

Computer Science A Level Transition Task

Task 1: Representation of Numbers from GCSE Level

- Visit isaacomputerscience.org
- Register a new account
- Join a group with the code: VA8HKR
- Complete the assignment set on the topic of GCSE Representation of Numbers.
- You may need to read the guidance on the site before taking the assignment. Go to Learn -> GCSE Topics -> Data and Information -> Representation of Numbers

Task 2: Fixed-point binary number representation

In the A-Level course you will become familiar with binary representation of negative and fractional numbers initially.

One method of representing fractional numbers is fixed-point representation. This is where the binary point stays in the same place. In this 8-bit number, the **binary point is between the 5th and 6th bits**, although it is not shown:

Denary place value	16	8	4	2	1	0.5	0.25	0.125
Bit	1	0	1	0	1	0	1	0

The binary number shown in the table above is 21.25 or $21 \frac{1}{4}$: $16 + 4 + 1 + 0.25$

Calculate the decimal value of each of the following bit patterns. Show all working.

	Place value							
	16	8	4	2	1	0.5	0.25	0.125
3a	1	1	1	0	1	0	0	0
3b	0	1	0	1	0	1	1	1
3c	1	1	1	0	0	1	1	1
3d	0	0	0	0	0	1	1	1
3e	1	1	1	0	0	1	1	0
3f	0	1	1	1	0	0	1	1
3g	1	0	1	0	1	1	1	0
3h	0	0	0	1	0	1	1	1
3i	0	1	0	1	0	1	0	0
3j	1	1	0	1	0	1	1	1

Task 3: Binary Representation of Negative Numbers Using Two's Complement

One method of representing negative numbers is two's complement representation. This is where the most significant bit (the left-most) is the negative of whatever it would usually be:

Denary place value	-128	64	32	16	8	4	2	1
1Bit	1	0	1	0	1	0	1	0

The binary number shown in the table above is -86: $-128 + 32 + 8 + 2$

Any number with a 1 in the most significant bit will be negative. Any number with a 0 in the most significant bit will be positive.

Calculate the value of each of the following bit patterns:

	Place value							
	-128	64	32	16	8	4	2	1
4a	1	1	1	0	1	0	0	0
4b	0	1	0	1	0	1	1	1
4c	1	1	1	0	0	1	1	1
4d	0	0	0	0	0	1	1	1
4e	1	1	1	0	0	1	1	0
4f	0	1	1	1	0	0	1	1
4g	1	0	1	0	1	1	1	0
4h	0	0	0	1	0	1	1	1
4i	0	1	0	1	0	1	0	0
4j	1	1	0	1	0	1	1	1