



How do rainbows form?

KS2 KS3 Ages 7-14 ⌚ 3 min read

A rainbow happens when sunlight enters water droplets in the air, bounces inside them, and exits — but at a slightly different angle for each colour of light. The result: white sunlight is sorted into its component colours, and you see them spread across the sky in a perfect arc.

Why does water split light into colours?

When light travels from air into water (or any denser medium), it slows down and bends — this is called **refraction**. Crucially, different colours of light bend by slightly different amounts: violet bends most, red bends least. White light entering a water droplet therefore immediately begins to separate — each colour taking a slightly different path through the droplet. The light bounces off the inside back wall of the droplet (reflection) and exits — refracting again as it leaves. By the time it exits, the colours are clearly separated.

Imagine sending a team of runners into a funnel. They all go in together, but the funnel affects each runner slightly differently — some are redirected more sharply, some less. When they emerge from the other end, they're no longer in a tight group — they've spread out, with the most-redirected at one end and the least-redirected at the other. That's what a raindrop does to light: the different colours enter together and emerge separated. When millions of droplets do this simultaneously, you see a band of colour across the sky.

Why is it arc-shaped?

A rainbow is always a circle (or arc) centred on the point directly opposite the Sun from your perspective — called the antisolar point. Because of the geometry of reflection inside the droplet, red light exits at about 42° from your line of sight to the antisolar point; violet at about 40° . All the droplets at exactly 42° from the antisolar point send red light to your eye. All the droplets at 40° send violet. Since these angles form circles around the antisolar point, you see a circular arc of red on the outside and violet on the inside.

Why can't two people see the same rainbow?

They can't, strictly speaking. A rainbow isn't an object with a fixed location — it's formed by light from specific droplets reaching your specific eyes at the right angles. If you and a friend stand side by side, you're each seeing light from slightly different sets of droplets. You're both seeing "a rainbow," but it's technically a different rainbow. And if you walk towards it, it moves — always the same angular distance from the antisolar point, forever out of reach.