# Lesson 17 – Binary Representation of Text and Images

|  |  |
| --- | --- |
| 40BThe Big Picture – Why is This Relevant? | 41BLearning Objectives: |
| * Students have now used the micro:bit for a number of lessons. They have looked at the IPO model and will now develop this understanding to realise how text and images are stored using binary data | * To understand how text is represented using binary data * To understand how images are represented using binary data * To understand the need for metadata |
| 42BEngagement – How Can I Engage Learners? | 43BAssessment for Learning |
| * Students will understand how text can be represented in binary using ASCII. They will have the opportunity to write their first name in binary so that they will realise how the computer would process it. They will be introduced to how ASCII codes can be entered into a Word document which will then be shown on screen as the corresponding character * Students will operate like a computer and will create a bitmap from the instructions provided. They will also have the opportunity to create their own bitmap | **Expected progress:**   * Students will understand how data can be represented in binary in order for a computer to be able to process it * Students will be able to create a bitmap from the binary code provided   **Good progress:**   * Students will understand why data is needed to be represented in binary in order for a computer to process it * Students will be able to create a bitmap from the code provided and will be able to write binary code to create their own bitmap   **Exceptional progress:**   * Students will understand why data must be represented in binary in order for a computer to be able to process it * Students will be able to write binary code to create their own bitmap and will understand the need for metadata * Students will understand how pixels are used to create an image |
| Links to KS3 Programme of Study | |
| * Understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits * Understand how numbers can be represented in binary | |
| 44BKey Concepts: | 45BKey Words: |
| * Computer processors are made of switches (logic circuits) and transistors which only have two states, on and off. Data therefore has to be in binary in order for it to be processed by the CPU * Characters are represented in binary using either the American Standard Code for Information Interchange (ASCII), Extended ASCII or Unicode. * Bitmaps comprise of a grid with each cell being one pixel. Each pixel has a binary code which represents one colour. Metadata is also required which is data about data. The number of colours will need to be stored along with the unique binary codes that are used to represent each pixel. The height and width of the bitmap will also be stored as metadata along with other information such as the author and location. | * Binary * Switch * ASCII * Bitmap * Metadata * Pixel |
| 46BDifferentiation: | 47BResources: |
| More able learners may wish to explore the use of Unicode and why it is needed in addition to ASCII. When completing the activity to create their own bitmap they may wish to introduce additional colours and the required accompanying metadata. | * Lesson 17 ppt * Lesson 17 ASCII worksheet * Lesson 17 Bitmap worksheet |
| Lesson Flow | |
| * Using the ppt to support the discussion discuss the use of binary. Highlight that processors are made of switches and transistors which only have two states, on and off. Binary is a base 2 system which also has only two states, 1 and 0 * Text has to be represented in binary. This can use ASCII, Extended ASCII or Unicode. All students should understand how ASCII can be used. More able students may wish to independently explore why Unicode is now more widely used. Students should consider the benefits and drawbacks of using Unicode instead of ASCII. Students should then complete the worksheet referring to the ASCII table at: <http://www.asciitable.com/> . They will convert a number of binary digits into text. This will require them to initially convert the binary digits into denary. Remind students how to do this using the worked example on the worksheet. Once they have completed this they should then write out the binary for their own first name. Students may wish to explore how ASCII codes can be entered into a word processed document. If they hold down Alt and then type in a number using the number pad on a keyboard when they release Alt they will see the corresponding text character on the screen. Please note that number lock will need to be turned on. Students should then complete the ASCII worksheet * Using the ppt as support discuss with students how bitmaps are stored in binary * Students should then work through the bitmap worksheet | |
| Making | |
| * There is no making activity in this lesson | |