

Max's Mathematical Cube Challenge

Learning objective: To identify, calculate, and apply knowledge of cube numbers up to 10^3 in real-world contexts.

Read each question carefully. Show your working out clearly, as marks are awarded for your method as well as the final answer. You have 30 minutes to complete this assessment.

Max the monkey is organising his collection of wooden blocks. He loves to stack them into perfect cubes. He knows that a cube number is the result of multiplying an integer by itself, and then by itself again. For example, 2 cubed (written as 2^3) is $2 \times 2 \times 2$, which equals 8.

Word bank: Cube number · Product · Dimensions · Volume · Calculate · Integer · Multiplication · Squared

1. Calculate the value of 4 cubed (4^3). Show your multiplication steps. (2 marks)

2. Identify which of these numbers is a cube number: 16, 27, 40, 64. Explain how you know. (2 marks)

3. Max has a box with a side length of 5cm. Calculate the volume of this cube in cm^3 . (Remember: Volume = length $\times$ width $\times$ height). (2 marks)

4. If a cube has a volume of 216cm^3 , what is the length of one of its sides? Show your reasoning. (3 marks)

5. Max buys small building blocks that cost £2 each. He wants to build a large cube with a side length of 3 blocks. How much will it cost him to buy enough blocks to build the entire cube? (4 marks)

6. Compare and contrast square numbers and cube numbers. Provide one example of a number that is both a square number and a cube number, and justify why it fits both categories. (4 marks)

7. Max says: 'If I double the side length of a cube, the volume also doubles.' Is Max correct? Justify your answer using a mathematical example. (3 marks)

8. Creative Writing: Imagine you are an architect designing a 'Cube City'. Write a short paragraph explaining why you would use cube-shaped buildings. Use your knowledge of volume and cube numbers to describe the size of your buildings. (5 marks)

Draw: Draw a visual representation of a 3^3 cube using smaller individual units to demonstrate how the total volume is calculated.



Extension challenge: Explain why the sequence of cube numbers grows much faster than the sequence of square numbers as the side length increases. What might happen if we tried to calculate 10^3 compared to 10^2 ? Total: /25