Mastering Mechanisms: Gears, Cams, and Levers

Learning objective: To understand how different mechanical systems transmit and transform motion to create movement in functional products.

Read each question carefully and apply your knowledge of mechanical systems. Think about how components like pivots, followers, and gear ratios affect the output of a design.

N/A

Word bank: Mechanism · Pivot · Cam · Follower · Gear Ratio · Oscillating · Rotary · Linear · Fulcrum

1. Max the monkey is building a rotating carousel. Explain why changing the size of the driving gear affects the speed of the output gear. Use the term 'gear ratio' in your explanation. (3 marks)

2. Compare and contrast a 'pear-shaped' cam and a 'circular' cam. What movement does each produce when rotating against a follower? (3 marks)

3. Kit the fox needs to design a lever to lift a heavy wooden block using a pivot. If the load is very heavy, where should Kit place the fulcrum in relation to the load to make the task easier? Justify your answer. (3 marks)

4. Identify one real-world object that uses a mechanism to turn rotary motion into linear motion. Describe how the mechanism works. (2 marks)

5. What might happen to the movement of a toy if the follower on a cam mechanism becomes worn down or detached? Explain the consequence for the mechanism's function. (2 marks)

6. Zara the zebra is designing a kinetic sculpture. She wants the figure to move up and down slowly, but rotate very quickly. Suggest a combination of mechanisms that could achieve this. (3 marks)

Draw: Draw a labelled diagram of a simple cam mechanism. Ensure you clearly label the 'cam', the 'follower', and the 'direction of rotation'.

Extension challenge: Design a 'Pop-Up' greeting card mechanism. Write a short paragraph explaining which type of lever or linkage system you would use to ensure the image stands up vertically when the card is opened at a 90-degree angle. Draw your schematic design on the back of your paper.