

Kit's Binary Code-Breaker Challenge

Learning objective: To understand how computers use binary (base-2) to represent information and to convert denary numbers into binary sequences.

Join Kit the fox in the digital den! Computers do not use our usual number system (denary). Instead, they use binary, which only has two digits: 0 and 1. Use the place value grid below to translate your chosen numbers into binary code. Remember, each 'bit' represents a power of two: 128, 64, 32, 16, 8, 4, 2, 1.

Word bank: Binary · Denary · Bit · Byte · Place value · Sequence · Power of two · Off · On · Algorithm

1. The Binary Concept: Explain why computers rely on a binary system rather than our standard denary (base-10) system. Think about how a circuit switch functions. (3 marks)

2. Place Value Breakdown: Choose a number between 1 and 255. Write it down and show how you would calculate its binary representation using the 128, 64, 32, 16, 8, 4, 2, 1 grid. (4 marks)

3. Comparing Systems: Compare and contrast the denary system with the binary system. What are the advantages and disadvantages of using only two digits? (3 marks)

4. Justification: If a computer uses a 4-bit system, what is the maximum number it can count to? Justify your answer using mathematical reasoning. (3 marks)

5. What might happen if a computer used a base-3 system (0, 1, and 2)? How might this change the way we store data? (3 marks)

6. Creative Coding: Write your age in binary. If you had to create a new way to represent your age using only symbols (not 0 or 1), what would they be and why? (2 marks)

Extension challenge: Design a 'Binary Message' for a friend. Choose a short word, convert each letter to its ASCII numerical value (e.g., A=65), and then convert those numbers into binary sequences. Provide a key so they can decrypt your secret code.