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Hexadecimal - GCSE Computer Science video for hexadecimal

GAME VOICE: Hexadecimal Dash.

D-KODE: Ha ha!

GAME VOICE: Load binary number.

NARRATOR: And you've got to turn that into hexadecimal.

D-KODE: What?

GAME VOICE: Do you know about binary?

D-KODE: Er, not really.

GAME VOICE: Binary basics.

NARRATOR: A computer is basically a bunch of circuits that can be switched to either on or off. And so a two-digit number system is all it needs to represent those two states.

Binary is that number system being made up of just ones and zeros.

D-KODE: Right.

NARRATOR: So, in order for a computer to understand and represent any number, that number first has to be converted into binary.

D-KODE: Got it!

NARRATOR: Did you know that in a computer, an eight-digit binary number like this, takes up one byte of storage?

D-KODE: Okay.

NARRATOR: And if we split that in two, each half is called a nibble.

D-KODE: A nibble? Okay, I see what they did there. Half a bite is a nibble. Like I get it.

NARRATOR: Each of those nibbles can be represented using just one hexadecimal digit.

D-KODE: How efficient.

NARRATOR: Which is exactly why we use hexadecimal in computer science.

D-KODE: Okay.

NARRATOR: Big old numbers take up less space if we first convert them into hexadecimal.

D-KODE: So, to turn that binary into a hexadecimal number, I first need to split it into nibbles?

NARRATOR: That's right.

D-KODE: What exactly is hexadecimal?

GAME VOICE: Here comes the hex-planation.

NARRATOR: Hex is the Greek word for six and the decimal system is, of course, based on the number ten.

D-KODE: Okay.

NARRATOR: So hexadecimal is an ancient mash-up of 6 and 10.

D-KODE: 16!

NARRATOR: Exactly.

D-KODE: We use the word denary, not decimal.

NARRATOR: Why?

D-KODE: It's way cooler!

NARRATOR: Agreed. So denary is base 10 and hexadecimal is base 16. It means that each column in hexadecimal is 16 to the power of its place value. So the first block tells us how many ones you have, and 16 to the power of 0 is 1.

Then 16 to the power of 1 is 16, so the next block tells you how many 16s you have. 16 to the power of 2 equals 256, so the next block tells you?

D-KODE: How many 256s you have?

NARRATOR: You've got it! 16 to the power of 3 is 4,096.

D-KODE: Whoa! 16 to the power of 4 is 65,000 and ... Okay, now you're doing my head in.

NARRATOR: Because hexadecimal is base 16, it means you have 16 digits to use to make the target. We need to represent all of those 16 digits using only a single symbol as once we get to number 10 in denary, then we jump into double digits.

D-KODE: And we want to save space.

NARRATOR: That's it! In hexadecimal, we use letters instead of double digits. After the number 9, we simply run through the alphabet.

A is 10, B is 11 and so on, until we reach F for 15, making a total of 16 hexadecimal digits ranging from zero up to F.

GAME VOICE: Zero to nine then alphabet time!

NARRATOR: All you have to do is work out what those target nibbles amount to. Then stick in the equivalent value in hexadecimal.

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D-KODE: All right, I'll give it a go.

NARRATOR: Round one.

D-KODE: Let's do this!

NARRATOR: Turn binary into hexadecimal.

D-KODE: Okay, so the first nibble is worth erm ...

NARRATOR: Here, let me help you.

D-KODE: Cheers. So we've got a 2, which in the hexadecimal range is erm ... 0, 1, 2. The second nibble is … we've got a 1 and a 4 and an 8. 13!

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 is A, 11 is B, 12 is C, so 13 is D. D2 is the hexadecimal number.

GAME VOICE: Target complete.

D-KODE: Yes!

GAME VOICE: Round two: convert hexadecimal into binary.

NARRATOR: Turn 9F hexadecimal into binary.

D-KODE: The first nibble needs to be 9. So an 8 ... and a 1. Next nibble needs to be F. Erm ...

NARRATOR: This help?

D-KODE: Cheers. Okay, so 10 in denary is A in hexadecimal. 11 is B, 12 is C, 13 is D, 14 is E, 15 is F. 15!

So 8 ... and 4 makes 12 plus a 2 makes 14. One more. 15.

NARRATOR: Challenge complete.

D-KODE: Yes!

NARRATOR: Hey!

D-KODE: What?

NARRATOR: I bet that wasn't what you hex-pected, huh?

D-KODE: Mate, you need help! Try BBC Bitesize.