Kit’s Code-Breaking Challenge: Mastering Binary

Learning objective: I can explain how computers use binary to store data and convert denary numbers into 8-bit binary code.

About 15 minutes. Grown-up tip: Use a light switch at home to explain that 'on' is 1 and 'off' is 0, just like a computer chip.

Computers use binary, a base-2 system consisting only of 0s and 1s. Each position represents a power of two. To find the binary for 13: 13 is 8 + 4 + 1. So, we place a 1 in the 8s, 4s, and 1s columns. Result: 00001101.

Worked Example: Convert 6 into binary.
1. 6 = 4 + 2.
2. Put 1s in the 4s and 2s columns.
3. Result: 00000110.

Draw: Draw a clear, 8-column horizontal table at the top of your page. Beneath each column, draw a small lightbulb icon. If the binary digit is 1, draw the lightbulb glowing. If the digit is 0, leave the lightbulb unlit. Style: Clean, technical, and educational.

Label words: Bit · Byte · Denary · Binary · Power of Two

Steps:

1. Draw an 8-bit grid above your diagram. Label the place values from right to left (starting at 1, then 2, 4, 8, 16, 32, 64, 128).
2. Using your grid, write the binary code for the denary number 9.
3. Convert the binary code 00010100 into a denary number. Show your working.
4. Explain why a computer uses only two digits (0 and 1) instead of our usual ten digits (0-9).
5. If a byte holds 8 bits, what is the largest number you can represent using all 1s (11111111)?



I did it! Name: _____ Date: _____

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