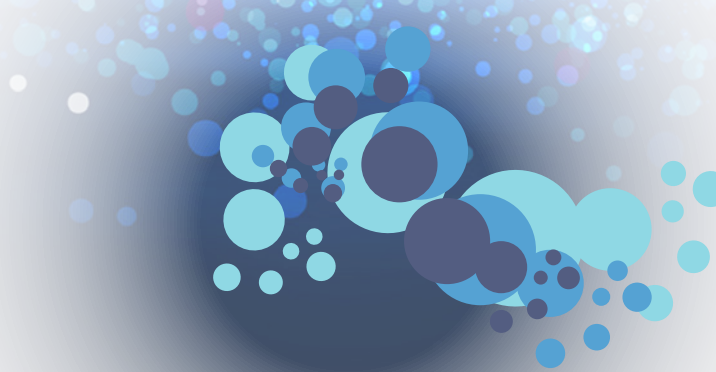


# The use of binary codes to represent characters

Teacher's Notes

## Lesson Plan

Length	60 mins	Specification Link	2.1.4/hi	Character	
Learning objective	(a) Explain the use of binary codes to represent characters (b) Explain the term character set (c) Describe with examples (for example ASCII and Unicode) the relationship between the number of bits per character in a character set and the number of characters which can be represented				
Time (min)	Activity	Further Notes			
10	<p>Explain that, however boring they find it, computers have to communicate with humans and that one of the ways they do this is by text, output to a monitor or printer.</p> <ul style="list-style-type: none"> <li>Ask the students if they can think of other ways that computers communicate with us.</li> </ul> <p>As computers communicate internally by binary digits (0 and 1) when they communicate with us they have to encode these into a form that we can easily read and understand – letters and numbers.</p> <p>Explain that humans have been using digital codes to communicate information at a distance for hundreds of years.</p> <p>Using a projector, play the <b>Starter Activity</b>, pausing it to discuss what is happening with the students.</p>	<p>Examples could include through sound or graphics.</p>			
15	Watch the set of videos.				
5	<p>Ask some questions about the video to assess learning. e.g.</p> <ul style="list-style-type: none"> <li>How many bits are used for the ASCII code?</li> <li>How many characters will this number of bits allow for?</li> <li>From what was the ASCII code developed?</li> <li>What is extended ASCII?</li> <li>Why was Unicode developed?</li> </ul>	<p>7 128</p> <p>The code used for teletypes and teleprinters.</p> <p>The use of the eighth bit to allow for more characters.</p> <p>So that more characters could be coded to allow all languages to be included.</p>			
5	<p><b>Activity 1</b></p> <p>Students use Activity 1 to consolidate learning from the video and discussions.</p>				
10	<p><b>Worksheet 1</b></p> <p>Students to complete Worksheet 1 either on paper or on computer.</p> <p>Ask individual students for their answers and discuss with the class so that all students will have the correct answers entered on their worksheets.</p>	<p>Answers provided.</p>			



Time (min)	Activity	Further Notes
10	<b>Worksheet 2</b> Students to complete Worksheet 2 either on paper or on computer. Ask individual students for their answers and discuss with the class so that all students will have the correct answers entered on their worksheets.	Answers provided.
	<b>Extension Challenge/Homework</b> <ul style="list-style-type: none"><li>• The students should complete and submit Worksheet 2 if not already completed.</li><li>• Ask the students to investigate the programming language they are most familiar with to develop routines to:<ul style="list-style-type: none"><li>• Convert a binary to a decimal number.</li><li>• Use a decimal number to display an ASCII character.</li></ul></li></ul>	
5	<b>Plenary</b> Using a projector, display <b>Activity 2</b> . Enter different bytes and convert to decimal and the ASCII character. Stress that a binary number has been converted to a decimal one and that has been used to display the character.	



## WORKSHEET 1 ANSWERS

**1** Explain what is meant by a 'character set'.

A defined list of characters recognised by the computer hardware and software.  
Each character is represented by a number.

**2** (a) ASCII is an acronym. In the space below state what words the initial letters represent.

American  
Standard  
Code  
Information  
Interchange

(b) The first edition of the ASCII code was published in 1963 and it was based on an earlier code.

What was this earlier code used for?

Teletype and teleprinter machines.

(c) (i) How many bits are used for this code?

7 bits

(ii) How many characters can be encoded using this number of bits?

128

(d) Not all of the characters are printable. What are the others called and what are they used for?

Control codes or control characters.

Used for controlling external devices e.g. printers or for formatting how the text appears.

## WORKSHEET 1 ANSWERS

**3** Many manufactures extended the ASCII code by using the eighth bit.

(a) How many characters can be represented using 8 bits?

256

(b) Why did the use of extended ASCII codes cause problems for users?

There was no standard.

Different manufacturers used them to represent different characters e.g. accented letters in French.

**4** Write down the characters represented by the following bytes.

(i) 10110101

(ii) 00101011

(iii) 11001001

**5** Write down the 8 bit code for the following characters.

(a) M

b) d

c) s

**6** (a) Why was the UNICODE character set developed?

A universal standard character set that covers all writing systems.

There needed to be more characters to cover all the languages on earth.

(b) How many bits are used to code a character in this character set?

16

## WORKSHEET 2 ANSWERS

**1 (a) Explain how ASCII is used to represent text in a computer system. (3)**

Each character is given a numeric code, including symbols, digits, upper and lower case. This code is then stored in binary. Each character takes 1 byte. Text is stored as a series of bytes (1 per character). Some codes are reserved for control characters (e.g. TAB, Carriage Return).

**(b) State what is meant by the character set of a computer. (1)**

All the characters which are recognised/can be represented by the computer system.

**(c) Unicode is also used to represent text in a computer system.**

**Explain the difference between the character sets of Unicode and ASCII. (2)**

Unicode has a much larger character set and can represent many more characters/characters from all alphabets.

Because unicode uses 16 bits and ASCII uses fewer/7/8 bits.