

# Nova's Night-Sky Physics Challenge: Investigating Forces

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

Nova the owl is preparing her stargazing equipment. Help her by sorting the scenarios below into two categories: 'Contact Forces' (where objects must touch) and 'Non-Contact Forces' (where objects act at a distance). Then, answer the deeper thinking questions to demonstrate your understanding of how these forces interact with everyday items.

*Word bank: Friction · Air resistance · Magnetism · Gravity · Surface area · Contact force · Non-contact force*

**1. Nova pushes her heavy telescope across the wooden floor. Which force opposes the motion of the telescope, and how does the type of floor surface change this force? Explain your reasoning. (2 marks)**

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**2. A magnet holds Nova's star charts against the metal wall of her observatory. Is this a contact or non-contact force? Justify your answer. (2 marks)**

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**3. Compare and contrast the way gravity acts on a falling feather versus a falling rock. Why do they move differently? (2 marks)**

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**4. What might happen if there were absolutely no friction when Nova tried to walk to her telescope? Justify your answer using your knowledge of movement. (2 marks)**

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**5. If Nova drops a flat piece of paper and a crumpled ball of the same paper from the same height, the ball hits the ground first. Explain why air resistance causes this difference. (2 marks)**

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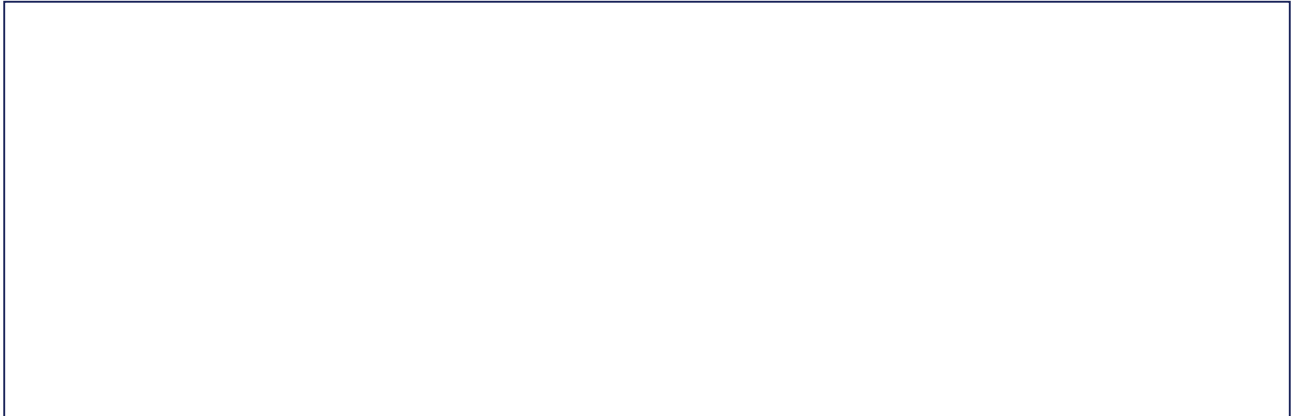
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**6. Design an experiment to test which surface creates the most friction: carpet, tile, or sandpaper. How would you ensure your test is fair? (2 marks)**

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**Draw:** Draw a diagram of Nova's telescope. Use arrows to label the forces acting upon it, such as the push from Nova's wing, the friction between the tripod and the floor, and the downward pull of gravity.



*Extension challenge: Nova wants to build a faster 'star-map delivery' paper aeroplane. Write a short explanation of how you could modify the design of the plane to reduce air resistance and increase its speed. Use scientific vocabulary such as 'aerodynamic', 'drag', and 'surface area' in your explanation.*