

Nova's Forces and Motion Challenge

Learning objective: To identify the effects of air resistance, water resistance, and friction as forces that act between moving surfaces, and recognise that some mechanisms, including levers, pulleys, and gears, allow a smaller force to have a greater effect.

Read each question carefully and use your knowledge of physics to provide scientific explanations. Show your working out where calculations are required.

Word bank: friction · air resistance · water resistance · gravity · gears · levers · surface area · streamlined · force

1. Nova the owl is watching a skydiver. Explain why the skydiver reaches a steady speed when falling through the air. Include the role of air resistance in your answer. (2 marks)

2. Max the monkey is trying to slide a heavy box across a wooden floor. He finds it very difficult. Suggest one way Max could reduce the friction between the box and the floor to make it easier to move. (1 mark)

3. Finn the dolphin is racing through the ocean. Why is Finn's body shape an advantage when moving through water compared to a square-shaped object? Refer to water resistance in your answer. (2 marks)

4. Kit the fox is building a pulley system to lift a heavy bag of books weighing 20kg. If he uses a system with four pulleys, how does this affect the amount of force he needs to apply compared to lifting the bag directly? Explain your reasoning. (2 marks)

5. If a bicycle has gears, explain how changing to a lower gear helps a cyclist when they are riding up a steep hill. (2 marks)

Draw: Draw a diagram of a simple lever (like a seesaw) and label the 'load', the 'effort', and the 'pivot'.



Extension challenge: Research and describe how the design of a racing car uses the concept of 'streamlining' to minimise air resistance, and explain how this helps the car reach higher speeds.