# Forces and Motion: The Nova and Kit Challenge

*Learning objective: To identify, explain, and investigate the effects of air resistance, water resistance, and friction as forces that act between moving surfaces.*

Join Nova the owl and Kit the fox as they explore the physics of the world. Read each question carefully and use your scientific knowledge of forces to select the best answer or provide a clear explanation.

Answer Key: 1.C, 2.True, 3.Friction, 4.B, 5.False, 6.Air Resistance, 7.A, 8.True, 9.Gravity, 10.B. Explanation for higher-order questions: Friction is a force that opposes motion between surfaces; increasing surface area generally increases drag. Gravity acts vertically downwards on all objects near Earth's surface.

*Word bank: Gravity · Friction · Air Resistance · Water Resistance · Surface Area · Newton · Mechanism · Buoyancy*

**1. Nova drops a feather and a pebble from the same height. Why does the pebble land first? A) It is heavier, B) The feather has more air resistance, C) The pebble has more gravity, D) The pebble is magnetic. (1 mark)**

**2. True or False: Friction is a force that can slow down moving objects. (1 mark)**

**3. What is the name of the force that acts between two surfaces sliding against each other? (1 mark)**

**4. Kit designs a boat. To make it move faster through water, what should he reduce? A) Weight, B) Water resistance, C) Buoyancy, D) Gravity. (1 mark)**

**5. True or False: A parachute works by decreasing the air resistance acting on the skydiver. (1 mark)**

**6. Which force acts upwards against an object falling through the atmosphere? (1 mark)**

**7. If you push a toy car across a carpet, why does it stop? A) Friction, B) Air resistance, C) Gravity, D) Magnetism. (1 mark)**

**8. True or False: A streamline shape helps to reduce drag in both water and air. (1 mark)**

**9. What force pulls everything towards the centre of the Earth? (1 mark)**

**10. Kit applies oil to a squeaky door hinge. What force is he trying to reduce? A) Gravity, B) Friction, C) Upthrust, D) Air resistance. (1 mark)**

**Draw: Draw a diagram of a bird flying, using labelled arrows to show the direction of gravity, lift, and air resistance acting upon it.**

*Extension challenge: 1. Explain why a crumpled piece of paper falls faster than a flat sheet of paper. 2. Compare and contrast water resistance and air resistance. 3. Justify why racing cars are designed to be as low to the ground as possible. 4. What might happen if friction suddenly disappeared from the world? 5. Design an experiment to test which surface creates the most friction for a rolling marble. 6. How would the movement of a space probe change once it leaves the Earth's atmosphere? Explain your reasoning.*