

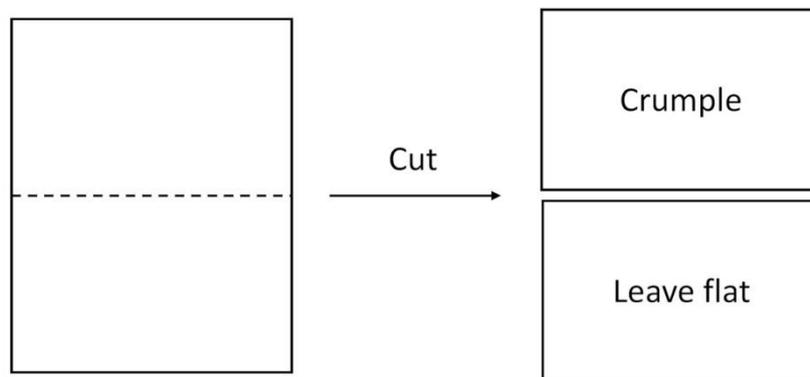
Falling with style: air resistance versus gravity

This activity is an introduction to air resistance and the forces that act on falling objects.

Equipment

- A sheet of A4 paper
- Scissors
- Some paper clips, about 6 should do but if they are very small you may need more

Experiment 1: slow the fall



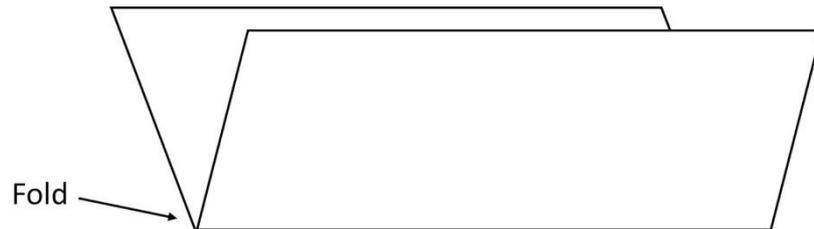
1. Fold your sheet of paper in half with the short edges together and then cut along the crease so that you end up with two pieces of paper the same size. Crumple one of the two halves into a ball.
2. Let go of the two halves at the same time and watch them fall. Do this several times. Make sure you drop them from the same height to make it a fair test!

What happens? Do both pieces of paper fall at the same speed? If not, which one falls faster?

Both pieces of paper weigh the same so what is happening to make them fall at different speeds?

If you want to investigate further: does it make any difference how you hold the flat piece of paper when you drop it? Try dropping it flat or from different edges. What happens?

Experiment 2: steady the fall

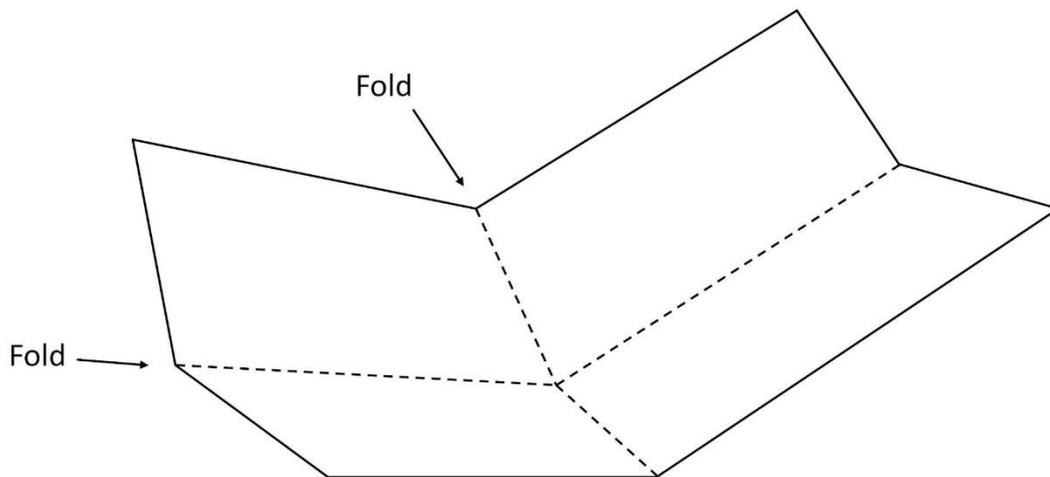


1. Taking the flat piece of paper from experiment 1, fold it in half by putting the long edges together. Open it out so it forms a long V shape.
2. Holding the paper by the long edges, so the V is pointing down, drop your paper and observe how it falls. Do this several times, holding the paper in the same way and dropping it from the same height so that it is a fair test.
3. Make a note of where the paper lands each time and how it falls.

What happens? Can you find a pattern in how the paper falls?

Can you think why a V shape falls differently to a flat piece of paper? What would happen as the V shape starts to tip to one side?

Experiment 3: steady the fall part 2



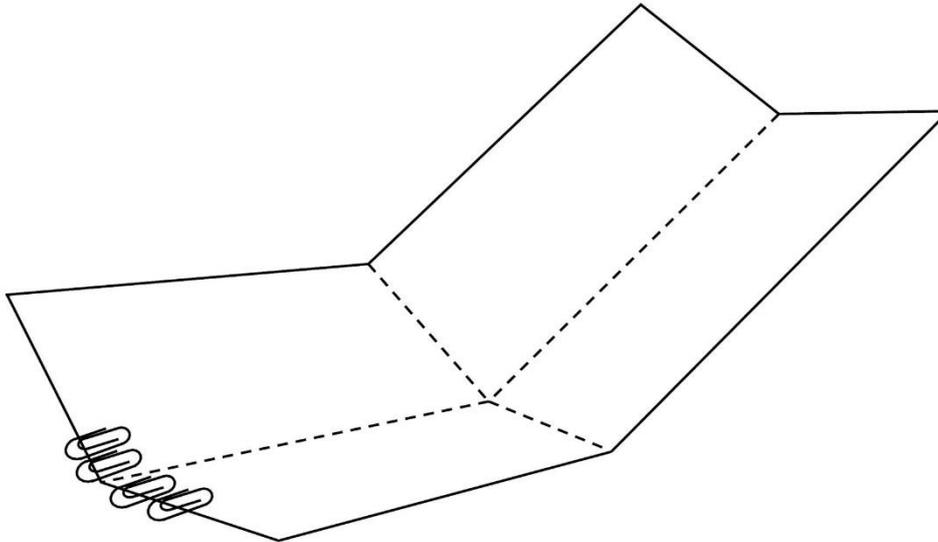
1. Using the same piece of paper from experiment 2, open it out and then fold it in half the other direction by putting the short ends together. Open it out again.
2. You should now have ended up with the paper divided into four quarters by the crease. Holding the paper, gently adjust the folds so that the paper is bent up evenly in both directions. You should be able to spin it on its central point on the table once you have done this.
3. Holding the sheet flat with the centre pointing down, drop your paper and watch it fall. Do this several times and make a note of how and where it falls.

What happens? How does this compare to experiment 2?

Why do you think adding an extra fold makes it fall differently? What do you think is happening as it falls?

For extra fun, try dropping the paper with the centre point upwards. What happens and why?

Experiment 4: directing the fall



1. Using the paper from experiment 3 chose one short edge to be the front - it doesn't matter which end. Add paper clips on the front edge of the paper, about 4-6 should work depending on their size. Position the paper clips evenly either side of the fold and as close to the central fold as possible.
2. With the front pointing forward, let go of the paper and watch the fall. Make a note of the landing point; do this several times.

What happens? How does this compare to experiment 3?

Why do you think adding weight to one edge makes it fall differently? What do you think is happening as it falls?

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Optimisation



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