

■ secondary

You're having a graph

A creative combination of equations and ellipses might get your pupils to see the bigger picture. **Colin Foster** shows how

It can be hard enough at the best of times to get software to do what you want. But it's even more of a challenge when you're deliberately trying to use it for something it wasn't designed for.

Children naturally push equipment to its limits to find the biggest product their calculators will work out or how far they can zoom in when using graph-drawing software.

There is a long tradition of using maths equipment for purposes for which it was never intended. In the old days, you used to be able to make up calculations with answers that

would read as words when the display was turned upside down. For example, 07734 reads as HELLO and 77345993 as EGG SHELL.

But most up-to-date calculators print the numbers too precisely for this to work well any more, and many allow you to type in letters anyway.

So how about using graph-drawing software such as Omnigraph or Autograph to draw pictures?

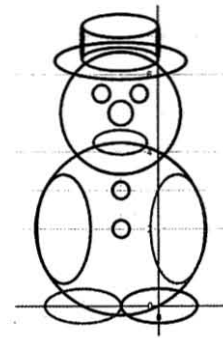
One option is for pupils just to experiment however they like and see what they can create.

Alternatively, you can make it more structured by indicating the kinds of mathematical graphs that you wish them to use.

For instance, just using equations of circles and ellipses, Year 10 pupils can make some quite impressive drawings, such as the snowman (above).

A lot of good mathematical thinking is necessary to achieve a picture like this. Typically, your curve doesn't appear quite where you want it or is the wrong size.

If something goes wrong, you ask: "Why did it do that? What do I need to



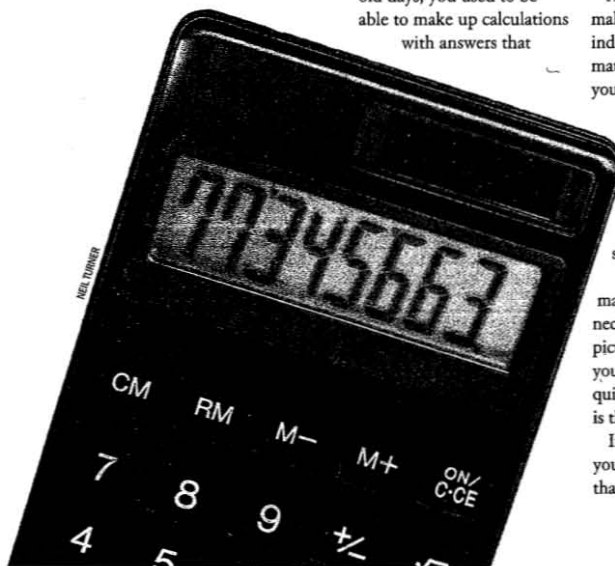
change to get it the way I want it?"

The beauty of a computer-based approach is that pupils can quickly and easily modify their equations, experiment and get instant feedback, and there is no visible record of the "mistake".

Even when a drawing is "finished", you can always pose subsequent challenges: "How can you give him a bigger smile? A smaller head? A taller hat? Bigger eyes? Fingers?"

Pupils have a lot of fun being creative and some of their drawings can be quite stunning. Even just using straight-line graphs, there is a lot that can be done.

Here are more challenges:
■ Can you write your





initials or design your logo?

■ Can you draw a flower or a butterfly?

■ Research what superellipses are and see what drawings you can make from them.

■ What other animals/aliens/monsters/objects can you draw?

This activity has the potential to be memorable, with pupils some time later recalling what the graphs of certain equations look like because they stumbled over them in the computer room.

This can also develop a subconscious sense about how a graph can be altered

by changing its component parts, which can last longer and be more meaningful than a more traditional, rule-based approach ■

Colin Foster teaches mathematics at King Henry VIII School in Coventry

There is a long tradition of using maths equipment for purposes for which it was never intended

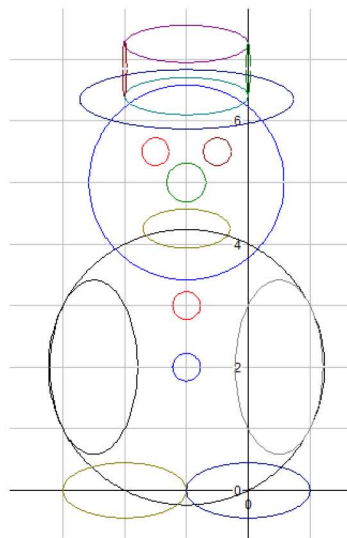
Creative Use of Equipment

Colin Foster

It can be hard enough at the best of times to get software to do what you want it to do. But it's even more of a challenge when you're deliberately trying to use it for something it wasn't designed for. Children have a natural tendency to push equipment to its limits, trying to find the biggest product their calculators will work out or seeing how far they can zoom in when using graph-drawing software.

There is a long and noble tradition of using maths equipment for purposes for which it was never intended. In the old days, you used to be able to make up calculations with answers which would read on the calculator as words when the display was turned upside down. For example, 07734 reads as *hELLO* and 577345993 as *EGGSHELLS!* But most up-to-date calculators print the numbers too precisely for this to work well any more, and many allow you to type in letters anyway.

So how about using graph-drawing software such as *Omnigraph* or *Autograph* to draw pictures? One option is for pupils just to experiment however they like and see what they can create. Alternatively, you can make it more structured by indicating the kinds of mathematical graphs that you wish them to use. For instance, just using equations of circles and ellipses, Year 10 pupils can make some quite impressive drawings, such as the snowman below.



A lot of good mathematical thinking is necessary to achieve a picture like this. Typically, your curve doesn't appear quite where you want it, or is the wrong size. If something goes wrong, you ask: 'Why did it do that? What do I need to change to get it the way I want it?' And the beauty of a computer-based approach is that pupils can quickly and easily modify their equations, experiment and get instant feedback, and there is no visible record of the 'mistake'. Even when a drawing is 'finished', you can always pose subsequent challenges: 'How can you give him a bigger smile? a smaller head? a taller hat? bigger eyes? fingers?'

Pupils can have a lot of fun being creative, and some of their drawings can be quite stunning. Even just using straight-line graphs, there is a lot that can be done.

Here are some further challenges:

- Can you write your initials or design a logo for yourself?
- Can you draw a flower or a butterfly?
- Research what *superellipses* are and see what drawings you can make from them.
- What other animals/aliens/monsters/objects can you draw?

This activity has the potential to be memorable, with pupils some time later recalling what the graphs of certain equations look like because they stumbled over them in the computer room. A subconscious sense can also develop of how a graph will be altered by fiddling with its component parts, and this can be longer-lasting and more meaningful than that produced by a more traditional rule-based approach.

Objectives: recognise and draw graphs of common mathematical functions; know and understand the effect changing part of an equation on the appearance of the graph

Resources: *Autograph* and *Omnigraph* software

Age: key stage 3-5

Colin Foster teaches mathematics at King Henry VIII School, Coventry.