

Max's Magnificent Measurement Mission

Learning objective: To calculate the volume of cubes and cuboids by counting unit cubes and applying the formula: $\text{length} \times \text{width} \times \text{height}$.

Read the passage below about Max the monkey's library project. Use your knowledge of 3D shapes to solve the mathematical challenges. Show your working out clearly.

Max the monkey is organising the school library. He has collected several wooden crates to store books, each made from smaller, 1cm x 1cm x 1cm wooden cubes. Max needs to calculate the volume of these crates to ensure all the books will fit. He knows that volume is the amount of space a 3D object occupies. By measuring the length, width, and height of a crate, Max can calculate the total volume in cubic centimetres (cm³). For example, a crate that is 4cm long, 3cm wide, and 2cm high has a volume of 24cm³ ($4 \times 3 \times 2 = 24$). Help Max organise his library by solving the following puzzles.

Word bank: Volume · Cuboid · Cubic centimetres · Dimensions · Capacity · Formula

1. Max has a small wooden box with a length of 5cm, a width of 2cm, and a height of 3cm. Calculate the total volume of this box in cm³. Show your calculation. (2 marks)

2. A larger crate has a volume of 60cm³. If the length is 5cm and the width is 4cm, what must the height of the crate be? Explain the method you used to find the answer. (3 marks)

3. Compare and contrast a cube with a side length of 3cm and a cuboid with dimensions 4cm x 3cm x 2cm. Which shape has the greater volume? Justify your answer. (3 marks)

4. Max finds a crate that is 10cm long, 10cm wide, and 10cm high. If he fills it with cubes that cost 5p each, what would the total cost be to fill the entire volume of the crate? (3 marks)

5. What might happen if Max tries to fit a book with a volume of 50cm³ into a crate that has a total volume of 45cm³? Explain why this is impossible. (2 marks)

Draw: Draw a cuboid on isometric paper that has a volume of 12cm^3 . Label the length, width, and height of your shape clearly.



Extension challenge: Imagine you are designing a storage unit for the school. If you have a total volume of 200cm^3 available, create two different cuboid designs (using different dimensions) that fit this volume. Write a short paragraph justifying which design would be more practical for storing long, thin poetry books versus wide, flat picture books.