

Max's Mechanical Masterpieces: Designing with Levers and Linkages

Learning objective: To understand how mechanisms such as levers and linkages can be used to create movement, and to apply this knowledge to solve a design problem.

Max the monkey has been observing how simple machines work in his jungle laboratory. Look at the mechanical design problems below. Using your knowledge of pivots, fulcrums, and linkages, describe how you would design a moving model to solve each task. For each question, explain your reasoning and describe the specific components you would use.

Word bank: pivot · fulcrum · linkage · force · lever · mechanism · rigid · input · output

1. Max wants to design a 'Monkey Wave' toy where a cardboard arm moves up and down when a lever at the back is pushed. Explain why the placement of the fulcrum is critical to ensuring the arm moves smoothly. (2 marks)

2. Imagine you are creating a pair of 'Mechanical Scissors'. If you increase the length of the handle (the effort arm), how does this affect the force needed to cut through thin card? Justify your answer. (2 marks)

3. Max has two separate cardboard shapes. He wants them to move in opposite directions simultaneously when one is pulled. Describe the linkage system you would use to achieve this. (2 marks)

4. Compare and contrast a fixed pivot with a sliding pivot. In what scenario might a designer choose a sliding pivot over a fixed one? (2 marks)

5. If a mechanism fails to move, what are the three most likely design flaws you should investigate? Explain your reasoning. (2 marks)

6. Justify why using a split pin (paper fastener) acts as a more effective pivot than using a piece of sticky tape for a moving linkage. (2 marks)

Draw: Sketch a labelled diagram of a simple lever mechanism that could open a cardboard 'treasure chest' lid. Clearly label the input force, the fulcrum, and the output movement.



Extension challenge: Design a 'Moving Jungle Scene' using at least two different types of linkages. Create a budget list for your project, assuming card costs £0.15 per sheet, split pins cost £0.05 each, and decorative materials cost £1.50 in total. If you have a budget of £5.00, how many 'moving parts' can you afford to include? Show your working.