COMPUTING
Student Handbook

CONTACT DETAILS

pbr@lpgs.bromley.sch.uk

https://firefly.lpgs.bromley.sch.uk (course resources)

Contents

Course information

Study skills and revision tips

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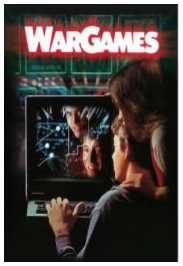
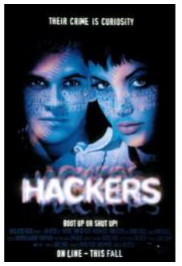
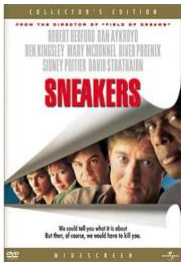
Films

Below are a selection of movies that cover a range of topics from the history of the computer and key players as well as ethical and moral issues brought about by technology. (Beware, not all are 100% accurate!)



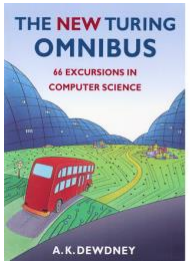


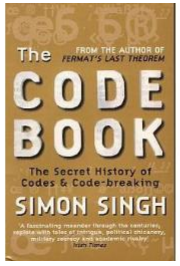


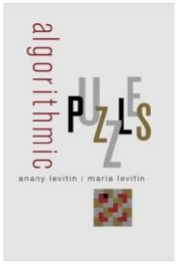
Title	Themes
HACKERS	Hacking, computer viruses, moral issues presented to programmers
ANTI TRUST	Open source VS corporation owned technology
THE NET	Identify theft
IROBOT	Artificial Intelligence, should we develop AI basd robots?
WARGAMES	A teenage hacker almost starts WWIII. Dated but a classic
FREEDOM DOWNTIME	Based on legendary hacker Kevin Mitnick
THE STARTUP KIDS	Find out how the founders of vimeo, soundcloud, dropbox etc got started
TRANSCEDENCE	Artificial Intelligence, should we upload our consciousness into computers?
THE IMITATION GAME	Alan Turing and co cracking the enigma code
SNEAKERS	Cryptography, government and espionage
PIRATES OF SILICON VALLEY	History of Microsoft and Apple
UNTRACEABLE	Explores the macabre side of the internet
TRIUMPH OF THE NERDS	An interesting insight into the history of computers

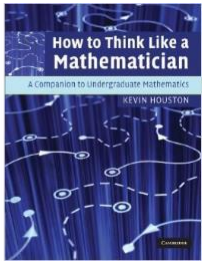
Books of interest

When you write your personal statement it is good to mention books you have read to further your knowledge of the subject. These books are recommended by the top universities.









The Code Book by Simon Singh. ISBN: 978-1857028898
Not strictly about Computer Science, but an interesting introduction to code-breaking and cryptography, fields that have a strong connection to Computer Science..

The New Turing Omnibus by A Kee Dewdney. ISBN: 978-0805071665
Mini articles on Computer Science topics.

Algorithmic Puzzles by Anany Levitin and Maria Levitin. ISBN: 0199740445
" ...The emphasis lies in training the reader to think algorithmically and develop new puzzle-solving skills: the majority of puzzles are problems where we are asked to find the shortest distance or the fewest moves to get from A to B, or construct a proof that a puzzle has no solution ..."

Computer Science: An Overview by J. Glenn Brookshear. ISBN: 978-0321544285
Overview of what computer science is all about: each topic is presented with its historical perspective, current state, and future potential, as well as ethical issues.

How to think like a mathematician, Kevin Houston, Cambridge University Press, 2009, ISBN 978-0-521-71978-0.
Don't be misled by the title; this book is absolutely relevant for computer scientists.

The Pleasures of Counting by Tom Kôrner. ISBN: 978-0521568234
Puts Maths into the context of how it is used to solve real-world problems.

Expectations

This list may seem basic and full of obvious points, however in year 12 students are given a little more freedom than they are used to. This can mean some students forget the fundamentals of being a successful student.

As a computing student you are expected to:

- Attend all lessons
- Be punctual to lessons
- Bring your Computing folder to all lessons
- Maintain an organised set of notes
- Revise regularly
- Be aware of your strengths and weaknesses
- Work on overcoming your weak areas
- Complete all homework to the best of your ability
- Complete at least one practical exercise a week
- Ask if you are unsure of anything

CHALLENGES you will face

The volume of new terminology you need to understand
This will be the main challenge you will face. You can help yourself by reading appropriate chapters/powerpoints ***before*** the lesson so you are familiar with the words that will come up in the lesson. **Regular revision will also be key.**

Juggling multiple subjects
Although you are studying fewer subjects the demands on each will be high. Ensure you are **organised and disciplined** enough to keep up with the workload for all subjects.

Overview of Year 12

During your first year you will learn a programming language. This will be a very practical process where you will be using the computers to write your programs and run them. It will be tough going at first and you will have to hone your problem solving skills, but it will be very rewarding when you get your programs running! As well as programming you will also be required to learn a lot of theory in the form of definitions, descriptions and explanations.

Assessment: 2 written exams (internal i.e does not go towards final grade)

01: Computing Principles	**50%**
02: Algorithms and Problem Solving	**50%**

01 Computing Principles (70 mks) — 1.25 hrs

This unit will introduce you to the inner workings of the Central Processing Unit (CPU) and other key parts of a computer based devices. You will look at the exchange of data between devices, including web technologies such as HTML, CSS & JavaScript along with software development and legal and ethical issues.

The final exam is a mixture of state, describe, explain and discuss style questions as well as more practical questions where you will have to show an understanding of programming, boolean and binary based logic. Questions will range from 1 to 9 marks.

02 Algorithms and Problem Solving (70 mks) — 1.25 hrs

Although this a written paper a large proportion of your preparation will be practical based (programming using a computer).

It is a different exam to unit 01 as it will require you to problem solve and use high level logical / programming skills as well as demonstrate problem solving skills. Again questions will range from 1 to 9 marks.

Sample questions from both these units can be found on pages 6 and 8.

BEYOND THE SPECIFICATION

For some students the only time they think about computing is during a lesson and maybe homework.

If you are serious about the subject you should go beyond the concepts covered in the specification. This might spark an interest in a particular area of computing and will make you more knowledgeable when applying for universities.

building logic & problem solving skills

http://projecteuler.net./
Project Euler is a series of challenging mathematical/computer programming problems that will require more than just mathematical insights to solve. Although mathematics will help you arrive at elegant and efficient methods, the use of a computer and programming skills will be required to solve most problems.

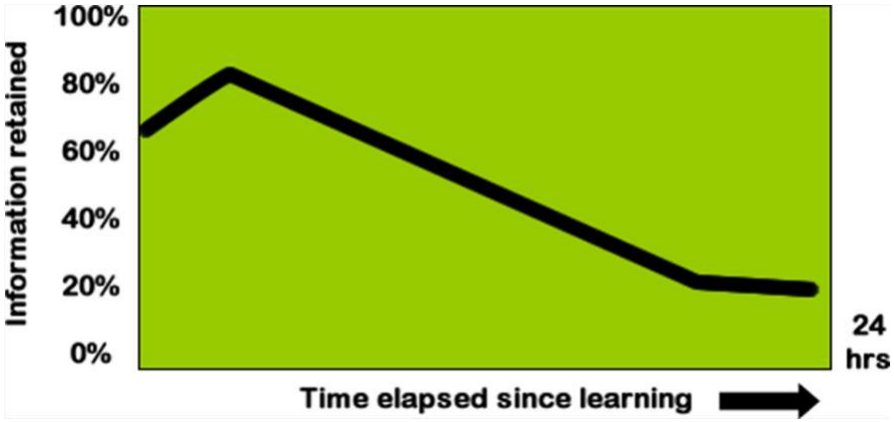
https://www.codecademy.com/
This is a great website with loads of short and longer projects to help you develop your programming skills. Signing up is free and you can pick and choose what exercises to try.

http://www.pythonchallenge.com/
Features riddles that ask you to write small Python programs to solve. The difficulty level gets progressively harder and more cryptic. This is an excellent site for programmers/developers that like problem solving!

http://www.mindcipher.com/
this site doesn't require you to do any programming. It does, however, include the "*world's greatest brain teasers, logical puzzles and mental challenges*", so if you're just out for a quick mental workout this is the place to go!

Memory fade

Before you have even left the classroom you will have forgotten a significant proportion of what you have seen and heard. Without revision within 24 hours you will have forgotten most of it. The steepness of the curve varies between individuals but the trend is the same. This is why regular revision is so vital.



Fighting memory fade

Do not fall into the trap of revising something once and thinking you are done with that topic. Continual revision is key. The following is recommended to truly embed something into your long term memory.

Revise new content after:

- 30 minutes (end of day)
- 24 hours
- 1 week
- 1 month

This may be hard to stick to but if you can do any sort of staggered revision like this it should help.

Overview of Year 13 (a level)

The Y13 exams will cover the content you learnt in Y12 plus a few extra topics thus part of the year will be spent covering new theory with some time dedicated to revision. You will also complete a piece of coursework. This will require a significant amount of work being completed outside of lessons. Your challenges will include juggling the coursework and preparing yourself fully for the 2 comprehensive exams.

Assessment: 2 exams and 1 piece of coursework

01: Computer Systems	**40%**
02: Algorithms and Programming	**40%**
03: Programming Project	**20%**

01 Computer Systems (140 mks) — 2.5 hrs

This exam includes all the content in the Y12 computing principles exam with a few sections added/expanded. It will be vital that you learn/understand the Y12 content to a deep level so that you retain it for Y13.

02 Algorithms and Programming (140 mks) — 2.5 hrs

Again this will include all the content from the Y12 equivalent unit but some additional complex topics will be added including object oriented programming.

03 Algorithms and Programming (140 mks) — April

The Project allows you to show off the knowledge and skills you have learnt in year 12 by planning, developing, testing and evaluating a unique system.

You have free choice in what sort of system you will develop, although you will have to consider your programming skills and time constraints.

We will start the project in the summer term of year 12 once all your exams are complete and the deadline is normally May 15th (of Y13).

Your final A Level grade—this is purely based on the marks you get from the 3 units listed above.

COMPUTING PRINCIPLES

1.1 Components of computer and their uses

You will learn about the main components found within a processor and understand what happens when an instruction is sent to the computer. You will compare RISC and CISC processors as well as multi core and parallel systems.

You will look at a range of input, storage and output devices and be able justify their choice in a range of scenarios.

1.2 Software and software development

You will understand the role of an operating system in the running of a system including scheduling, memory management, interrupts and translators.

You will also cover the core concepts involved in procedural programming including variables and constants, procedures and functions and a range of string handling and file handling processes. You will also learn a second programming paradigm called assembly language.

1.3 How data is exchanged between different systems

This sections covers databases, networks and web technologies.
You will learn about flat files databases and relational databases including a range of terminology such as primary and foreign keys.

You will look at the characteristics of networks including the internet. You will cover range of network specific terminology including TCIP/IP stack, DNS, protocols, packet and circuit switching.

You will also learn some basic HTML, CSS and JavaScript

1.4 Data types, data structures and algorithms

This section covers a range of programming concepts such as data types, binary arithmetic, arrays, stacks and queues as well as boolean logic.

It will require you to apply your understanding to specific problems rather than just explain how something works.

Dealing with distractions

Can't keep away from

Try the following:

Go to the library to do your work and do not take your phone, laptop, tablet with you.

Get someone you trust e.g a parent to change your password to facebook etc. They can give you access back at the weekends. This is great if you struggle to be self disciplined.

Keep your phone in a different room when you are doing work.

Uninstall apps that distract you and reinstall when the exams are over.

Get distracted on your computer?

Trying to do coursework online but keep getting sidetracked by cat videos and news sites? The resources below work by restricting the amount of time you can spend on time-wasting websites. Once your allotted time has been used up, the sites you have blocked will be inaccessible for the rest of the day

Minutesplease.com
Block a site within seconds

StayFocusd extension (Chrome web browser only)
Download for free and set sites you want to block or allow.

http://getcoldturkey.com/
Cold turkey lets you block sites and programs on your computer from half an hour up to a full week

SelfControl
For apple devices—block sites for a set amount of time. Even if you delete the app the blocks will remain in place!

USEFUL RESOURCES

Websites

https://firefly.lpgs.bromley.sch.uk
This site contains all the class notes, practice questions, past papers and marks schemes. Familiarise yourself with it early—favourite the link.

Youtube.com—search for 'OCR Specification Order'
A large number of short videos covering the key concepts for Y12. A great way to refresh your memory at the end of the day.

Flashcard Apps

Revise keywords on the go using these apps.

Flashcards+
Simple but effective flashcard app that lets you organise your cards into those you are confident with and those you need to revise.

CRAM.com
Make flashcards quickly and view cards made by others. Includes a range of different ways to use the cards including quizzes and games.

Quizlet.com
Similar to Cram in that you can view cards made by others and use the cards to complete quizzes.

Other apps

ExamTime.com
Access to a range of study tools including flashcards, quizzes, Mindmaps, notes and a study planner

Evernote peek
Capture notes in a variety of ways including sound clips, images or text.

SimpleMind+
Great mind mapping software to organise concepts in a different way.

1.5 Legal, moral, ethical and cultural issues

Technology has brought about all sorts of new issues that didn't exist before. This section will give you an awareness of 4 key laws that relate to technology

- The Data Protection Act 1998
- The Computer Misuse Act 1990
- The Copyright Design and Patents Act 1988
- The Regulation of Investigatory Powers Act 2000

It will also make you think about the moral, social and ethical opportunities and risks associated with technology. This will cover issues like:

- Computers in the workforce
- Automated decision making
- Artificial Intelligence
- Environmental effects
- Monitoring Behaviour
- Piracy and offensive communications

SAMPLE QUESTIONS from past papers

State what is meant by the term real-time [1]

Describe why Film title is not a suitable primary key [2]

Discuss the legal issues an online film streaming company might have considered when setting up their service and how they can ensure they comply with legal requirements [9]

Reasons to Choose Us

Come play laser Tag with us for:

- State of the art equipment
- Friendly staff

Write some HTML code which could have been used to produce the extract of text above. You can assume it is already inside <body> tags [6]

Using two's complement convert the denary number –43 into an 8bit binary number. You must show your working [2]

2.1 Elements of Computational Thinking

You section looks at 4 strands of computational thinking:

Thinking abstractly—removing the parts of the problem that are irrelevant leaving you with the core details that will affect your solution

Thinking ahead: We look at the sort of planning involved in creating a system including consideration of the inputs and outputs.

Thinking procedurally: Determining the steps needed to solve a problem and breaking these sown into sub procedures.

Thinking Logically: Determining when decisions need to made and the logical conditions that affect the outcome of a decision

2.2 Problem solving and programming

We will examine how computers can be used to solve problems and programs can be written to solve them.

Think includes key programming terminology and concepts including programming constructs, variables and modular design using functions and procedures.

You will also look at the process involved in developing software from understanding what the problem is through to designing, building and testing.

2.3 Algorithms

An algorithm is a set of instructions that perform a specific task. You will practice writing algorithms for a given problem and look at some commonly used algorithms including:

- Bubble sort, insertion sort,
- Binary search and linear search
- Adding and removing data from queues and stacks

WHERE you study is just as important as how you study

You will need to find places **IN and OUT of school** that you can study. It is recommended that this area is a study area only and not used by you for other purposes.

Nobody is a revision robot

Take short breaks every hour or so to give yourself a rest. Drink water and eat healthy snacks to keep your brain ticking over.

Focus on understanding

There will be some definitions that you will have to learn accurately but really the most effective way to revise is to concentrate on understanding rather than memorizing. Memorising requires huge efforts and can limit the sort of questions you can answer whereas if you have a good understanding of a topic you should be able to answer a broad number of questions on a topic.

Make your notes easy to follow

Make sure you can link your notes back to the specification with simple labelling. This way you know which bits you have covered and what you have to focus on next.

Make your notes visually appealing

Take time with your notes so you can read them back easily. Use a bit of colour! colourful notes are easier to memorise than plain black and white ones. Use diagrams where possible to break up the text and don't overload each page, perhaps use revision cards to break up topics.

Do plenty of past papers / questions and mark them

This will get you familiar with the layout and structure of the questions. Understanding how to answer a question fully is just as important as understanding the theory. Using the mark schemes to mark your own work will improve your technique.

Reward yourself

Give yourself something to look forward to after revision each day. People who manage to find the right balance between study and leisure are the ones who get the top marks.

Think positively

If you have done the work you will have nothing to worry about when the exam comes around.

Exam PREPARATION

You will ultimately be assessed on how well you perform in your end of year exams. Do not leave your preparation to last minute, get organised early so there are no last minute panics. You want to spend the weeks leading up the exams revising not getting organised and finding things.

Find out when all your exams are as early as possible.

Devise a regular work schedule ensuing you are spending enough time on all your subjects.

Nearer the exams devise a revision schedule to ensure your time is used wisely and you are prepared for the right exams at the right times.

Ensure you have copies of the specifications that list what you need to know for each exam.

Ensure you have a full set of notes for everything in the specification. You will be re writing things but you must ensure you have at least one core set notes to work from.

As well as revising make sure you do factor in time to switch off and relax. Stress can make it hard to take in and recall information.

SAMPLE QUESTIONS

from past papers

Describe what is meant by the term IDE (Integrated Development Environment [2]

Identify and describe three features commonly found in an IDE that will help programmers to find any bugs in their code. [6]

Compare a program procedure with a function [2]

```
FUNCTION Mystery ( number )
     IF number < 10 THEN
          RETURN number
     ELSE
          RETURN Mystery (number-9)
     END IF
END FUNCTION
```

Identify the parameter that is passed to this procedure [1]

Describe the logical decision that is made [2]

The programmer tests this code with the value 16. Show the output that would be obtained. [5]

Explain why it is necessary for the developers to use abstraction [2]

Explain how a map is an example of an abstraction [2]

Explain how levels of abstraction assist the map user [3]

As the size of an array increases the average number of checks required in a search algorithm grows logarithmically. State what is meant by logarithmic growth. [1]

Assuming an array is sorted give a situation when a linear search would perform better than a binary search. [1]

The Project

You will start the project in June (after you have finished your year 12 exams) and continue working on it through most of year 13. (The deadline for the coursework is normally May 15th).

The project will involve you working through the systems life cycle from defining what you intend to create, to analysing, designing, building, testing and evaluating your final system.

CHOOSING A SUITABLE PROJECT

You can make any type of project that interests you but you need to have some sort of 'end user' that will help you come up with ideas. This could be someone that runs a business, a teacher or a group of students.

Your main limitations when choosing your project are:

TIME

You will have limited time to complete your project so you must choose a project of a suitable size. If your program is unfinished by the deadline you will lose significant marks.

PROGRAMMING CONFIDENCE/ABILITY

You will all end year 12 with varying degrees of confidence in your programming ability, the project is a great way to improve your skills and learn new techniques but you should be realistic about how complex your program can be. Again if you set out to complete something that is complex but only manage to make parts of it you will lose significant marks.

Types of programs that can work well include:

- Math based quizzes
- Revision tools / quizzes for other subjects
- Stock / Order / Invoice management system
- Progress tracker for students
- Simple games

PRACTICE

1. Attempt every past paper question on your focus topic

2. Check your answers against the mark schemes. Be harsh!

3. Identify the areas you are weak on and write out the correct answers. Spend time learning these areas by reading and writing fresh notes.

4. In a months time come back to the topic and repeat all the steps.

TAKE RESPONSIBILITY

Find the time It is up to you to find the time to ensure you are able to complete homework, synthesise & practice to the best of your ability.

Identify your weaknesses and work on overcoming them Don't ignore the areas you find hard or don't like doing. These are the areas you should be spending the most time on until you feel comfortable with them.

Be honest with yourself Are you working as hard as you can? Are you marking work accurately? Don't tell yourself everything is fine if it is not. Seek help early on if you are struggling.

Study Skills ACTIVE REVISION

Revision is far more than sitting and reading through notes. This is a very passive approach that can be very ineffective. More active and effective suggestions can be seen below.

LITTLE and OFTEN

Don't hold it all off and cram last minute. An hour a night allows your brain to process and archive all the information for long term retrieval.

OTHER IDEAS

Create revision posters and stick them on your wall. Read a couple each time you walk into your room

Get family and friends to test you

Record yourself and listen back

Make electronic flash cards using free apps like cram or flashcards+

Synthesis

1. Summarise class notes on each topic on A4 paper. Use colour and diagrams.

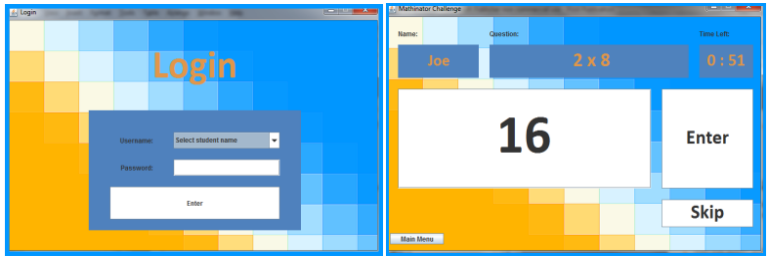
2. Rewrite these notes to be more concise.

3. Rewrite the notes onto revision cards or posters to put on your wall.

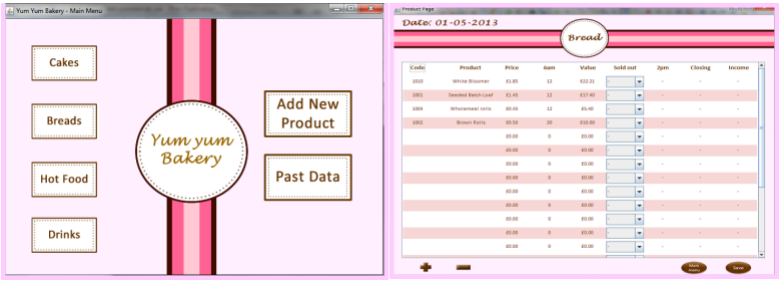
4. Test your knowledge using your revision cards or posters.

Science quiz where students had to recall information about different elements.

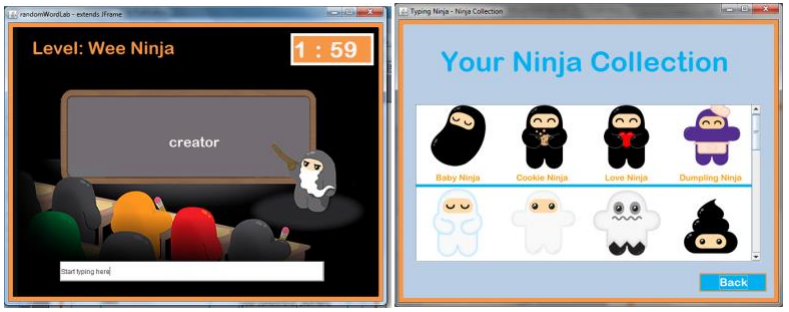
Maths program for primary students learning their multiplication tables.



Stock management system for a bakery allowing them to analyse current and past sales.



Touch typing program for year 7 students with a ninja theme. When students hit different targets they are rewarded with ninja characters.



LESSONS

Attending lessons will be key. However you will need to do more than just show up.

BEFORE LESSONS

Read over what we will be covering in the lesson.

For many lessons I will ask you to watch a video or read through some slides that will link to the up coming lesson. This will mean you can immediately play an active part in the lesson and will already have a few questions on hand that will further your understanding. This will be essential in allowing us to complete the course in the permitted time

DURING LESSONS

The challenge is to remain focussed so you are registering what is being said. To avoid tuning out try to:

Listen carefully

Don't just tune in and out, it won't be long before you are lost. Don't sit next to someone that might distract you.

Take Notes

This is a more active activity and should help maintain your focus.

Ask questions when you don't understand.

It is impossible to stay focussed if you do not understand what is being said.

AFTER LESSONS

You need to work on retaining what is covered in lessons. How much time you spend outside of lessons has a major impact on results.

Read over notes

This will help you remember the finer details.

Write out comprehensive notes

Don't start summarising things too early or you may overlook bits.

Complete homework

This will help check your understanding.

Do questions on topics that were covered earlier in the year

Don't wait until just before the exams to review things covered months ago.

If there are any parts that you do not understand do not overlook them—get help.