# Nova’s Forces and Friction Challenge

*Learning objective: To identify, compare, and explain the effects of forces including friction, air resistance, and contact forces on moving objects.*

Read each question carefully and use your scientific knowledge of forces to provide detailed explanations. Remember to use technical vocabulary where appropriate.

Nova the owl is observing objects moving across different surfaces in the forest. She notes that a smooth, icy pond allows a pebble to slide much further than a patch of rough, mossy bark. Meanwhile, Max the monkey is experimenting with paper aeroplanes to see how air interacts with his designs.

*Word bank: friction · surface · resistance · gravity · contact · force · motion · acceleration*

**1. Nova pushes a wooden block across a smooth wooden floor and then across a piece of sandpaper. Explain why the block travels a shorter distance on the sandpaper. (2 marks)**

**2. Max drops a flat sheet of paper and a crumpled ball of paper from the same height. Compare their descent and justify why air resistance affects the flat sheet more. (3 marks)**

**3. Identify the type of force that acts between the tyres of a bicycle and the road surface to allow the cyclist to stop when they apply the brakes. (1 mark)**

**4. What might happen to the motion of a ball if it were rolled across a surface with zero friction? Explain your reasoning. (2 marks)**

**5. Define a 'contact force' and provide one example from your daily life that Nova would observe in the forest. (2 marks)**

**Draw: Draw a diagram of a toy car moving down a ramp. Use arrows to label the direction of movement, the force of gravity, and the force of friction acting against the car.**

*Extension challenge: Nova wants to design the ultimate 'friction-free' sled for the winter. Write a short paragraph explaining which materials you would choose for the base of the sled and the path it travels on. Justify your choices by referring to the texture and surface properties of your chosen materials.*