GCSE to A level

Computer Science Transition workbook

Exam board: OCR
Assessment: 2 written exams (40% each exam) and a programming project (20%)

- The topic of **Computer Science** is at the heart of the modern world
- Studying it can make you extremely sought after in todays job market
- The transition from GCSE to A level is significant, this includes:
    - An increased emphasis on **technical content**
    - An increased emphasis **independent research**

This workbook is designed to allow you to practice some of these skills and build on your existing knowledge.

Please complete by your first lesson back in September, sending digital copy to both DET and CHH (see emails below)

Name:

If you need any help or you have any questions about the transition work or the course please contact either:
chh@churchdownschool.com or det@churchdownschool.com

1 “Tell me about yourself”

Craig’n’Dave

Why did you choose Computer Science? What is the course about?

In this simple task you get the opportunity to tell me your choices and reasons behind choosing to study Computer Science. Please answer all questions as best you can.

1. Why did you choose to study A level Computer Science?

2. What other courses have you chosen to study at Key Stage 5, and what made you choose this combination?

3. What are you hoping to achieve from studying Computer Science?

4. How would you describe yourself as a learner at GCSE? What skills where you good at, what areas would you like to improve on?

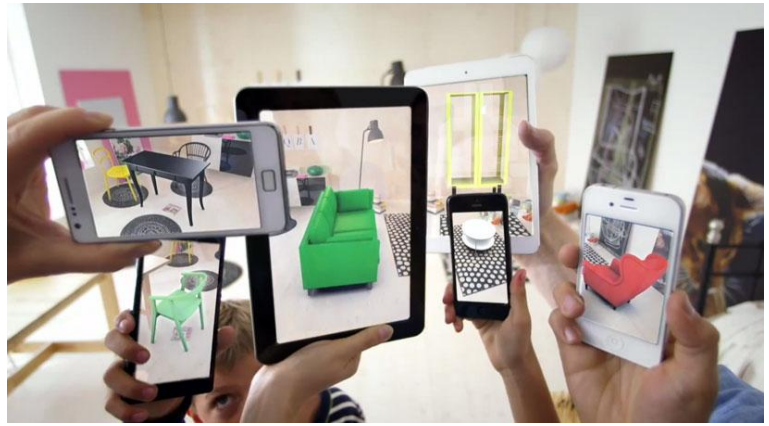
5. What are your other hobbies and interests outside of school? Anything related to Computing?

6. How many external exams will you take as part of this course? How much of your final grade is the programming project worth?

2 Independent research task

Craig'n'Dave

Emerging computer technology



In this task you get to investigate any area of emerging computer technology which interests you.

You can pick any area which interests you, but examples could be:

- Artificial intelligence
- Robotics
- Automated self driving cars
- Quantum computing
- Augmented reality

In no more than ONE side of A4 summarise the area you have chosen under the following four headings:

1. What is it?
2. What are the possible Social, Moral, Cultural and Ethical **benefits** of this technology on society
3. What are the possible Social, Moral, Cultural and Ethical **risks** of this technology on society
4. My conclusion on this technology and what it will mean for our world 10 years from now

Additional help:

For additional help and support in structuring your answer you might like to watch some of the videos from the following Craig 'n' Dave playlists:

OCR:
SLR 17 – Ethical, morale and cultural issues
https://student.craigndave.org/videos/slr-17-ethical-moral-and-cultural-issues

3 Note taking practice task

Craig'n'Dave

The Cornell method of note taking

The expectation to do independent research at A Level will increase dramatically from GCSE.

There is a real skill to taking decent notes outside of lesson which are of value. Research has proven that one of the most effective methods is the "Cornell" note taking method.

1. To start download the "Cornell note taking template" from Craig n Dave:
   - https://craigndave.org/cornell-note-taking/

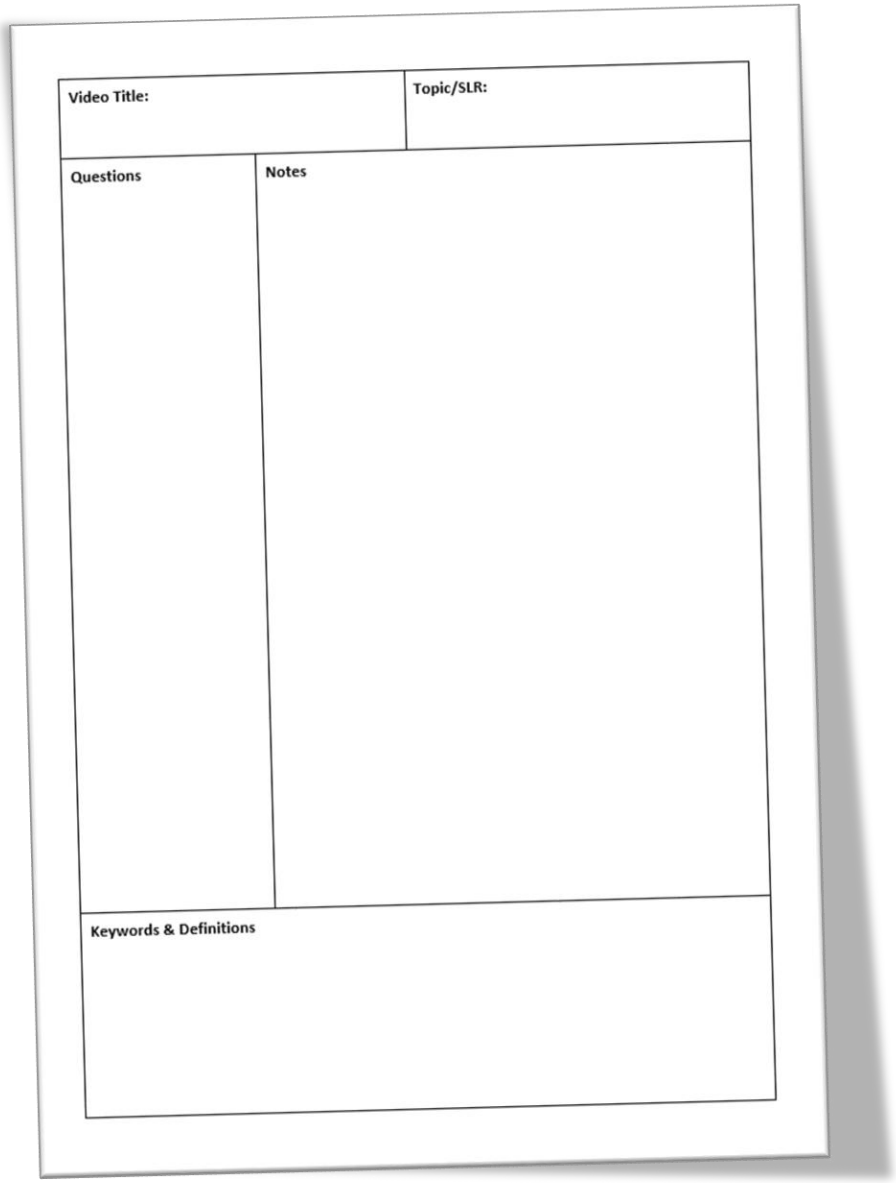
2. Watch the following two videos from Craig 'n' Dave:
   - OCR: 3. OCR A Level (H406-H466) SLR1 – 1.1 Performance of the CPU - Craig 'n' Dave
   - OCR: 32. OCR A Level (H446) SLR7 – 1.2 Programming paradigms - Craig 'n' Dave

3. Write the title of the video and its topic in the top boxes (use a different sheet for each video).

4. In the main "Notes" section, write notes from the video. You can do this in any way you like, a suggestion might be to rewind slightly when the canvas changes, thinking carefully about what was important in the previous few minutes.

5. Having recorded the notes, review them:
   - Turn each part into a question in the section on the left.
   - For example, the notes may say, "The value of the program counter is passed to the memory address register".
   - The question then becomes, "which register is the value of the program counter passed to?"
   - Sometimes these questions are easy, and at times they are more difficult to write.
   - There may also be more than one valid question.
   - You will need to decide for yourself which are the most appropriate questions for revision.

6. Finally pull out all the key words and their definitions words the notes and list them in the bottom section.



4 Programming tasks – building confidence and recapping

Craig'n'Dave

Learning to "code" is a fun and essential part of A Level Computer Science. This task is a nice refresher ahead of starting your A Level course.

1. Head over to the web site: CSUK:Coder – CSUK's 'Learn to Code' Platform
2. Sign in with your school email and the password: alevelcomp1
3. Go to PyQuests section, in this section you need to complete 5 levels in each of the programming categories:
    1. Inputs, variables and outputs
    2. Data types, casting and arithmetic
    3. Selection
    4. Count controlled iteration (for loops)
    5. Condition controlled iteration (while loops)

Nothing is to be handed in within this section as we can monitor your progress via the website.

If you want to do some recap of some other areas, then please go Python Tutorial

You need to be comfortable programming (this can be worked on but it isn't going to be teacher led initially)

5 Computational logic task

Craig'n'Dave

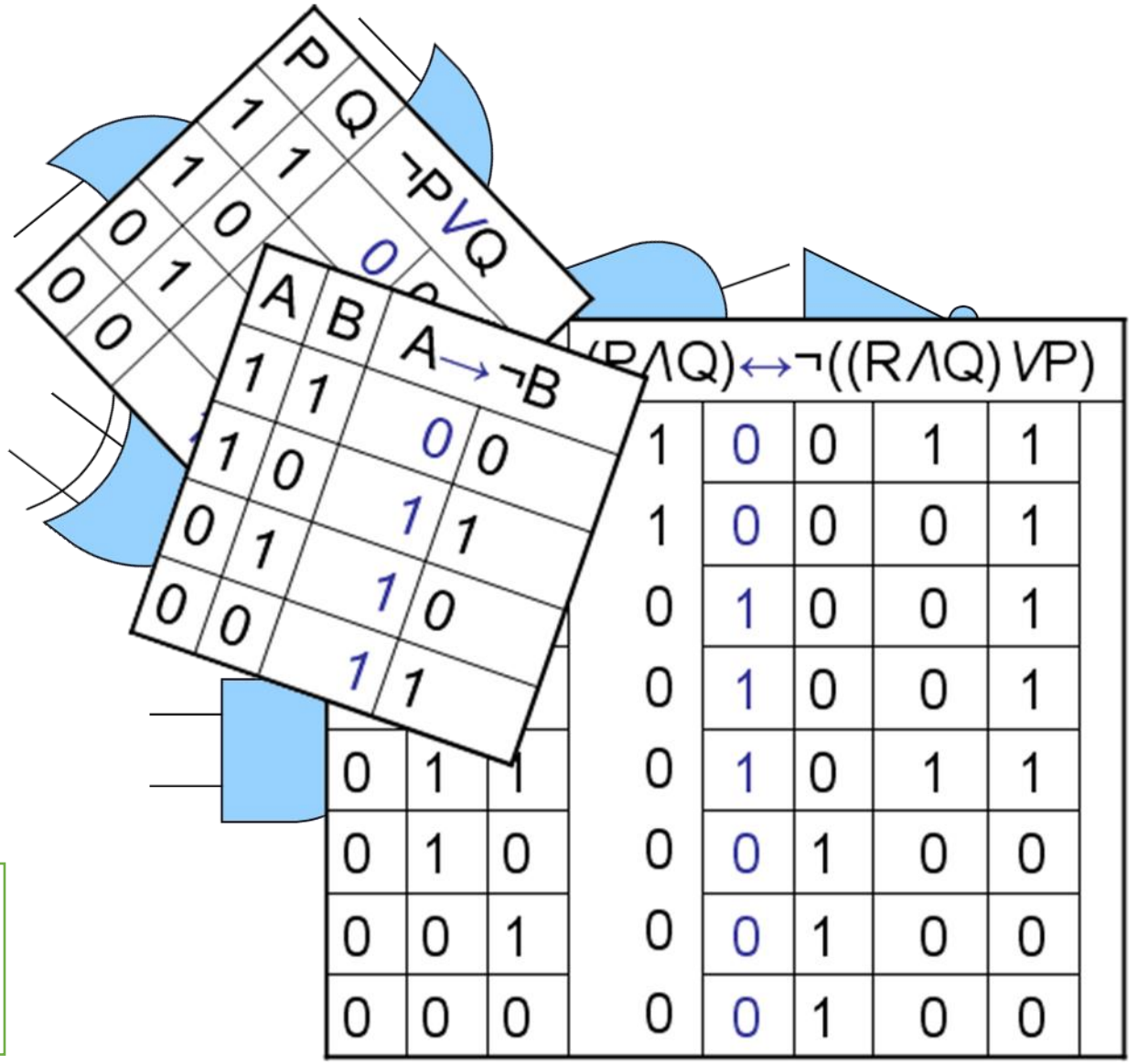
Truth tables to circuit diagrams

An important area of computer science is understanding the logic gates and diagrams which are used to represent the physical circuitry of computer systems.

Carry out some research into the following areas:

- Logic gates:
  - AND
  - NAND
  - NOR
  - NOT
  - OR
  - XOR
- Truth tables
- Boolean expressions
- Circuit diagrams

Complete the tasks on the following slides.



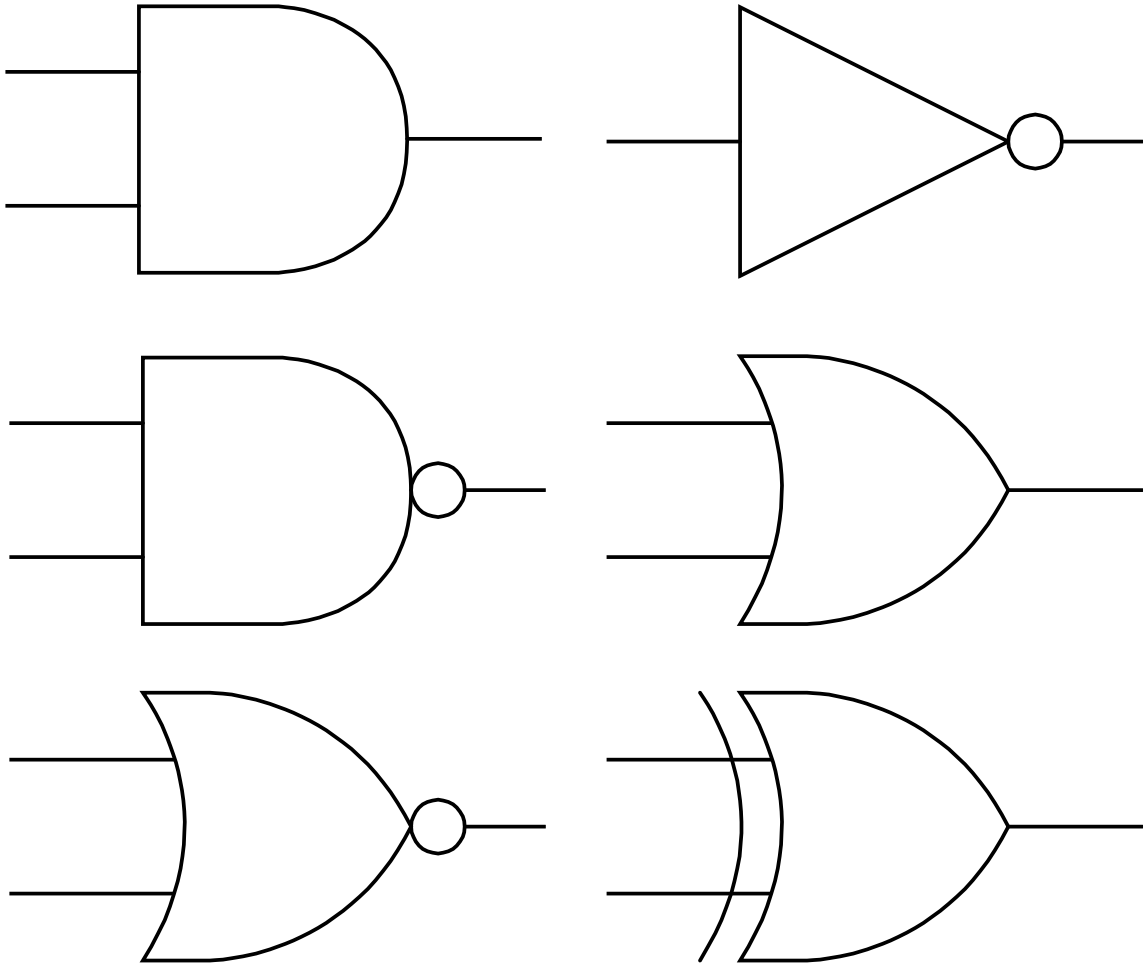
Additional help:

For additional help and support in structuring your answer you might like to watch some of the videos from the following Craig 'n' Dave playlists:

OCR: SLR 15 – Boolean algebra
https://student.craigndave.org/videos/slr-15-boolean-algebra

Truth tables to circuit diagrams

1. Drag the labels into their correct place on the following diagram:



OR

AND

XOR

NOT

NAND

NOR

Truth tables to circuit diagrams

2. Draw the circuit diagram which would represent the following Boolean expression:

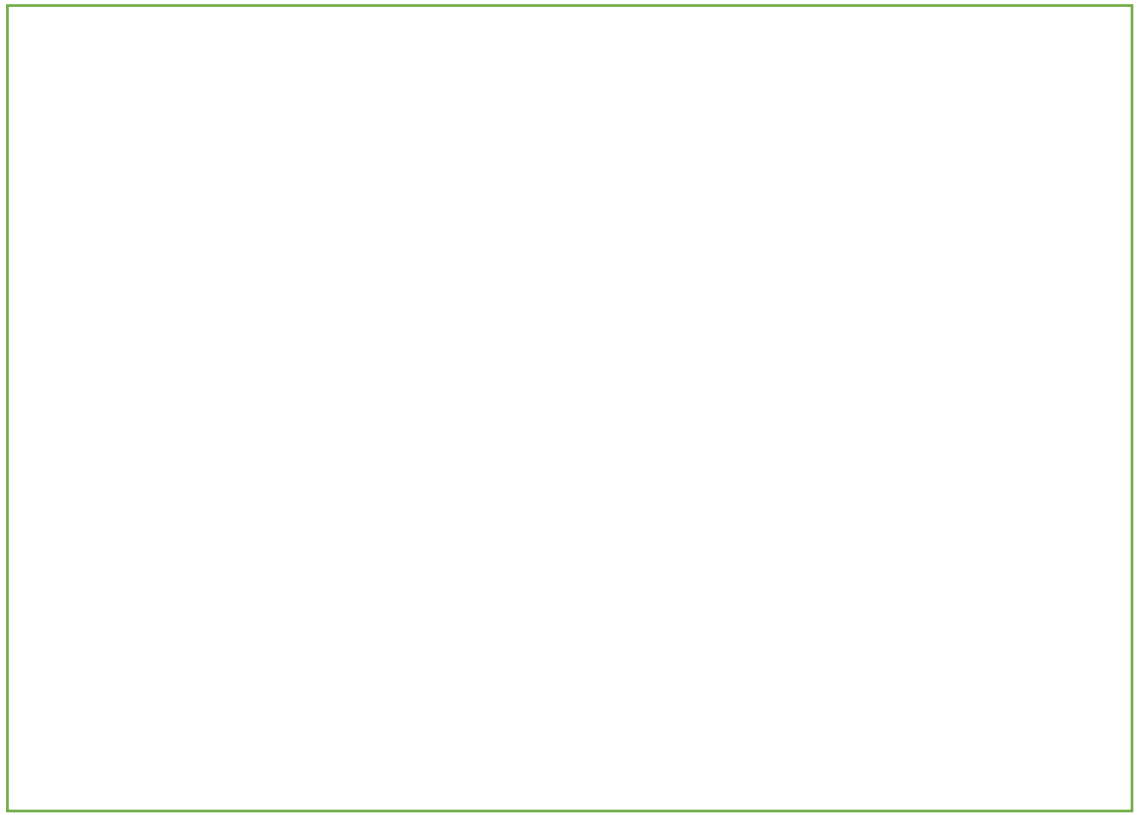
OCR Boolean Expression: **F = ¬(¬C ∧ (A ⩒ B)**

A

B

C

F



3. Complete the truth table for the circuit diagram you have drawn

A	B	C	D	E	F
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

Representing negative numbers in binary

In GCSE computer science you will have learnt how to represent positive whole numbers in binary e.g. 47

At A Level you will need to know how to represent negative as well e.g. -47

Start to recapping (or learning if you didn't do the GCSE) how to represent positive whole numbers between 0-255 in binary

Now research how to represent negative numbers in binary using the method known as:

- Two's complement

Complete the tasks on the following slides.

Additional help:

For additional help and support in structuring your answer you might like to watch some of the following videos from Craig 'n' Dave:

GCSE recap: How to represent positive binary values 0-255
https://student.craigndave.org/videos/aqa-gcse-slr13-number-bases

A Level: Representing negative binary values using Two's Complement
https://student.craigndave.org/videos/aqa-alevel-slr11-twos-complement

Representing negative numbers in binary

1. Write out the positive binary number 107, the answer should be displayed in 8 bits.

128	64	32	16	8	4	2	1	Binary weighting
								Binary value

2. Write out the negative binary number -107 using Two's Complement, the answer should be displayed in 8 bits.

								Binary weighting
								Binary value

3. How would you represent the lowest negative number possible using Two's Complement, given 8 bits.

								Binary weighting
								Binary value

4. How would you represent the largest positive number possible using Two's Complement, given 8 bits.

								Binary weighting
								Binary value

16 Binary task

Craig'n'Dave

Converting between base-2, base-10 and base-16

Expected time to complete: 1½ hours

As humans we have use the decimal or denary number system (base-10), made up of the unique digits 0-9.

Computer systems at the most basic level use only binary 1's and 0's (base-2).

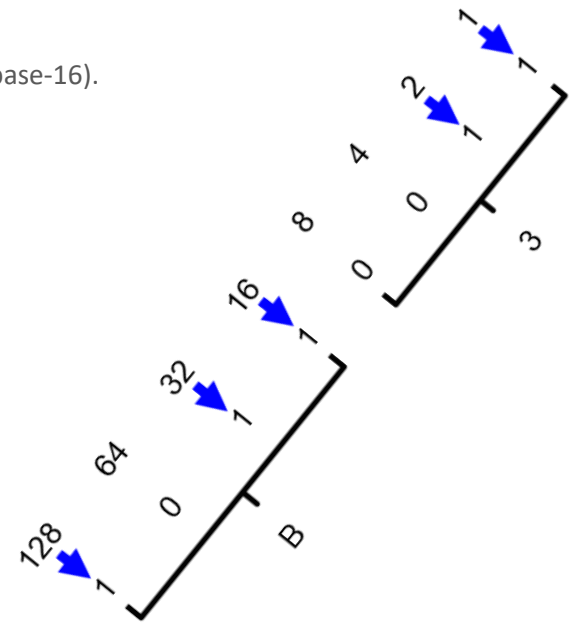
As a computer scientist you will also need to become familiar with the hexadecimal number system (base-16).

You will also need to be comfortable with converting numbers between these three base systems.

Research the following areas:

- Base-2 binary number system
- Base-10 decimal/denary number system
- Base-16 hexadecimal number system
- How to convert between base-2, base-10 and base-16

Complete the tasks on the following slides.



Denary	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

Additional help:

For additional help and support in structuring your answer you might like to watch some of the following videos from Craig 'n' Dave:

Base 2, 10 and 16 number systems:
https://student.craigndave.org/videos/aqa-alevel-slr10-base-2-10-and-16-number-systems

Converting between binary, hex and decimal:
https://student.craigndave.org/videos/aqa-alevel-slr11-aqa-converting-between-binary-hex-and-decimal

6 Binary task

Craig'n'Dave

Converting between base-2, base-10 and base-16

Expected time to complete: 1½ hours

1. Convert the base-2 binary number 11000101 into base-10 and base-16.
(Show all your working)

2. Convert the base-16 hexadecimal number 9F into base-2 and base-10.
(Show all your working)

You may wish to cut and paste this standard binary weighting line to help lay out parts of your answer

128	64	32	16	8	4	2	1	Binary weighting
								Binary value