How do digital systems represent data?

The story of binary

Outcome

explain how digital systems represent all data using numbers AC9TDI6K03

explore how data can be represented by off and on states (zeros and ones in binary) AC9TDI6K04

I can explain how digital systems use numbers as a way to represent a variety of data types.

What data are stored on a computer?

What are data?

Data can be represented as text, images and sound.

To understand how computers represent these data, we need to understand how computers work.

1. What makes a computer a computer?
2. Binary and data
3. How big are data?

1. What makes a computer a computer?

Brainstorm: Think, puzzle, explore

*What do you **think** you know about a computer?*	*What questions or **puzzles** do you have about a computer?*	*How can you **explore** this topic and find out more about computers?*

1. What makes a computer a computer?

Scaffold: Video explaining the core elements of a computer: youtu.be/xfKn5OjHLqQ

- Input
- Storage
- Processing
- Output

What are some examples of computer output? *Investigate how the computer represents these data.*

2. Binary and data

Brainstorm: Think, puzzle, explore

*What do you **think** you know about binary and data?*	*What questions or **puzzles** do you have about how binary works?*	*How can you **explore** this topic and find out how computers store data?*

2. Binary and data

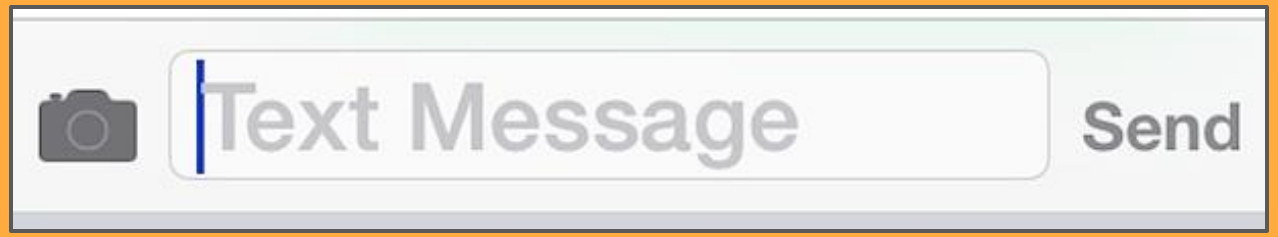
Scaffold: Video explaining how data are stored using binary:
youtu.be/ewokFOSxabs

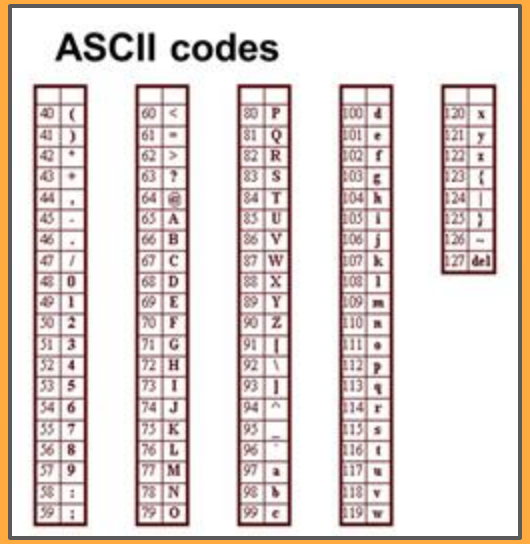
- Text
- Images
- Sound

Binary and data (text)

Task: Create a simple text message and send it to a friend in binary.

Sending text using binary





ASCII codes

40	(	60	<	80	P	100	d	120	x
41	)	61	=	81	Q	101	e	121	y
42	*	62	>	82	R	102	f	122	z
43	+	63	?	83	S	103	g	123	{
44	,	64	@	84	T	104	h	124	|
45	-	65	A	85	U	105	i	125	}
46	.	66	B	86	V	106	j	126	~
47	/	67	C	87	W	107	k	127	del
48	0	68	D	88	X	108	l		
49	1	69	E	89	Y	109	m		
50	2	70	F	90	Z	110	n		
51	3	71	G	91	[	111	o		
52	4	72	H	92	\	112	p		
53	5	73	I	93	]	113	q		
54	6	74	J	94	^	114	r		
55	7	75	K	95	_	115	s		
56	8	76	L	96	`	116	t		
57	9	77	M	97	a	117	u		
58	:	78	N	98	b	118	v		
59	;	79	O	99	c	119	w		

2. Binary and data (images)

Task:

studio.code.org/s/pixelation/stage/3/puzzle/1

Binary and data (images)

Questions: Students answer the following questions on the next slide.

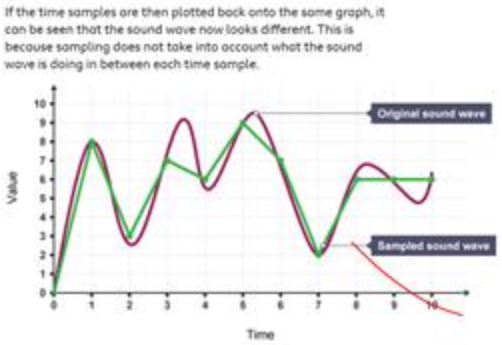
How are data linked to the quality of images?

Why does video content take longer to download than images?

What makes a good-quality image?

2. Binary and data (sound)

Resource:

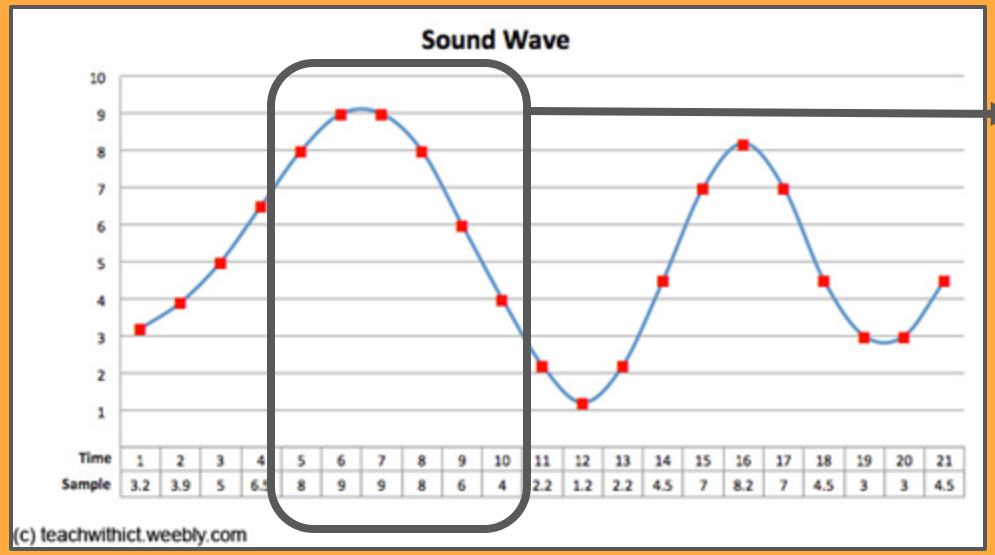


www.bbc.com/bitesize/guides/zpfdwmn/revision/3

Binary and data (sound)

Task: Students answer the following questions on the next slide.

Binary conversion of sound wave



Time	5	6	7	8	9	10
Sample						
Binary						

3. How big are data?

Tasks:

Infographic: Represent the different measurements of data.

Inquiry question: Do data have weight?

Years 5–6 assessment task: How do digital systems represent data?

Using the knowledge developed through these activities, you need to create a digital or analog portfolio and a video/oral presentation that illustrates your understanding of data and binary.

Complete the following:

- slide presentation or document of no more than five slides/pages
- aligned video/audio presentation of no more than two minutes
    - use desktop or tablet applications to support the presentation **or** use paper-based options and oral presentation methods

This task will be completed over five to six 50-minute lessons over five to six weeks.

Marking guide

Please refer to the draft assessment rubric.

Digital Technologies	**Above standard** ***Students*:**	**At standard** ***Students*:**	**Below standard** ***Students*:**
Digital systems	explain comprehensively the components of digital systems: hardware and software components (internal and external) that are used to process and transmit data	securely access and use multiple digital systems and describe their components and how they interact to process and transmit data.	state some facts about the hardware and software components (internal and or external) of a digital system
Data representation	explain comprehensively how digital systems use binary numbers as a basis for representing a variety of data types	process data and show how digital systems represent data.	state some facts about digital systems, numbers, binary and/or data representation

This document will guide the final rubric to ensure a task-specific criteria.