Y10-02-P10: Hexadecimal

Learning objectives

In this lesson you will learn to:

- define what is meant by the term 'hexadecimal'

- explain why hexadecimal notation is used

- convert between hexadecimal and binary.

For more information about this topic and additional student activities see Topic 2 of the student book.

Quick test!

Copy down this number. You have 5 seconds!

Did you get it all down correctly?

Human problems

That was difficult, wasn't it?

Did you get all of the digits correct?

Even if you had more than 5 seconds, chances are you'd make a mistake.

This is because people find binary numbers hard to read, write and understand.

An alternative solution

Computer scientists often use an alternative method of representing long binary numbers.

This is known as hexadecimal.

Hexadecimal is a number system that is base 16.

Hexadecimal values

You don't need to memorise this table!

Remember that:

- 10_{10} is 1010_2 and A_{16}
- 15_{10} is 1111_2 and F_{16}

Then you can work out the rest.

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
16	10000	10

Conversion

You can convert easily between binary and hexadecimal by splitting the binary number into nibbles.

0	1	1	0		1	1	0	0

You convert each nibble into denary and then into one hexadecimal digit.

4 + 2 = 6		8 + 4 = 12 = C

So the hexadecimal is 6C.

Conversion

Going from hexadecimal to binary is just as straightforward.

We take the hexadecimal, split it into its digits and convert these to decimal and then into binary nibbles.

Binary conversion by subtraction

Denary (Base 10)

B	E
B = 11	E = 15

11 - 8 - 2 - 1	15 - 8 - 4 - 2 - 1
1011	1111

Where is it used?

One of the most common uses of hexadecimal values is for colours.

Find out more information about this in Activity 3.

Wrap up: you have learned how to…

✓ Define what is meant by the term 'hexadecimal'.

- Base-16; 0-9 then A, B, C, D, E, F.

✓ Explain why hexadecimal notation is used.

- Easier for people to read, write and understand.

✓ Convert between hexadecimal and binary.

- Split into nibbles and convert each nibble.