

A – Level Computer Science Summer Work



How to use this document:

- Use the contents page and any blue text to navigate the document.
- Carry out the required research
- Use the corresponding video for each practice set to support and to self-assess.
- Use the videos to revisit GCSE topics as needed

1. Complete and self-mark your workbook from the taster day! (these videos may help)

https://www.youtube.com/watch?v=mGfOJQgdl_U

<https://www.youtube.com/watch?v=IGQ9YOnhWxA&t=207s>

2. Visit the OCR A level website, (A level H446) read up about the project, start thinking about what you want your project to do, read through some of the available exemplars.

Some examples are here :

High Level - <https://www.scribd.com/document/924853911/Candidate-Exemplars-June-2017-H446-03-04-Set-a-Low>

Low Level - <https://www.scribd.com/document/924853911/Candidate-Exemplars-June-2017-H446-03-04-Set-a-Low>

3. Start researching what you want your project to be. Mind Map it, think about your ideas and document them.
4. Look into and write an explanation of why floating-point binary was to blame for the 1991 patriot missile failure
5. Start watching through the Craig 'n' Dave videos for OCR A level and start making Cornell notes.

<https://www.youtube.com/watch?v=dVi2B7fGVm4&list=PLCiOXwirraUBj7HtVHfNZswnjyZQj97da>

<https://www.goodnotes.com/blog/cornell-notes>

6. Refresh your knowledge from GCSE

OCR -

<https://www.youtube.com/watch?v=7Up7DIPkTzo&list=PLCiOXwirraUAEhj4TUjMxYm4593B2dUPF>

EDEXCEL- <https://www.youtube.com/watch?v=KyH-9WG1utM&list=PLCiOXwirraUCo6-YUFGk34mAinrmC7y6j>

7. Review Two's complement, print and complete the PDF Worksheet

Binary addition and Two's Complement

Add these binary numbers together

Answers (Extra Marks for Converting to Decimal)		
1	01100011 00101011	
2	00110110 01101100	
3	01100110 00110110	
4	01001011 00011011	
5	00011111 00011101	
6	01011000 01100100	
7	01111000 01110100	
8	01001111 01010011	
9	00100111 00110100	
10	10100111 01000001	

Introduction to 2's Complement

1. What is 2's Complement?

2's complement is a method used in computing to represent negative binary numbers. It allows for easy addition and subtraction of binary numbers.

2. How to Find the 2's Complement of a Binary Number:

- o Step 1: Invert all the bits of the binary number (change 0 to 1 and 1 to 0).
- o Step 2: Add 1 to the least significant bit (rightmost bit) of the inverted number.

Converting Binary to Decimal Using 2's Complement

1. Convert the following 4-bit 2's complement binary numbers to decimal:

a) 1010

b) 1101

c) 0110

d) 1111

2. Convert the following 8-bit 2's complement binary numbers to decimal:

a) 10001100

b) 11110000

c) 01111111

d) 00000001

Converting Decimal to Binary Using 2's Complement

1. Convert the following decimal numbers to 4-bit 2's complement binary numbers:

a) -3

b) 5

c) -6

d) 2

2. Convert the following decimal numbers to 8-bit 2's complement binary numbers:

a) -20

b) 15

c) -32

d) 8

Addition and Subtraction Using 2's Complement:

Perform the following operations using 4-bit 2's complement representation. Show your work.

a) Add 0110 and 1010

b) Subtract 0011 from 0101

c) Add 1111 and 0001

d) Subtract 1010 from 0110

Error Checking:

Determine if the following 4-bit 2's complement operations result in an overflow:

a) $0101 + 0100$

b) $1010 + 1110$

c) $0110 - 1001$

d) $1000 + 1000$

Reflection Questions

1. Why is 2's complement preferred over other methods for representing negative binary numbers?
2. How does 2's complement simplify the design of arithmetic circuits in computers?
3. What happens when the result of a 2's complement operation exceeds the bit limit?

Convert these binary numbers to their negative denary equivalents

Answers (Extra Marks for Converting to Decimal)

11	1110010110	
12	1111110111	
13	1110011111	
14	1110100100	
15	1110101101	
16	1110000001	
17	1110011100	
18	1110101011	
19	1111111001	
20	1111011001	