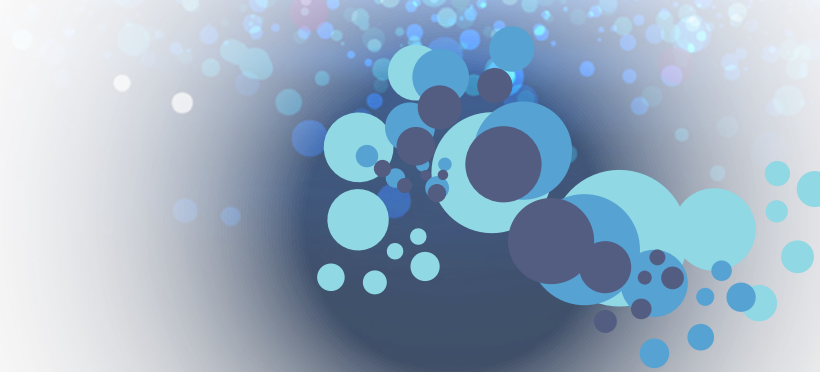


Binary data

Teacher's Notes

Lesson Plan

Length	60 mins	Specification Link	2.1.2d	Binary data
Learning objective		Understand the binary counting system		
Time (min)	Activity	Further Notes		
5	<p>Introduce the topic. Show students the link to the specification. Explain the purpose and objectives of the lesson.</p> <p>Example starter question</p> <p>Teacher to ask class 'What symbols represent how we count' [Wait a few seconds if no-one answers]</p> <p>Answer: the written numbers 0 through to 9. Computers count differently.</p>	<p>Why do we have 0-9 (a total of ten numbers). Because we have 5 fingers on each hand. We [humans] count in base10.</p>		
5	Watch the set of videos.	<p>The teacher should make their own judgement whether they wish to play it straight through or stop for discussion.</p>		
5	<p>Discuss number representation with the students.</p> <p>Activity: Students to write down what they think the term 'binary' means.</p> <p>We will come back to this in the plenary when they re-write their definition as a class.</p>	<p>At this stage pick out any key answers that are near or totally correct. If none, then remind the students that computers work with 0s and 1s.</p>		
5-10	Work through the interactive activity as a class.	<p>This will help students understand how binary counting differs from decimal counting, but also show the similarities.</p>		
25	<p>Worksheet 1</p> <p>Individual or pair activity.</p> <p>Students complete the worksheet on binary numbers, converting denary to binary using the 'place value help table' on the worksheet.</p>	<p>The time for this activity varies depending on the class. Allow less able students the time to continue working.</p>		
	<p>Submission of Worksheet 1</p> <p>There are several options for this:</p> <ol style="list-style-type: none"> 1. Pupils to submit their own worksheet electronically for marking and feedback, or store it for future use. 2. Each group selects a spokesperson who feeds back to the class a summary of the group's responses, or the answer to one of their questions. 3. The teacher selects individuals to feedback either an overall summary or the answer to one of their questions. 			



Time (min)	Activity	Further Notes
15	Worksheet 2 – Exam style questions Each pupil to answer their questions individually and to submit for marking. Add a timer: less time will also give the students the opportunity to work under pressure but in a no exam environment.	It is extremely beneficial for students to be able to gain an experience of exam style questions early on. It allows them to get used to the nature of the exam, and provides them with opportunities to perfect their exam technique as well as generating plenty of revision material.
5	Plenary Round robin or binary counting. Teacher to use 3 -4 denary (normal numbers); students to answer in binary. As a class, re-write the definition of binary. This could be then displayed in the classroom.	Use the exam board glossary as a reference.

A little binary message: [remember to start counting from the right.]

01110010011001010110110101100101011011010110001001100101011100100010000
00111010001101111001000000111001101110100011000010111001001110100001000
00011000110110111101110101011011100111010001101001011011100110011100100
00001100110011100100110111101101101001000000111010001101000011001010010
00000111001001101001011001110110100001110100001011100000110100001010

WORKSHEET 1 ANSWERS

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1

Write out the binary value for each of the numbers in the above table:

1=	0	0	0	0	0	0	0	1
2=	0	0	0	0	0	0	1	0
4=	0	0	0	0	0	1	0	0
8=	0	0	0	0	1	0	0	0
16=	0	0	0	1	0	0	0	0
32=	0	0	1	0	0	0	0	0
64=	0	1	0	0	0	0	0	0
128=	1	0	0	0	0	0	0	0

Remember in Computer Science we start at zero.

Using the place value help table above work out the following numbers:

64=	0	1	0	0	0	0	0	0
127=	0	1	1	1	1	1	1	1
57=	0	0	1	1	1	0	0	1
13=	0	0	0	0	1	1	0	1
5=	0	0	0	0	0	1	0	1
115=	0	1	1	1	0	0	1	1
48=	0	0	1	1	0	0	0	0
75=	0	1	0	0	1	0	1	1



WORKSHEET 2 ANSWERS

1

Convert the following decimal numbers into binary.

(a) 14

1110

(b) 127

1111111

(c) 249

11111001

(d) 73

1001001

(e) 257

10000001

2

Work out the following sums in binary. Check your answers by converting the numbers and the result into decimal.

(a) $11011 + 1101$

101000

(b) $11010101 + 00111110$

100010011

(c) $1111 + 1$

10000

(d) $111111 + 1$

1000000

(e) $10101010 + 01010101$

11111111