Lesson_07 Binary Representations

Lesson Title : Number Representation in Computers

IB Standard for Assessment 2.1.9 Define the terms: bit, byte, binary, denary/decimal, hexadecimal

IB Standard for Assessment 2.1.10 Outline the way in which data is represented in the computer.

SWBAT/IB Teaching Standard for Assessment: To include strings, integers, characters and colours. This should include considering the space taken by data, for instance the relation between the hexadecimal representation of colours and the number of colours available. TOK,INT Does binary represent an example of a lingua franca?

Do Now / Coding Component (2 minutes) **- see the coding tasks in the lesson**

Part A. Introducing the Lesson (5 minutes) - Teacher will pose the question for the students to resolve: Suppose my alphabet has only 2 letters. How many 1 letter words and 2 letter words may I form? Now double the number of letters in my alphabet. How many 1, 2, 3,4 letter words may I form? Using asymptotic thinking, which alphabet will have more words - an 8-letter alphabet or 16-letter alphabet? This is the thinking behind the choice of which number-base to use in computer systems. There are 4 number systems: denary, binary, octal, and hexadecimal but the most fundamental base is the binary number system because the number 1 and 0 may be used to designate 2 states of a switch - on or off. By combining sequences of binary numbers, a code system of up to 256 symbols can be represented.

Part B. Student Centered Activity. (20 minutes) Each group will be assigned to view the GCSE video (GCSE.GURU) on number conversions and research/write a code in java or python that will perform the task. The groups will then put their codes together. Teacher will provide coding support as needed.

Group 1: Binary to Hex	Group 2: Denary to Binary	Group 3: Denary to Hex	Group 4: Hex to Denary

Part C. Whole Group Lesson Component /Harkness Protocol (15 minutes) -

> ***Group Activity:*** *Analyse the way that hexadecimal number system is used to represent colours. Visit the game http://www.hexinvaders.com/ and play with the game briefly.*
>
> ***Topic for discussion:*** *The hexadecimal representation of colours assumes that ALL colours can be represented by this framework – how do you know that this is a true statement? Is there a way to validate this claim?*

Topic for discussion: TOK,INT Does binary represent an example of a lingua franca?

Part D. Optional Tasks. *Teaching note - in subsequent lessons, students will be required to perform base number conversions by hand to prepare them for the IB Assessments.*