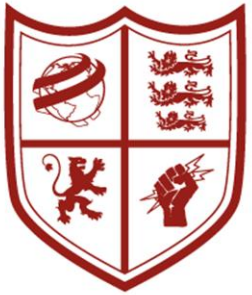
COMPUTING

# GCSE Computer Science



Stretford Grammar School

Aspirat primo fortuna labori

COMPUTING

# What is Computer Science?

Computer Science is the study of **computation**; how problems are solved and **how computers and computer systems work** in terms of solving problems, as well as how they are constructed and programmed.

Computing is not just programming; a working knowledge of programming is necessary but not sufficient for a thorough grounding in computer science.

The fundamental aspects of Computer Science are logical thinking and problem solving. Developing **computational thinking** skills is one of the big advantages of studying computer science, whatever your ultimate career.

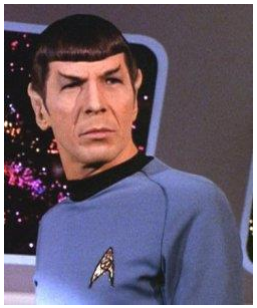
Stretford Grammar School
Aspirat primo fortuna labori

COMPUTING

# Logical and Algorithmic Thinking

One of the fundamental parts of computational thinking is to be able to think logically. Computers use logic to perform computation but that isn't quite the same as thinking logically in a computational thinking sense.

**Logical thinking** is about deducing as much new information as possible from the little you already have but not by jumping to conclusions. The new information gleaned must follow from the existing. You can't be right just because you are lucky.



**Algorithmic thinking** is the ability to think in terms of common tasks to be completed as a way of **solving problems**. It is the ability to create a set of instructions that can solve many similar problems and will work every time. Algorithmic thinking is a core skill people develop when they learn to write their own computer programs.

Stretford Grammar School
Aspirat primo fortuna labori

COMPUTING

# Problem Solving

The simple key skills that Computer Science develops are:

1. Decomposition
2. Abstraction
3. Automation

Simply put, this means breaking down a problem into parts, removing any details or parts that are not important, and creating an *algorithm* (a sequence of instructions) to solve the problem.

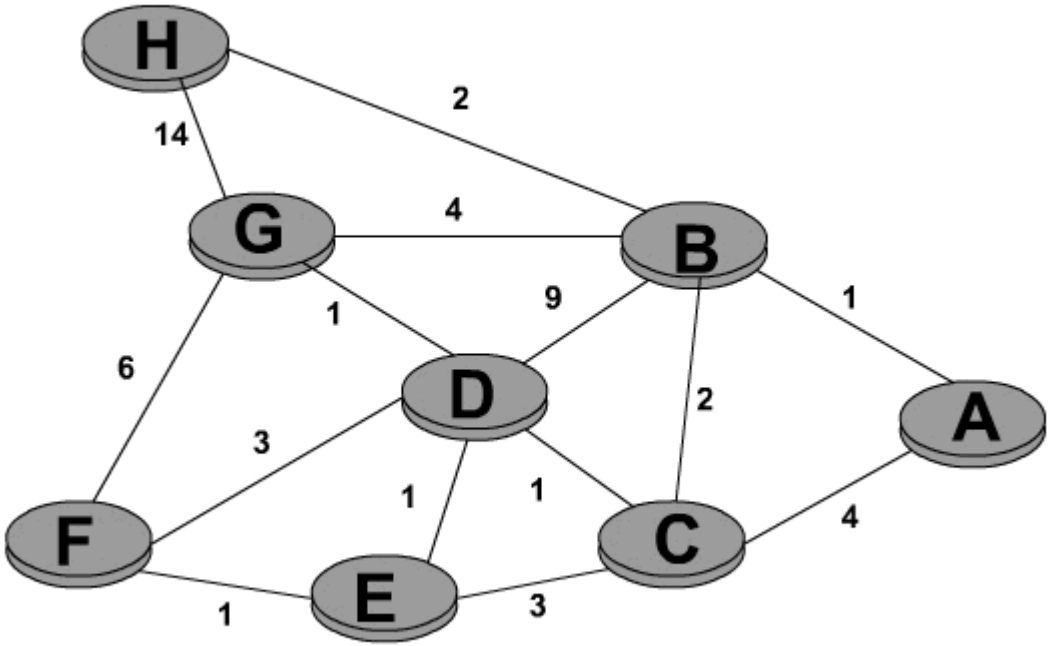
In reality, this is the same process followed by all science-based professions, from Doctors and Engineers to Virologists and Rocket scientists, but in Computer Science, the final step is making a computer do the actual work for us.

Stretford Grammar School
Aspirat primo fortuna labori

COMPUTING

# Problem Solving

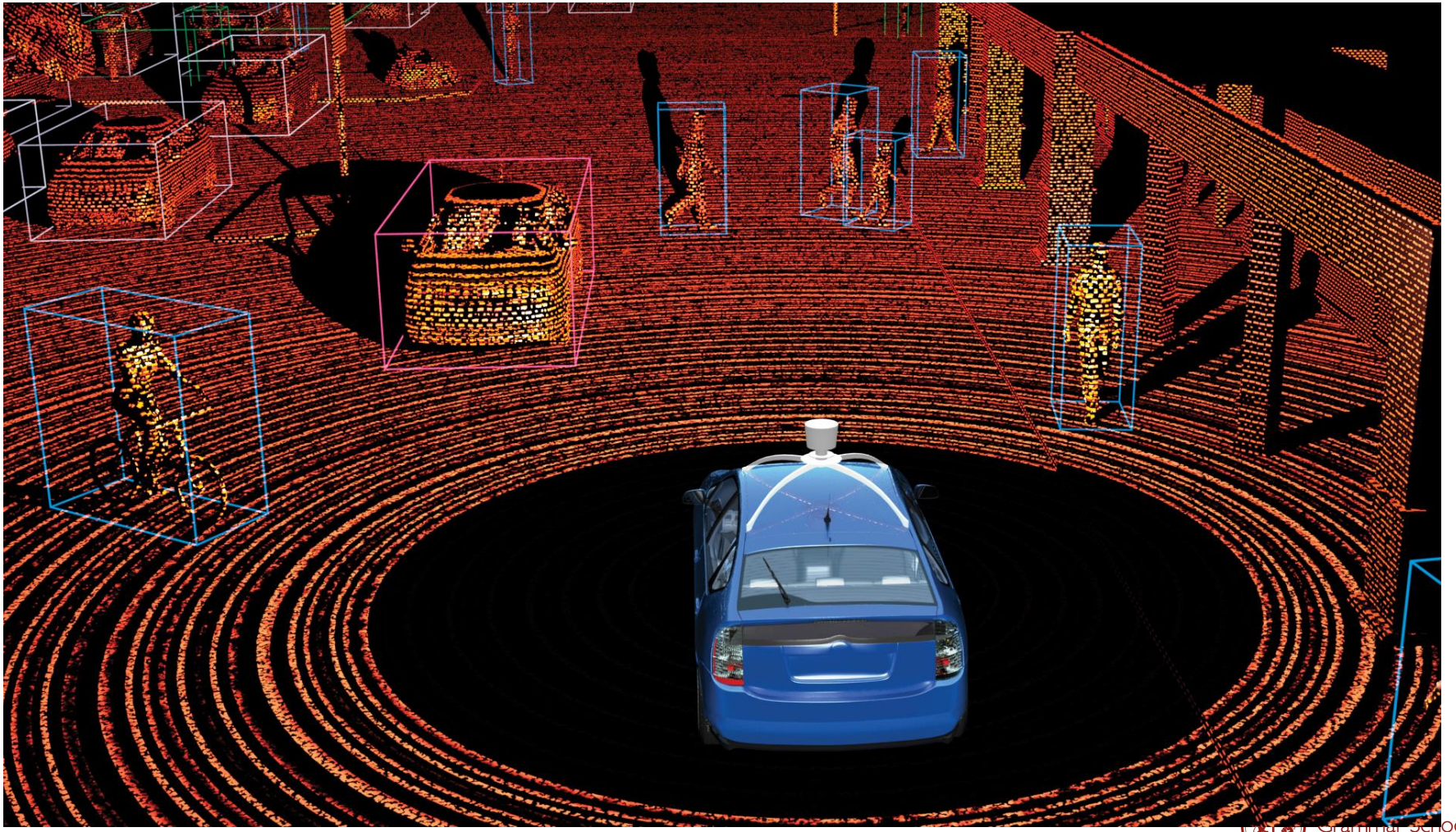
Here is an example of a problem: what is the best route to get from point F to point H? Is there a way of finding the best route between any two given points? This is exactly how Satnavs work in todays society.



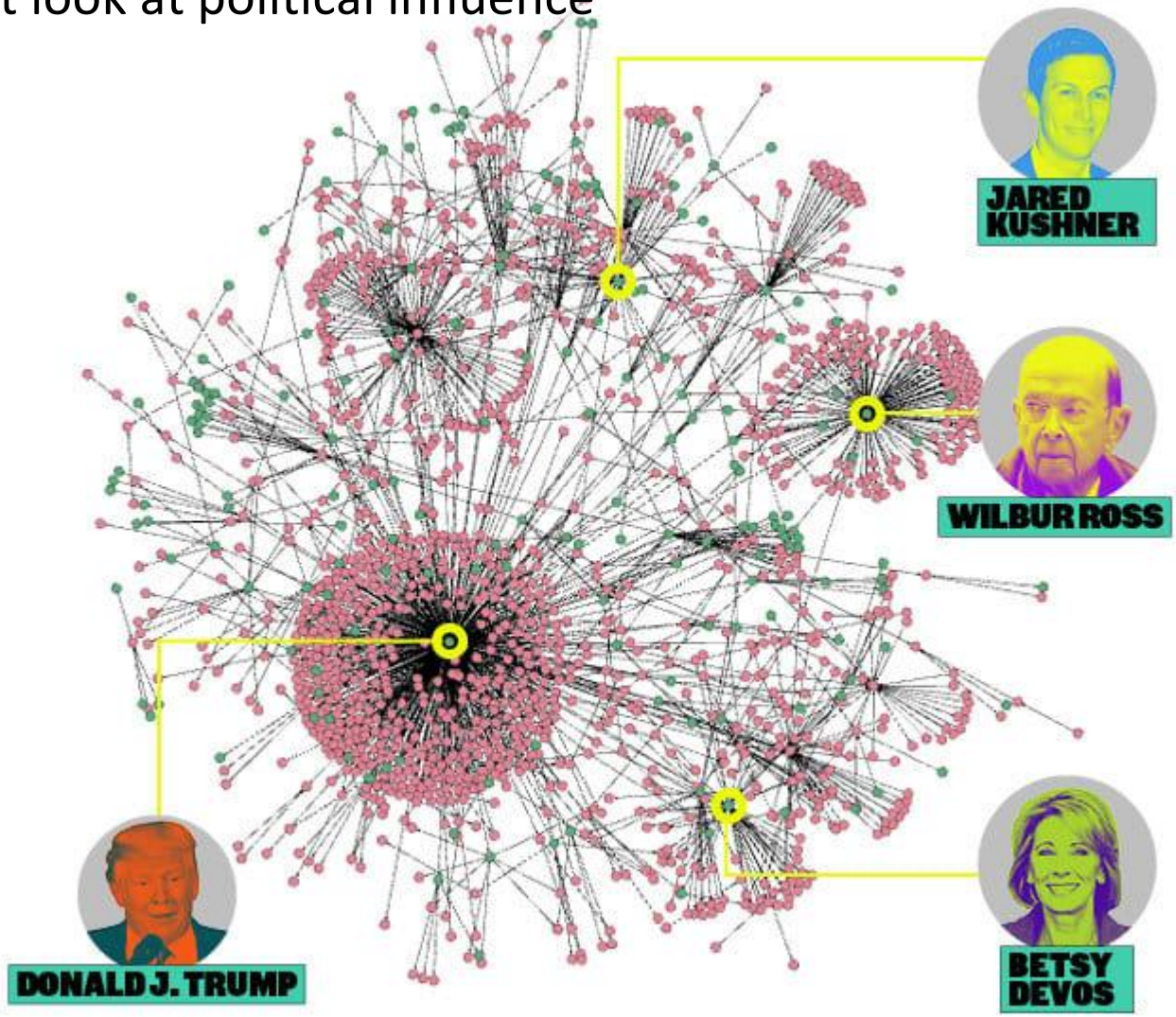
The artificial intelligence when figuring out where the footballer will go is based on the same algorithm.

COMPUTING

The self driving systems of a car is also based on the same algorithm – no just the sat nav but also making sure it doesn't hit someone.



The same algorithm can even be used to map connections between people that look at political influence



COMPUTING

# Programming

Programming is a core activity of computer science. It is a skill for creation. A program is just a plan of action a machine can follow but from such plans comes everything the computers you see around you do.

Programs must be written in a precise language, so that there can be no confusion as to what is meant. If followed in the prescribed order, a well-written program should get the job done without fail.



Stretford Grammar School
Aspirat primo fortuna labori

COMPUTING

# Programming

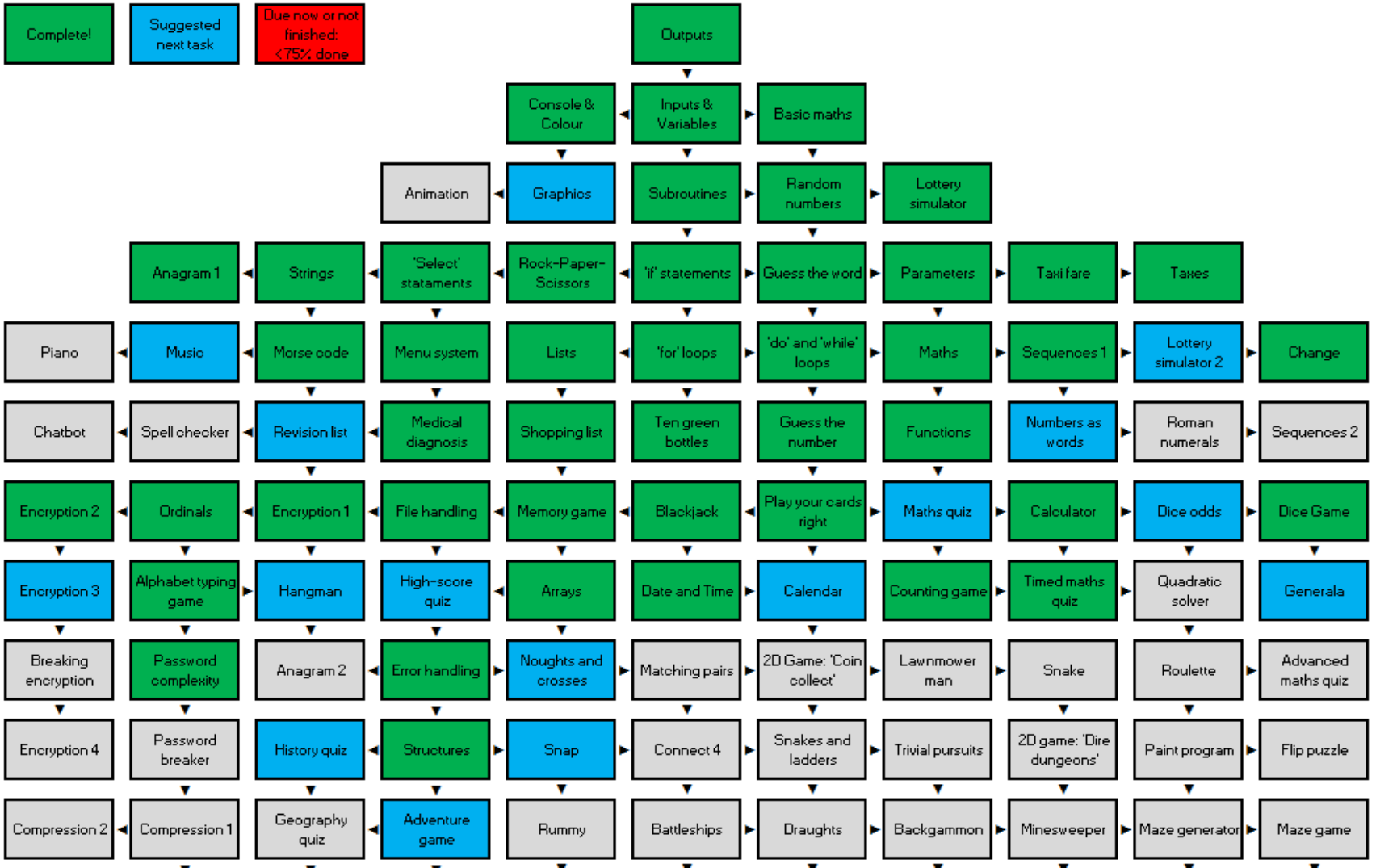
In Years 10 and 11, students build on the basic programming skills they develop in Y8 and Y9 a series of tasks, building up from learning how to use the smallest blocks of code, then moving on to tasks in which students must select a few techniques to solve a slightly larger problem, before being challenged by significantly larger, more complex problems which may take many hours to complete.

Students' progress is monitored closely so each is aware of their strengths and weaknesses and how to progress. The choice of tasks is, for the most part, chosen by the students, so those who wish to progress at a faster rate will have a path to follow.

Stretford Grammar School
Aspirat primo fortuna labori

# Programming

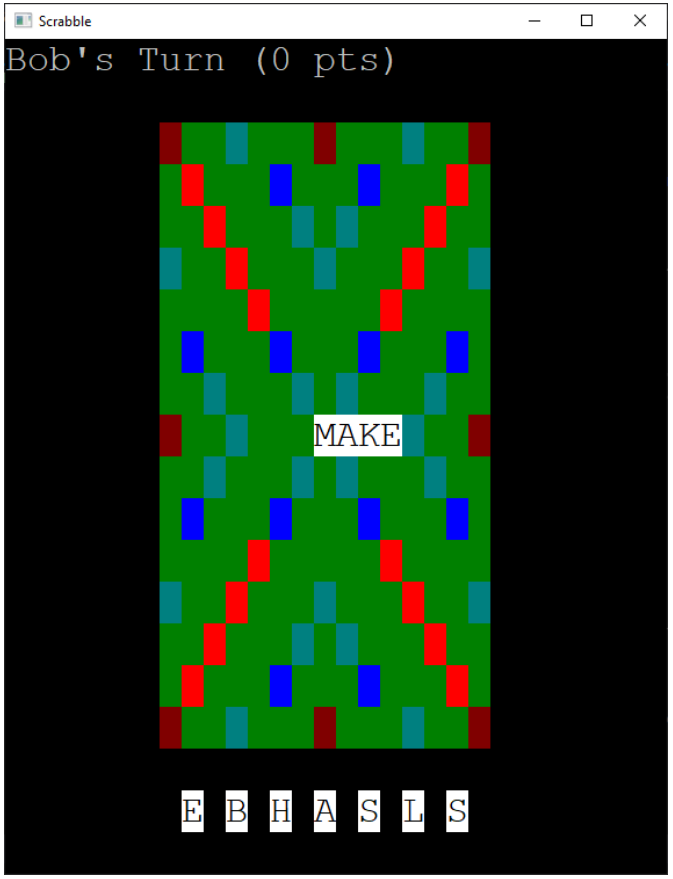
Below is an example of the tracking for programming tasks that each student has. This list is updated weekly by staff so students who like to work independently will always know what to do next to improve!

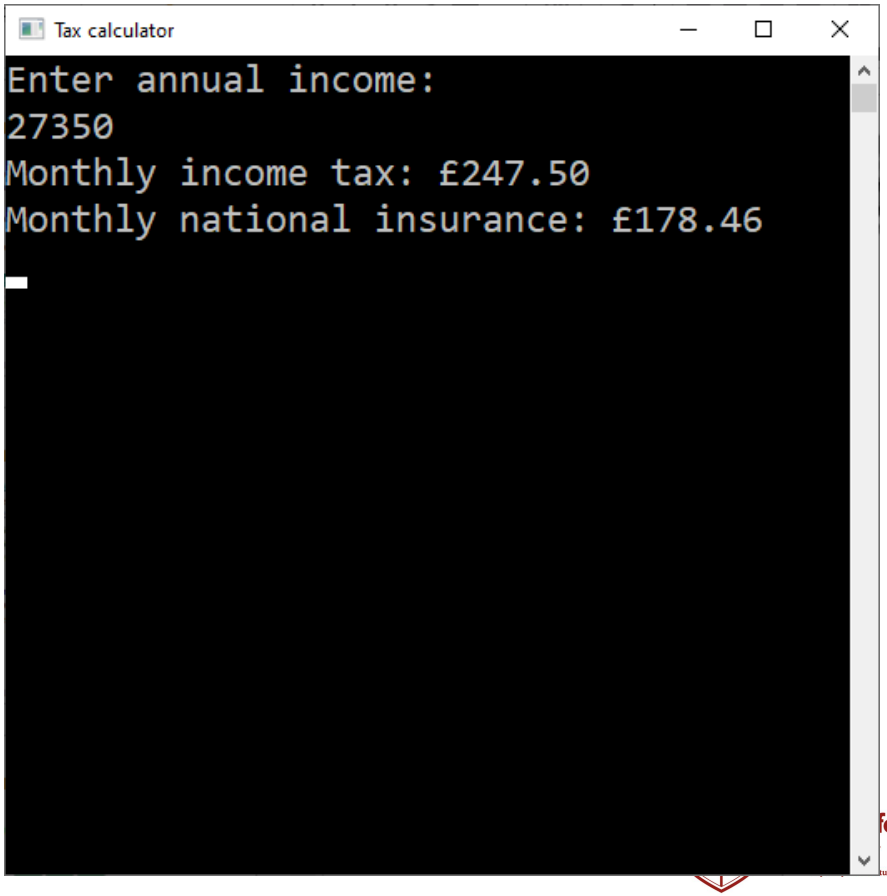


COMPUTING

# Programming

Students can immediately see the results of their work1

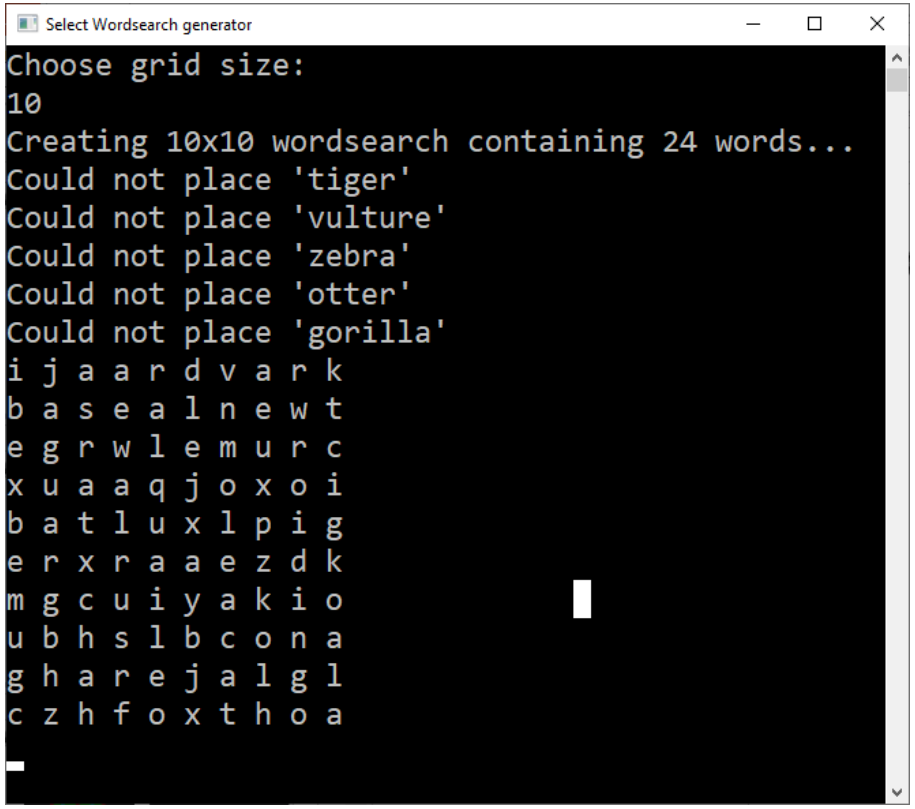


COMPUTING

# Programming

Straight away you will know if something works or not and can get instant feedback on your own work.



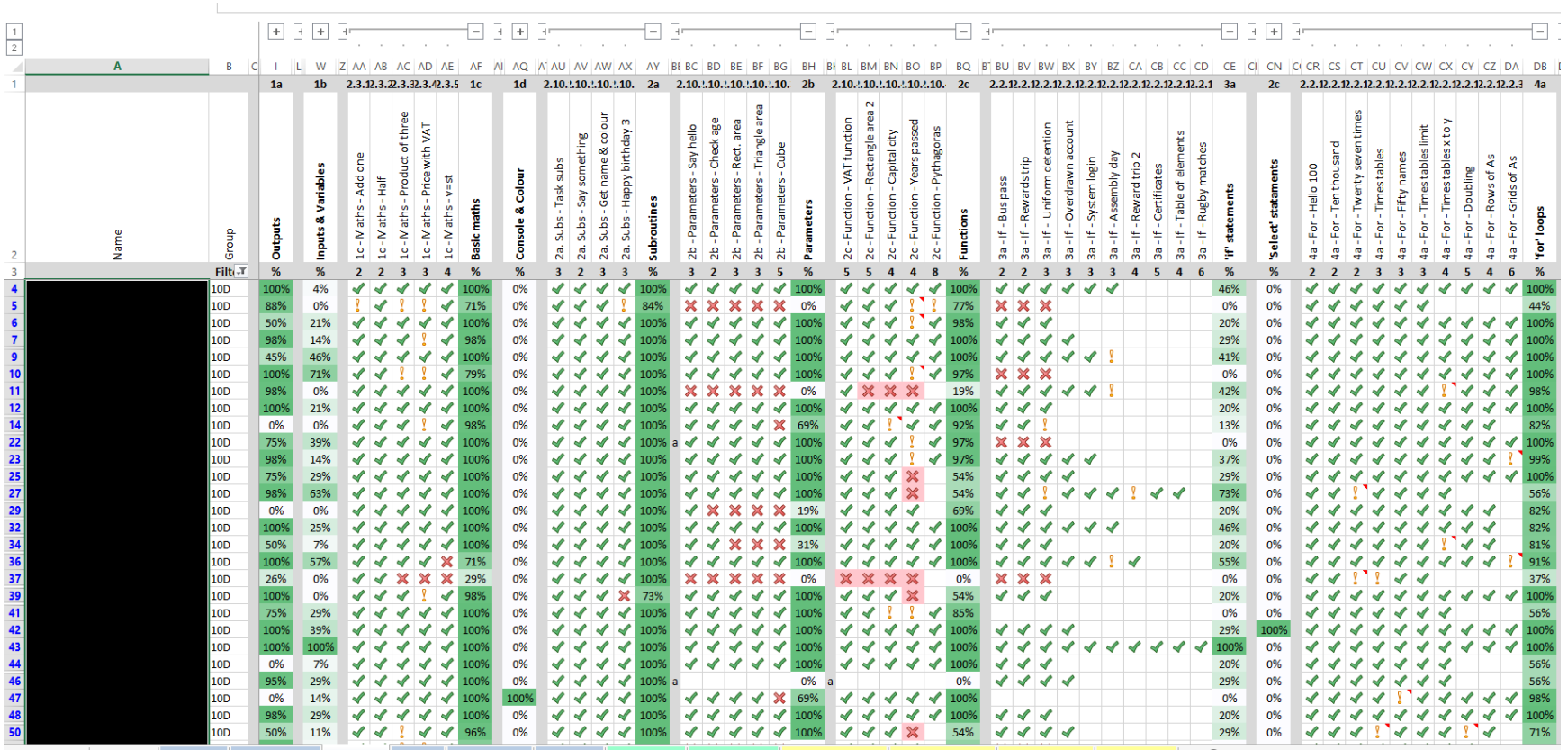


Stretford Grammar School
Aspirat primo fortuna labori

COMPUTING

# Programming

Detailed record of all the programming tasks you have done




Grammar School
Aspirat primo fortuna labori

COMPUTING

# Theory

**Data representation**

How do computers store information? How are text, images, sounds, graphics, etc. actually stored?

**Hardware and Computer internals**

How does a computer actually work at the lowest level?

How does a computer process instructions to run programs?

**Communications and Networking**

How is data sent and received across networks like mobile phones and the internet? How do we make sure it all gets to its destination?

**Ethical and Legal Issues in Computing**

Who has access to your data? How can computers be used to save lives? What if someone is killed by a robot: is its programmer at fault?

Stretford Grammar School
Aspirat primo fortuna labori

COMPUTING

# AQA GCSE Computer Science

**Paper 1 (50% of GCSE, written exam)**

This paper tests students' abilities in writing and interpreting algorithms, and tests logical thinking skills and knowledge of programming.

**Paper 2 (50% of GCSE, written exam)**

This paper tests a students' knowledge of computer hardware, networks, databases computer security, and the ethics of computer use.

Stretford Grammar School
Aspirat primo fortuna labori

COMPUTING

# Questions?

- Students can speak to their Computing teacher in lessons
- Students or parents can contact via e-mail for any specific questions

S Zareen (Curriculum Leader)

s.zareen@stretfordgrammar.com

Stretford Grammar School
Aspirat primo fortuna labori