LESSON 19

How computers store data, bits and images

40 minutes | Strand 2: Let's get connected | Outcome 2.6 | Outcome 2.7

WHAT THIS LESSON DOES

In this lesson you will learn how computers store data using bits. You will encode a short message into binary, colour a pixel grid from bits, and decode bits back into text and drawings.

CURRICULUM OUTCOMES

Outcome	What the specification asks for
2.6	explain how computers represent data using 0s and 1s
2.7	investigate how drawings and photos are represented in computing devices

WHAT STUDENTS SHOULD BE ABLE TO DO

- Explain how computers represent numbers and text using 0s and 1s (LO 2.6)
- Investigate how drawings and photos are represented in a computer as pixels and bits (LO 2.7)

BEFORE THE BELL

- Copy the class code table from the second step onto the board before the class comes in, and leave it up for the whole lesson.
- Ensure paper, pens and colouring materials are available for all students.
- Print bit pattern sheets for the decoding activity if not displaying on the board.
- Scrap paper, pencils and a board or screen for the code table and grids
- Write the class code table on the board before or during this step
- Scrap paper and pencils; class code table visible on the board
- Board space for a quick 4 by 4 sketch beside the class code table

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HOW THE LESSON RUNS

4 min	introduction	Start
4 min	content	Bits, numbers and text
6 min	activity	Hands-on: encode a message
3 min	content	Pixels and pictures
7 min	content	Hands-on: colour and design a pixel grid
10 min	activity	Your turn: decode bits back
3 min	content	Make sense
2 min	content	Reflect
1 min	summary	What you covered

TEACHING MOVES

- Keep the class code table visible on the board throughout the lesson, because students refer back to it in every hands-on step.
- Teach bits and text first, let students encode a message, then introduce pixels before the grid tasks so concepts arrive one family at a time.
- Model one letter as the full chain on the board (letter → number → bits), for example H → 8 → 1000.
- Circulate the room to monitor bit grouping during hands-on activities.
- In the decode step, the work every pair must finish is the letter message plus the swap-and-check, so leave at least five minutes for the swap. The given grid decode and the HELLO message are for early finishers only.
- Name the swap as a test: mismatches are debugged by checking groups of four and row order.
- Use cold calling for the quick checks in the make sense section.

WHAT TO WATCH FOR

- Forgetting to split bit sequences into groups of four; remind students to group every four bits.
- Running bits together without spaces; instruct to leave gaps between groups of four.
- Misreading similar bit patterns; encourage checking against the code table.
- Own design bits not matching the coloured squares; catch this in the swap.

DIFFERENTIATION

- Support: Give students a printed copy of the class code table so they are not reading it from the board.
- Extension: Given grid decode (X pattern) and second decode message (HELLO) for early finishers; optional 8 by 8 grids in the design step.
- Support: Pair students for the encoding and decoding tasks.