Engineering Marvels: Designing Stable Structures

Learning objective: To evaluate the structural integrity of a design and justify material choices based on physical properties.

Use this writing frame to document your design process. Consider how Max the monkey would use maths to ensure stability, and how Kit the fox would use clever solutions to solve structural weaknesses.

In order to construct a tower that remains stable under pressure, one must carefully consider the properties of the materials used.

Word bank: structural integrity · tensile strength · compression · reinforcement · consequently · furthermore · in contrast · stability · symmetrical · load-bearing

1. Design Intent: Describe the intended purpose of your structure and explain why you have chosen this specific shape. What might happen if the base were narrower? (3 marks)

2. Material Analysis: Justify your choice of materials by comparing their physical properties. Why is one material more suitable for the primary frame than the others? (3 marks)

3. Structural Reinforcement: Explain how you have incorporated techniques such as triangulation or cross-bracing to prevent structural failure. (3 marks)

4. Budgetary Constraints: If your materials cost £2.50 per unit and you have a budget of £20.00, calculate how many units you can afford and explain the impact this has on your final design. (3 marks)

5. Critical Evaluation: Compare and contrast your design with a standard tripod structure. What are the advantages and disadvantages of your approach? (3 marks)

6. Future Refinements: If you were to build this structure on a larger scale, what modifications would be necessary to maintain its structural integrity? (3 marks)

Extension challenge: Design a 'stress test' experiment for your structure. Write a short paragraph detailing the exact method you would use to measure the load-bearing capacity, ensuring you account for variables like wind resistance or base weight.