the company who would fabricate the base plate and the viewing station was constructed. Only when the structure was actually installed did the artist know for sure that the mathematical calculations were correct. The TI-Nspire, with its flexible blend of dynamic geometry and trigonometrical calculation had given him confidence that the High Line Viewing Station would offer visitors a novel reconsideration of the Manhattan skyline – a well-placed confidence as it turned out when the art work was unveiled in May.

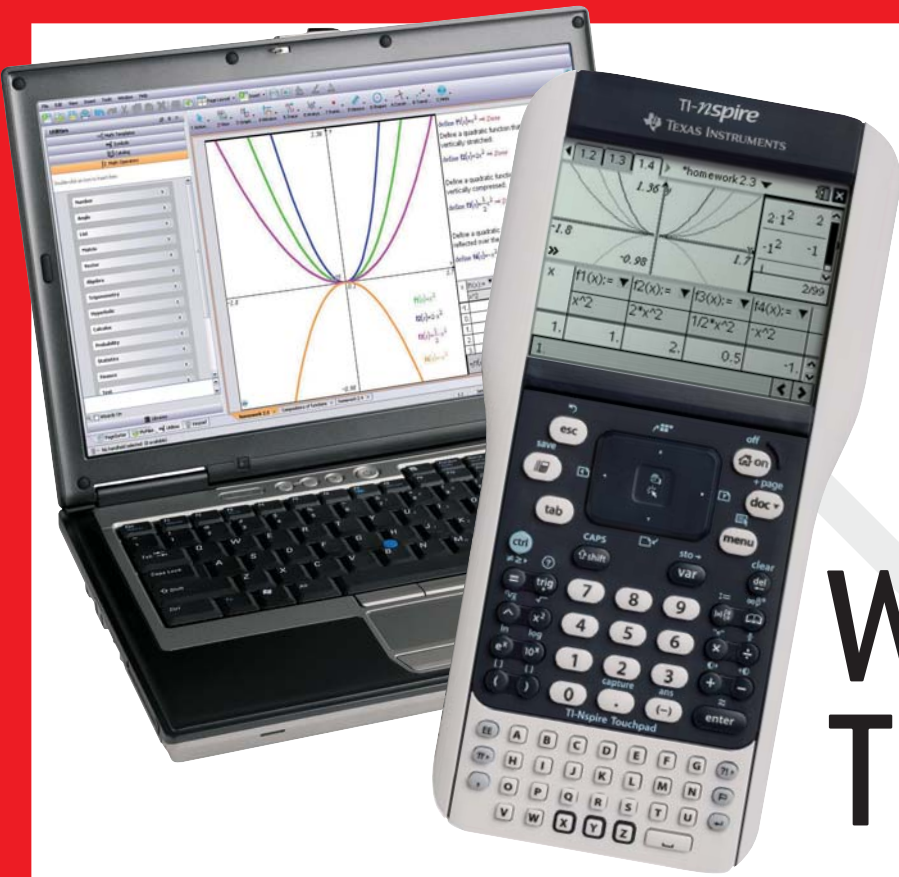
The final part of the TI-Nspire document displayed a diagram that the artist could present to the fabricators, along with every relevant length and angle that they might need.

In March 2010 the artist travelled to New York, with TI-Nspire as an essential part of his travel luggage along with camera and measuring tapes. The camera was carefully set up and aimed at the cityscape chosen within the known parameters. Determining measurements and check measurements were made and recorded on TI-Nspire.

This example of maths applied to art in the real world may be something that you could discuss with your class. There are many interesting modern sculptures and artworks which rely on intricate calculations and precise constructions, so using dynamic images of shapes and spaces with maths ICT can help learners to notice and understand how things that they may walk past every day are created!



Photo: Jason Mandella



What is TI-Nspire?

In the relentless pace of technological advance, every now and then a development comes along which provides a real step-change.



Jenny Orton taught mathematics in secondary schools in East Anglia off and on for about 20 years. She is currently working on a range of projects including work for the NCETM, Hull LA and T³, and is based (not quite centrally!) in Norwich. She still talks herself back into the classroom from time to time, usually with TI-Nspire on hand. Email: jennifer@orton.demon.co.uk

With machines such as the Sinclair ZX80, the BBC-B computer, the graphics calculator, the iPhone, the iPad and with software such as the word processor, the spreadsheet or dynamic geometry, describing exactly what the technology is provides a bit of a challenge. Once you've tried it yourself you know at first hand what it does, but describing it to someone else inevitably evokes such statements as "it's like a ... but you can also... but the great thing is...". In this article Jenny Orton considers whether TI-Nspire offers a similar step change in technological advance and tries to answer the simple question: *what is TI-Nspire?*

When I started teaching some 25 years ago, the curriculum demanded that we write Information and Communication Technology (ICT) into our schemes of work for mathematics: if I remember rightly, we didn't have sophisticated graphing packages, we didn't have dynamic geometry, but I think most maths teachers at that time recognised the power of ICT to motivate, engage and illuminate through simple activities. Few classrooms were set up with data projectors so ICT was very much in the hands of the students.

Now we hear the recommendation from Ofsted (*Understanding the Score*) that secondary schools should "improve pupils' use of ICT as a tool for learning mathematics" – a weakness highlighted in many Ofsted reports, while the recent Scottish report into ICT use in schools, also highlighted that "many staff...do not understand fully enough their own role in the effective promotion and use of ICT for learning and teaching". It seems to me that since I started teaching the ordinary teacher has been given less opportunities to offer students simple hands-on ICT activities, and perhaps has been seduced by the ready-made teacher presentations that are so readily available.

If ICT is made to seem like the specialist's preserve, too many teachers will be put off. We need once again to address the issue of enabling students to exploit the power of ICT whether it be to develop understanding or to engage in investigation and exploration, and to do this we need a robust and accessible platform. My work with Texas Instruments technology, first as their Education Technology Consultant, and now as a freelance consultant, has led me to believe that TI-Nspire certainly satisfies that need for a robust, powerful and accessible platform.

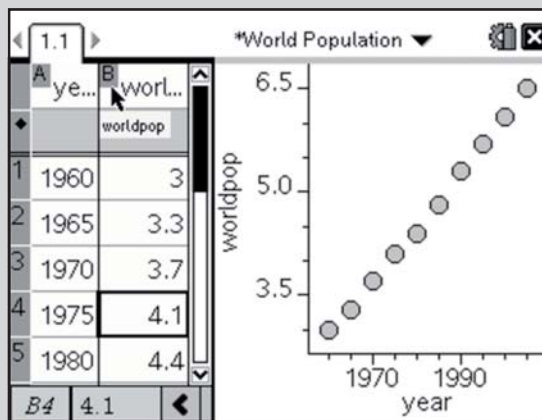
TI-Nspire is software and not a graphics calculator (though it does have a calculator application). Because the software runs both on a computer and on a handheld device it has great flexibility in the classroom. Instead of booking a lesson in a computer room, there can be access to the same powerful learning tools sitting on the table. This is ICT in the hands of the student and software means menus, files, folders, documents – all familiar territory for teacher and student alike.

The TI-Nspire software provides a full suite of applications to use in the learning of number, algebra, geometry and statistics, with the same ICT skills employed in each area – that alone makes it a good return on the investment of exploration time in this era of low interest rates! Dynamic linking of applications allows, for example, the collection of measurements or data that can be stored in a spreadsheet and graphed on a graphing plane, producing multiple representations. Probes can be attached so real data can be collected in the field (helping you to support the STEM agenda) and statistical graphing features allow for the data to be modelled through trial and improvement. The Geometry application allows students to explore geometric relationships through manipulation of the relevant diagrams and variables with the aid of a ‘grabbing’ hand.

Perhaps the power of TI-Nspire is best illustrated with a couple of short examples.

Real data handling

When it comes to statistics, the facility to cut and paste data from Excel into the TI-Nspire Lists & Spreadsheet application and easily to transfer them to a class set of handhelds opens up the opportunity to explore real data. Whether, like this population data, it is from the UN statistics site (<http://data.un.org>) or from CensusatSchool (www.censusatschool.org.uk), large data sets can be processed quickly, freeing up time for learners to choose appropriate representations and interpret and compare their charts and graphs, or just predict the future!

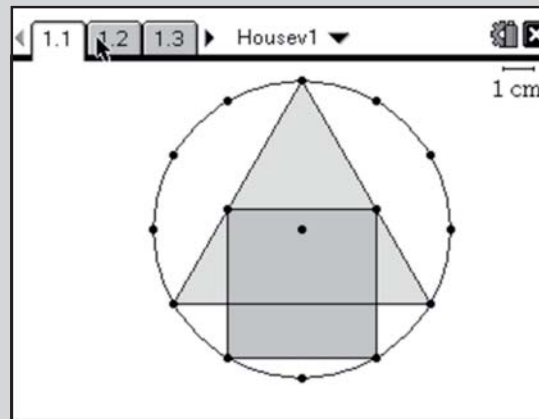


Similarly, data can be collected using a temperature probe or a motion detector, and analysed with the features of the statistics application. Sometimes having two windows displayed side-by-side gives instant feedback on how changing the data affects the graph.

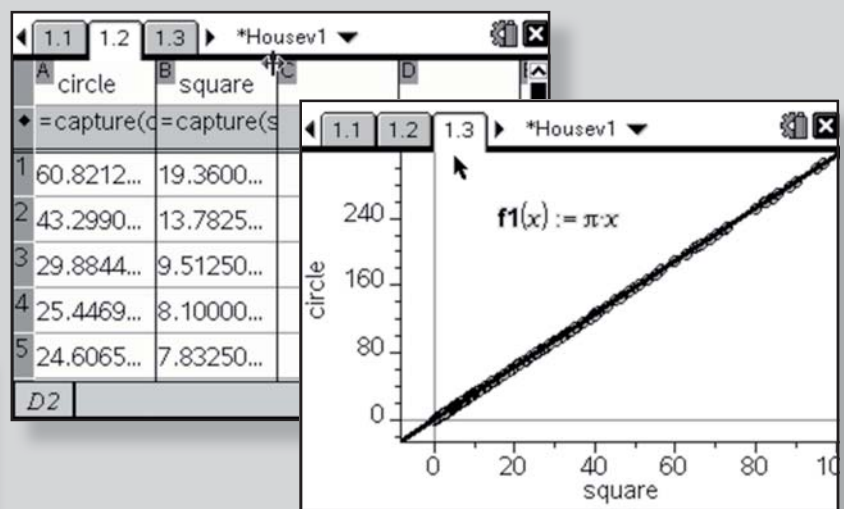
Explorative geometry

Last summer I was asked to write a few words to accompany an image of crop circles used on a previous edition of [n]sight. I became increasingly intrigued by the geometry behind them and one particular crop circle shape, *House of Pi*, lent itself to detailed scrutiny. Going beyond the obvious

symmetries, I carried out a series of *what ifs* and came up with a surprising ratio: that of the area of the square to the area of the circle.



TI-Nspire allows the areas of the circle and the square to be measured and captured on a spreadsheet. By changing the size and then plotting the areas, the relationship is revealed, and then we start to think about proof.....



These examples just begin to illustrate the range of learning activities that can be created with TI-Nspire. Every time I see someone deliver CPD or give a conference session using ICT, another stream of possibilities seems to be opened up. Because of the software environment, files can be pre-constructed and shared around the class either via a USB hub or even wirelessly, so it is possible to balance the ICT skills against the mathematical benefits. When creating live activities the Teacher Edition of the software has an emulator, which means the teacher can show the class what's going on.

Whether it is representing, analysing, interpreting and evaluating or communicating and reflecting, various types of ICT increasingly offer teachers and learners the tools to help develop the key process skills, which can be seen as fundamental to producing problem solvers. The great thing about TI-Nspire is that all these process skills can be delivered efficiently and effectively through one single multi-representational package.

Inspiring Simpsons

Bart's Parts



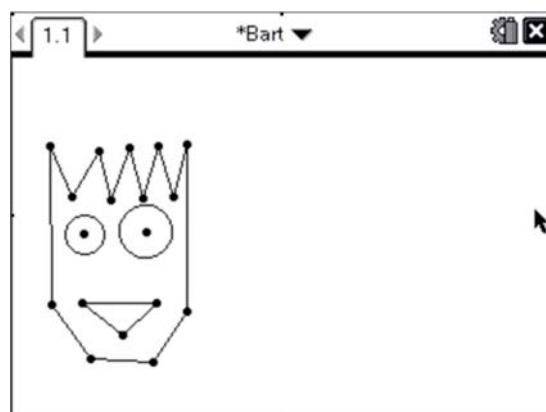
Peter Ransom is Director of Mathematical Studies at The Mountbatten School and Language College, Romsey. prm@mountbatten.hants.sch.uk

I have a number of classroom mathematics lessons based around the legendary but timeless Simpsons and in this lesson I pay tribute to Bart Simpson. Since TI-Nspire handhelds have easy-to-use dynamic geometry, I like to use them for the topic of reflection with Year 7 classes. The lesson has a secondary objective of getting students used to working with the menus on the Geometry page and of investigating the Transformations menu.

Producing an object

Start by opening a new document and selecting a Geometry page. Remove the scale by pressing **menu** **2** **7**.


Then, *on the left-hand side of the page*, draw the outline of Bart's head using the Polygon tool, **menu** **9** **4**, followed by his eyes using the Circle tool, **menu** **9** **1**, and his mouth using the Triangle tool, **menu** **9** **2**. Produce something like this.

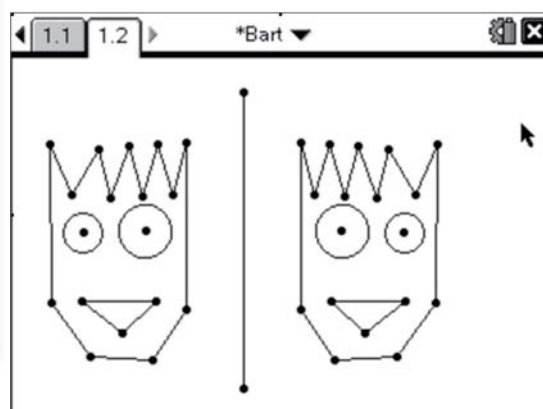


Producing an image

You can quickly draw a line segment to act as the mirror line using the Segment tool, **menu** **7** **5**.

Now you are ready to reflect each of Bart's parts using the Reflection tool, **menu** **B** **2**.

For example, to reflect his head, move the cursor over the outline of Bart's head until the word *polygon* appears, click the button  or press **enter**, then move the cursor over to the line segment and when the word *segment* appears click the button again. The head outline is reflected.



Let students play around a bit, moving Bart's parts and seeing what happens to the image. For example, they can click on one of the circles and drag to change the size of an eye.

Reflecting on the reflection

Seed the following ideas among your students and ask them to write what they notice. They can do this either in their exercise books or on a new Notes page on the handheld. (Press **ctrl** **doc** **6**.)

Press **menu** **7** **5** and draw a line segment from one object point to its image.

Press **menu** **7** **3** and mark the intersection point of this line with the line of reflection.

Press **menu** **8** **1** and use the Length tool in the Measurements menu to measure:

- the distance from the object point to the line of reflection;
- the distance from the line of reflection to the image.

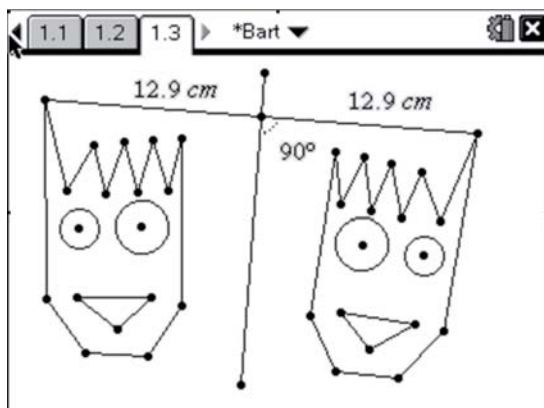
Press **menu** **8** **4** and use the Angle tool in the Measurements menu to measure:

- the angle between the two line segments.

Students can also move the line of reflection and see what happens to Bart if

- the line itself is dragged;
- one end point is dragged.

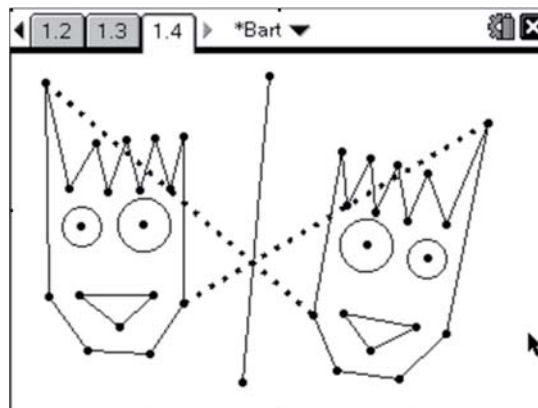
Spontaneous questions sometimes come from the class: "What happens if you move the line to the left of Bart?" WOW! It is a great feeling when they anticipate what you are thinking! It is one of the many joys of teaching to be steered along the road of mathematics by the class. They think they are in control and respond accordingly. Throw the question back at them. "What do you think will happen?" Depending on your philosophy you can get them either to write or to discuss what they think happens before investigating situations like this.



A surprise development

In the past when I used this activity one student unexpectedly asked, "What happens if you draw two lines using two points and their images but don't join point and image?"

Below is what she meant. Over to you to prove what you find!



While writing this I am thinking of many other missed opportunities with this diagram. For example:

- join corresponding points and look at similar triangles;
- join all four points and do some vocabulary work – what shapes can you see?
- move the line of symmetry so the big eyes correspond – what point will the line pass through?

Organising the lesson

I have four main ways of using TI-Nspire in the mathematics classroom. For which of these do you think the Bart's Parts idea is most suited?

1. Whole class demonstration.

Here I use the digital projector and the TI-Nspire Teacher Edition software as an electronic blackboard.

2. Directed student use with the class using TI-Nspire handhelds.

This happens when I set a task where I want students to use TI-Nspire in a particular way. It often includes the use of preloaded TI-Nspire documents (tns files).

3. Whole class activity with both the Teacher Edition software and handhelds being used.

4. Independent student use with students asking and answering their own questions.

Here the class works on a common task that may last a few lessons or even weeks.

In the past, I have used the Bart's Parts idea first as a starter, showing students what to explore and then as a class lesson. Now we work it together so that students can work creatively, designing their own part of Bart and letting their creative juices flow.

Objectives, vocabulary and justification

Mathematical objectives of the lesson are:

- Understand and use the language and notation associated with reflections.
- Recognise and visualise the transformation of a 2D shape
- Reflection in given mirror line and line symmetry

Vocabulary includes Line of symmetry, mirror line, object, image, perpendicular, polygon

This activity supports students' understanding of the properties of reflections (e.g. the constructed line between object and image points is perpendicular to and equidistant from mirror line). It also helps to address the common misconception that arises when mirror lines are limited to "vertical" and "horizontal" lines.

Management issues

In the mathematics faculty we find that students need to use TI-Nspire handhelds regularly or they forget what to do. We are constantly developing more teaching ideas and helping each teacher explore what works for them.

We have also been working together doing team teaching to reduce the initial nervousness of working with a class of students with handhelds. We spend about an hour planning a lesson and familiarising ourselves with what we will do before one of us, usually the class teacher, leads the lesson while the other helps to sort out any questions with the technology. After the lesson the lead teacher reflects on the lesson and writes notes for others in the faculty. This way we share the experience and any problems are then anticipated.

We have also made contact with another local school that uses TI-Nspire and hope to meet once every half term to discuss ideas and develop lessons that we can share.

Bart's Parts and other stories about using Cabri in the classroom appeared in *Micromath 18.3* and subsequently in *Moving on with Dynamic Geometry* and *Integrating ICT into the mathematics classroom*.

A short video of Peter demonstrating this activity can be accessed from the Nspiring Learning website <http://resource.nspiringlearning.org.uk/downloads/>

"How To" video guides



Using an EasyTemp probe with a TI-Nspire handheld



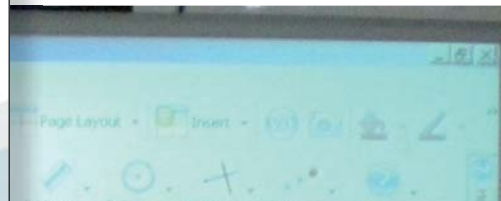
Introduction to TI Connect-to-Class with TI-Nspire



'Bart's Parts' - rotation and symmetry with TI-Nspire



STEM activity, using an EasyTemp probe to create a cooling curve



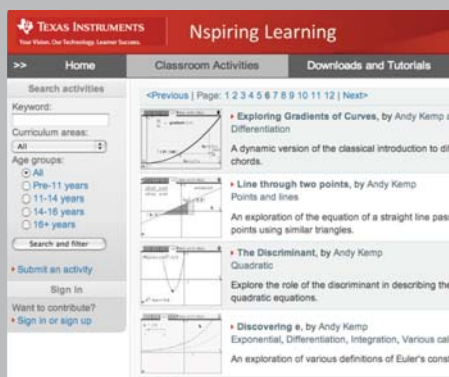
Summer 2010 *(n)*sight competition

SCREEN SNAP

Teachers: here's your chance to win your own personal TI-Nspire 'Teacher Bundle', comprising a TI-Nspire with Touchpad handheld and TI-Nspire Teacher Software licence that you can use for yourself or in your school.

Below are nine 'screen snaps' that exemplify the wide range of uses of TI-Nspire. Each one can be found on the Classroom Activities pages of the Nspiring Learning website; www.nspiringlearning.org.uk. Only the file names have been obscured to make it a bit harder!

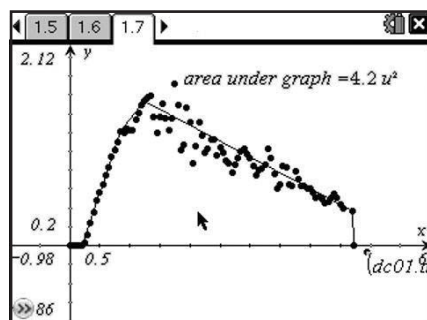
Can you find these screenshots on the website?



Simply send an email with the letter of the screen snaps below (A to I) together with the name of the corresponding activity from the website to the editor, barrie.galpin@zen.co.uk by the 31st of October 2010. Then complete the following: **"I would like a new activity on the website, which..."**

The person who correctly matches the screen snaps and who, in the editor's opinion, best specifies a new activity will win the TI-Nspire Teacher Bundle. The prize will be delivered by the 30th of November 2010.

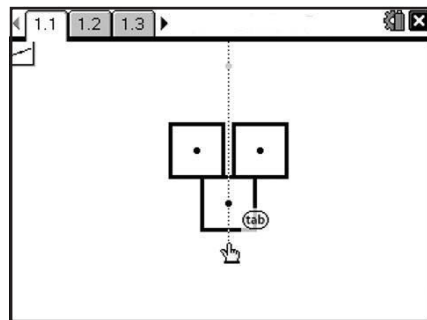
A Data & Statistics page



D Question page

The screenshot shows a question page with the prompt: "Describe the function you observed on the previous page:". Below it, a text box contains the response: "The output is always two more than the input". A "Suggested Response:" section shows: "As the open dot moves the closed dot moves at the same rate always staying the same distance apart. The function is $f(x)=x+2$ ".

G Geometry page



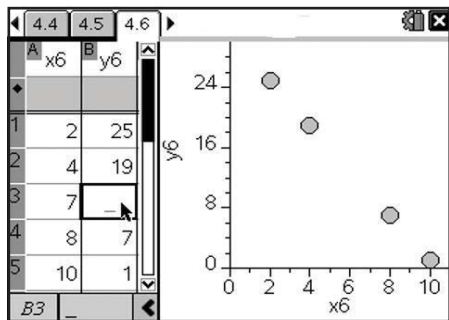
B Lists & Spreadsheet page

	A sides	B ratio	C	D
1	3	3.4641		
2	4	2.82843		
3	5	3.2492		
4	6	3		
5	7	3.19541		

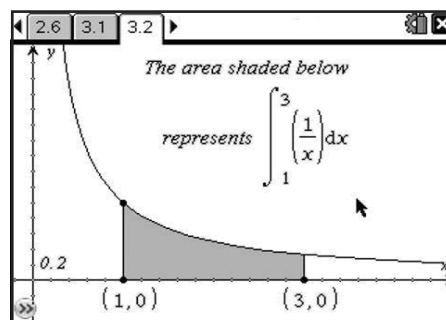
E Split Notes/Calculator page

The screenshot shows a split view with calculator commands and a list of dice rolls. The commands are `randInt(1,6,25)` and `randInt(1,6,18)`. The list of rolls is: {6,6,1,4,3,5,1,3,6,2,5,6,2,3,1,6,1,1,4,6,6,2,2}.

H Split Lists & Spreadsheet/Data & Statistics page



C Graphs page



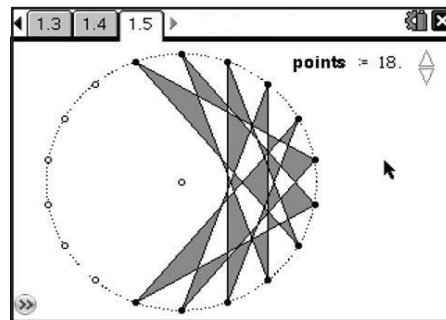
F Notes page

Pages 1.4 and 1.5 are blank Data & Statistics pages' where you could draw Scatterplots. You could then use menu 4 and 'Plot function' to try out your rules.

Page 1.6 is a blank Graphs page which you could use in the same way as page 1.4.

Page 1.7 is a blank Notes page for you to write about what you did and what you found out.

I Geometry page



Contact your local Education Technology Consultant

They are happy to provide more information, help organise loan equipment, share materials and deliver product demonstrations, as well as supporting T³ events in your region.



In Central, Eastern England and Wales, please contact Christopher Rath:
T: 01604 663077
M: 07810 152450
E: c-rath@ti.com



In Scotland, Northern England, Northern Ireland and the Republic of Ireland, please contact Alex MacDonald:
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M: 07584 141152
E: a-macdonald@ti.com



In Southern England including London, please contact Mark Braley:
T: 01604 663060
M: 07584 141146
E: m-braley@ti.com

What TI technology is available?

We offer a range of handheld devices, software, wireless systems, graphics calculators and data logging sensors and probes (to meet the STEM agenda).

Our software integrates with existing classroom projection systems to enhance the learning and teaching experience.

- **TI-Nspire™** – the award-winning handheld and software ICT suite for maths and science with additional options:
- **Teacher Software** - includes an emulator of the TI-Nspire handheld and enhanced functionality
- **TI-Nspire Navigator™** System – the wireless classroom network for TI-Nspire
- **TI Connect-to-Class™** – document and file sharing for TI-Nspire handhelds
- **CBL 2™, CBR 2™, EasyTemp™** and **EasyData™** with support for more than 30 probes and sensors.
- The **TI-84 Plus™** and **TI-83 Plus™** family of graphics calculators
- **TI-SmartView™** – the software emulator of the TI-84 Plus graphics calculator
- **Cabri Junior** and a host of other APPS available on the TI-84 handheld device
- **TI-Nspire CAS, TI-89 Titanium** and **Voyage™ 200**, our CAS (Computer Algebra Software) solutions.



TI Technology Loan

– to support evaluation of our technology and your CPD activities.

Using our free loan service, you can find out more about how TI technology can enhance your pupils' learning. It's an ideal way for you to get TI products for teacher workshops and in-service training or to borrow individual handhelds for class evaluation. Loans are available for up to three weeks.

What services do we offer?

T³ (Teachers Teaching with Technology™)

Since 1992, T³ practitioners have been delivering professional development for mathematics and science teachers. Their experience and depth of subject knowledge helps teachers to develop effective practices through pedagogy and technical confidence. The courses they run place the emphasis on sharing appropriate uses of ICT in the classroom.

In addition to offering a range of CPD opportunities, T³ members support research projects and author supporting materials for a wide range of activities and topics. T³ is an international organisation and support from

Texas Instruments enables practitioners to deliver high quality courses and classroom-ready materials.

For further details, including dates and venues, please visit www.tcubed.org.uk or email t3@ti.com.

Volume Purchase Programme

– free TI technology for volume purchases through our educational suppliers.

With every purchase of a TI-Nspire handheld device or graphics calculator, you could obtain free TI technology – from as little as purchases of 20 devices.

For more information, visit nspiringlearning.org.uk