

Max's Structural Engineering Challenge: Design and Evaluate

Learning objective: To understand, explore, and evaluate how to strengthen structures using materials and shapes to improve stability and rigidity.

Max the monkey is obsessed with building the perfect treehouse! Use this design template to plan your own stable structure. Consider how you will use reinforcement, such as triangles or cross-bracing, to ensure your model can withstand external forces. Fill in each section carefully, justifying your design choices based on structural integrity.

Word bank: stability · reinforcement · tensile strength · compression · cross-bracing · struts · rigid · load-bearing · geometric · foundation

1. Design Brief: Describe the purpose of your structure and identify the specific load it will need to support. Why is this purpose important? (3 marks)

2. Material Selection: List the materials you will use and justify why each one is suitable for a stable structure. Consider their properties. (4 marks)

3. Structural Reinforcement: Explain how you will incorporate shapes like triangles or techniques like cross-bracing to prevent your structure from collapsing. (4 marks)

4. Force Analysis: If a heavy weight were placed on top of your structure, which parts would be under compression? Explain your reasoning. (3 marks)

5. Compare and Contrast: Compare the structural stability of a square frame versus a triangular frame. Which is more rigid and why? (4 marks)

6. Evaluation: If you were to build this on a larger scale, what might happen if the base was not properly anchored? Justify your answer. (3 marks)

Extension challenge: Design a 'stress test' experiment for your structure. Write a short paragraph explaining how you would measure its success using a budget of £10 for testing equipment (e.g., weights, tape, or timers). Justify why your chosen method provides accurate data.