iBYTES

Mash-ups

Welcome to iBYTES – a free and exclusive teaching resource from OCR.

For teachers and students of GCSE ICT and GCSE Computing, *iBYTES* provides interesting and topical content to enrich learning, both in and out of the classroom.

OCR

Harriet's first house

Harriet is in her early twenties and has been working in the retail business from when she left school at the age of 18. Since she started work, Harriet has been regularly putting money into a savings account to enable her to buy her first house. Her parents have encouraged her to look upon buying a house as an investment and so the idea of buying a house at auction that needs renovation appealed to Harriet, as this would be a way that she could make money by selling the house on after renovations were complete.

Harriet went to the auction with her father, Robert. Harriet's parents were contributing to the purchase of the house and Robert was going to carry out much of the work on the house himself to further keep costs down. There were a few houses of potential interest going under the hammer on the day of the auction but father and daughter kept calm and were determined to stick to their budget. They were the successful bidders on a three-bedroomed Victorian terraced house and soon after the auction they were handed the keys and took possession of the house.

Over six months both father and daughter worked hard on the renovations, rewiring, plastering, painting, installing a kitchen, adding a bathroom and laying flooring until the house was finished and ready for selling again.

It's a mash-up

So what does all this have to do with IT? Well, when it comes to buying and selling houses, IT plays an important role and Zoopla, a Web 2.0 site that uses mash-up software, is the place many people go to before they even put their house up for sale or when they start looking for a house to buy or rent. Zoopla is becoming one of the most popular websites in this country when it comes to looking for a new property to buy.

Zoopla provides information such as house prices for properties recently sold and estimates of current values of properties for all 27 million homes in the UK.

It is a directory of UK residential properties, that can be searched by potential buyers and was created as a mash-up of Royal Mail's database, the UK HM Land Registry's data on property bought and sold, Google Maps, Microsoft Maps 'Bird's eye view', and other data sources. Users of the website can add to and edit information, which also adds to the usefulness of the data. For example, they can use the '*ClaimMyHome*' button to claim a house and they can then set a '*TemptMe*' price as a price they might consider selling for even if they haven't actually put their house up for sale; they can also edit the information about their home to make it more accurate and attractive to potential buyers.

Discover and do

Click here

What is a mash-up?

"Mash-ups are an exciting genre of interactive Web applications that draw upon content retrieved from external data sources to create entirely new and innovative services. They are a hallmark of the second generation of Web applications informally known as Web 2.0."

The term mash-up was borrowed from a practice used in pop music, where a mash-up is a new song mixed from the vocal and instrumental tracks from two different songs, usually belonging to different genres.

A mash-up on the web often uses open Application Programming Interfaces (API) and data sources to produce results that probably weren't the original reason for producing the data. Recently, web applications have started to publish APIs which means that software developers don't need to build them themselves. It's important that the data is turned into something more useful than just its original use for its intended use in the mash-up, or there isn't much point to the mash-up. When Google Maps brought out its API, this led to a wide variety of mash-ups being launched, combining Google Maps with all kinds of data, and many of the popular mash-ups use Google Maps as one of their data sources. Soon after Google Maps, API was launched, Microsoft and Yahoo also launched their own APIs for their map applications.

Photo mash-ups can be created, as social networking sites allow photos to be shared, displaying data about who took the picture, where it was taken and when, and who or what is in the picture. This means that other people can take the photographs and combine them with other data about the place, person, etc, producing a whole new source of data.

Companies such as Amazon and eBay have released their own APIs to allow other people to access their data. This means that shopping mash-ups are available to compare prices of goods for sale.

Companies such as the BBC use RSS to allow news feeds to be placed on other websites, tailored to a user's particular interest. Similarly, the Met Office and other companies allow RSS feeds of local weather to be placed on websites. These are all examples of mash-ups, too.

So what other interesting mash-up websites are there?

- ***uksnowmap.com*** – combines Google Maps with #uksnow tweets from Twitter to show where it's currently snowing in the UK – a useful website for the early months of 2013 when snow disrupted many of our journeys!
- ***BBC News Map*** (http://dev.benedictoneill.com/bbc/) – a Google Map with pins indicating news stories across Great Britain (see what's happening where you live). This combines the BBC website with Google Maps.
- ***Take Me To My Car*** – a mobile app that allows a user to park their car and pinpoint its position on Google Maps so they know exactly where to find it when they return after a busy day shopping.
- ***Tesco store locator*** – uses Google Maps and information about Tesco stores to show the nearest store and how to get there and also its contact details.
- ***Amazon*** and ***eBay*** comparison shopping – this takes data from Amazon and eBay, the user types in a product they are looking for, and the website shows results from both shopping websites.

- *TwitterPoster* – a poster showing photographs of Twitter users with their Twitter influence represented by the size of their photo.

- *Live UK Rail Map* – shows trains approaching stations in the UK in real time. Yellow pins on Google Maps show stations, green pins show trains travelling north, and red pins show trains travelling south; clicking on a train gives information on where the train has come from and is heading to, and its expected departure time from the next station it reaches.

These are just a few of many mash-ups available on the internet and mobile devices, to make our lives easier or just more interesting, or maybe just to waste some time!

Back to Harriet's house …

So, how did Zoopla work for Harriet and her first house? Six months ago Harriet paid £65,000 for her house. After all of the work was finished, the value of the house is £90,000. By using the Zoopla website, Harriet can edit the information about her house, such as adding information about an extra bathroom that was installed and the renovations and decoration carried out. As she had the house valued by three different local estate agents, she can also change the current valuation on Zoopla to a more accurate value that reflects the work done over the last six months. In addition, Harriet can display a TemptMe value that tells potential buyers how much she would be tempted to sell the house for, even though she has yet to put it up for sale.

If Harriet decides to rent out her house, rather than sell it, Zoopla can also display the estimated rental value to visitors to the site who might be looking for somewhere to rent.

And, of course, Harriet can now look around the website for her next property to buy, suitable for renovation and investment in the future.

Links to the GCSE ICT specification

Specification criteria map:

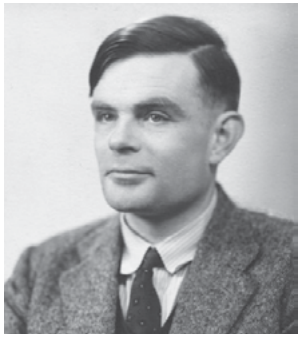
	Content specification	Page number in specification
ICT Systems	2.1.1	6
Exchanging Information	2.1.2	7
Legal, Social, Ethical and Environmental Issues	2.1.6	9
ICT and Modern Living	2.1.9	10
Exchanging Information	2.3.5	14
Presenting Information	2.3.6	15
Current and Emerging Technologies	2.3.10	16

Some computing heroes

Most of us can name some great engineers, inventors, scientists and entrepreneurs of the past and present. But not many people know about the great computer scientists and mathematicians who have driven the astonishing progress of computing into all our lives. Most of us know that many aspects of modern life would be impossible without computers. If we stop to think, we know that all this development has taken place remarkably quickly, within the lifetime of many people living today. But how has this happened? It is mostly because of many fascinating original thinkers who broke the rules. They deserve to be better known by the general public, partly because they were often quirky characters who dared to think differently.

Alan Turing

Most people have heard of Alan Turing, the mathematician who first came up with the idea that a machine might be produced that could carry out a set of instructions, given to it as an algorithm. His story is well known because of his immense contribution to code breaking in World War II. Like many computing heroes, he was a bit of an odd character. One of his endearing qualities was that he chained his coffee mug to a radiator in case someone stole it.



Alan Turing

Tommy Flowers

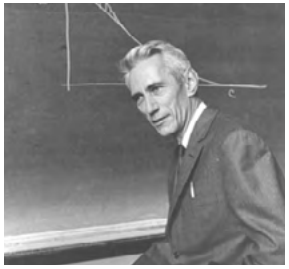
Another hero from the war years was Tommy Flowers, who was an engineer working for what was then the Post Office Telephones. He oversaw the building of the first electronic computer. You can see a reconstruction of this plus many other fascinating aspects of computing history at the **National Museum of Computing** in Bletchley.

Tommy Flowers

Claude Shannon

We talk easily of bits and bytes these days and many of us are used to the idea that all information can be expressed in small units and can be measured, but this was a revolutionary idea when first proposed by Claude Shannon in the USA in 1948. He was another quirky character who would ride his unicycle around the corridors of Bell Labs, where he worked for many years. Imagine what the Health and Safety Executive would say about that these days. A nice quote from him is:

I visualize a time when we will be to robots what dogs are to humans, and I'm rooting for the machines.



Claude Shannon

Edsger Dijkstra

Edsger Wybe Dijkstra was born in Rotterdam, Netherlands in 1930. He originally studied physics but became interested in computer science and worked at the Mathematical Centre in Amsterdam. He later worked for the Burroughs Corporation, in the USA, in the early 1970s then moved to the University of Texas at Austin in the early 1980s.


Edsger Dijkstra

Dijkstra made many important contributions to the development of computer science, not least in the field of high-level languages. He worked on the development of a compiler for the Algol language and had strong opinions on how programs should be written as simply and clearly as possible. Some languages make use of Go To statements. These transfer control from one part of a program to another without making any provision for returning. The Go To statement is an easy way to make a branch in a program but it was often overused, which made it incredibly difficult to follow the logic of a program. A style of programming became common that was known as 'spaghetti programming' because such programs resembled the tangled threads of a plate of spaghetti.

Dijkstra hated this and wrote a letter in 1968 entitled *Go To Statement Considered Harmful*. His opinions led to the widespread adoption of structured programming methods which helped in producing more readable and error-free program code.

Like many computer scientists, Dijkstra had pretty strong opinions and wasn't shy in expressing them. Many of them could be taken as good advice for any programmer or other computer scientist.

I think of the company advertising 'Thought Processors' or the college pretending that learning BASIC suffices or at least helps, whereas the teaching of BASIC should be rated as a criminal offence: it mutilates the mind beyond recovery.

Program testing can be used to show the presence of bugs, but never to show their absence!

The question of whether Machines Can Think ... is about as relevant as the question of whether Submarines Can Swim.

The competent programmer is fully aware of the strictly limited size of his own skull; therefore he approaches the programming task in full humility, and among other things he avoids clever tricks like the plague.

Simplicity is a great virtue but it requires hard work to achieve it and education to appreciate it. And to make matters worse: complexity sells better.

We must be very careful when we give advice to younger people: sometimes they follow it!

Simplicity is prerequisite for reliability.

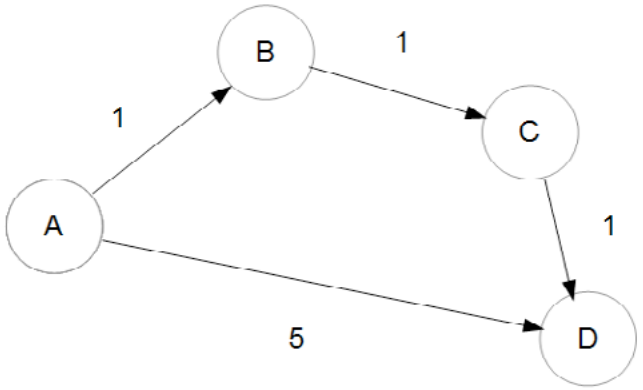
If you want more effective programmers, you will discover that they should not waste their time debugging, they should not introduce the bugs to start with. In other words: both goals point to the same change.

The shortest path algorithm

One of Dijkstra's more well-known achievements was the development of an algorithm that bears his name. It is an example of a shortest path algorithm. The shortest path problem is the problem of finding a path between two vertices (or nodes) in a graph such that the sum of the weights of its constituent edges is minimised.

This is easier to understand than it might seem.

Imagine four cities A, B, C and D. (The cities are nodes in a graph. The routes between them are edges.) You can easily find the distances between them if you want. Alternatively, it might be more useful to know the travelling time between them or how much it costs to travel between them. In this simple example, it is easy to see that there are two possible routes between A and D. If the numbers represent cost or time, it is easy to see that ABCD is more economical than AD.



For more destinations than this, the answer is less easy to see and a computer solution is needed.

Dijkstra's algorithm works like this:

Take starting position

Examine all the direct paths to adjacent destinations

Mark each destination with its cost (distance)

Select lowest cost (shortest distance)

Check distances from this lowest cost to its adjacent neighbours

Repeat for other visited destinations

Mark these with total distance from start

Take shortest path from start

Write total cost in destination

Mark destination with this distance

This is a powerful algorithm which has many real-world applications. It can be used to:

- Devise a travel itinerary for a holiday company
- Produce a route map
- Route messages across a network.

You might like to see a demo of the algorithm:

There are lots of examples of short programs online that people have written to demonstrate the Dijkstra algorithm.

Computing is a young science and there are bound to be lots of new heroes who think outside the box and come up with groundbreaking (and often simple) solutions to real-world problems.

OCR GCSE Computing specification references:

	Content specification	Page number in specification
Fundamentals of Computer Systems	2.1.1 b	6
Representation of Data in Computer Systems	2.1.4 a, b, h, k, n, p	8
Computer Communications and Networking	2.1.6 f, h, i	10
Programming	2.1.7 a, b, c, d, e, g, h, i, p, q, r	11
Programming Techniques	2.3.1	14
Design	2.3.2	15
Development	2.3.3	15
Testing and Evaluation	2.3.4	15

Mini bytes

Check out our videos from BETT

It was great to meet so many of you at this year's BETT conference. We hope you found it useful to hear about our IT qualifications and 'meet the experts', including our own subject specialists, the Raspberry Pi team, Computing At School and other partners.

To find out more about our Computer Science suite, why not take a look at these **two videos** we made at BETT: on one, you can meet people who make Computing exciting to learn and teach, while on the other, you can watch Raspberry Pi's Rob Bishop demonstrating how to use the Pi.

Modern relevant qualifications that have the edge

At OCR, we're proud to be leading the way in the development of Computing qualifications. We've recently launched our Entry Level Certificate, following the success of a GCSE that has been taught in schools for two years. We're the only awarding body to offer full progression from Entry Level to GCSE through to A Level. Find out more about our **Computer Science qualifications here**.

Fulfilling the Computer Science element of the EBacc …

Google's free Raspberry Pi offer

The Raspberry Pi is a low-cost, credit-card-sized, programmable computer that plugs into a monitor and a keyboard. It's been developed by the Raspberry Pi Foundation, a charitable organisation linked to Cambridge University, to inspire a generation of learners to discover how computers are programmed and how they function.

On the eve of BETT back in January, Google joined forces with us at OCR and five other partners to announce an initiative to hand out thousands of free Raspberry Pi computers to schools across the country.

Each free Raspberry Pi that Google gives away will come with a learning support pack. This includes a 'Getting started' tutorial booklet with an introduction to using the computer, plus links to a variety of our own resources and to other useful resources on the internet, all on a pre-loaded SD card. You can read more about these in the article below.

Interested in a free Raspberry Pi? Email us for more details.

To find out more about it, follow this *YouTube* link to watch Rob Bishop from Raspberry Pi at a Google TechTalk:
www.youtube.com/watch?v=u4THiC5-JZo

Raspberry Pi resources now available

Working with Raspberry Pi and leading practitioners, we've developed teaching and learning resources that 'map' this small computer to the curriculum. These include tutorials to get teachers and learners up and running, along with some Classroom Challenges – ranging from learning about the architecture of the Raspberry Pi through to building a robot! They're available to download at **www.ocr.org.uk/raspberrypi**

You'll also find a Resources link on our **website**. This e-resource identifies useful links to external resources such as *The MagPi* – **www.themagpi.com** – a monthly magazine that offers help and advice to users of the Raspberry Pi and also contains programming activities using Scratch and Python.

We're proud to support this new initiative

Do you have a passion for Information Technology?

Do you have a passion for a technological area? Do you have a lot of knowledge of this area? Do you think that you could write an ***iBytes*** document using that knowledge? We are on the lookout for imaginative and dynamic teachers to write ***iBytes*** documents. They should be informative, exciting to read and centred around a recent technological development. They should also strongly and visibly link to our **GCSE in ICT** or **GCSE in Computing** specifications.

If you feel that you could contribute an ***iBytes*** document, please email Julian Parkin on **julian.parkin@ocr.org.uk**

www.ocr.org.uk
OCR customer contact centre

General qualifications
Telephone 01223 553998
Facsimile 01223 552627
Email general.qualifications@ocr.org.uk