

READING CHALLENGE

How a Rainbow Happens

Rain, sun, and the secret colours hiding inside light

Level	A1 — Beginner
Age Group	Teens (11-16)
Topic	True Stories
Duration	~8 min read
Skill	Reading

It is raining. Then the sun comes out. You look up at the sky and you see it — a big, beautiful **rainbow**. Red, orange, yellow, green, blue, indigo, violet. Seven colours in the sky. It is like magic. But it is not magic. It is science. And the science is simple.

What Is a Rainbow?

A rainbow is a **curved** line of colours in the sky. It looks like half a circle. You see a rainbow when two things happen at the same time: there is **sunlight**, and there are **raindrops** in the air. The sun must be behind you. The rain must be in front of you. When you look at the rain with the sun behind you, you can see a rainbow.

Rainbows are not solid things. You cannot touch a rainbow. You cannot walk to it. It is just light. It is light doing something special inside millions of tiny raindrops.

The Secret Inside White Light

Sunlight looks white. But it is not really white. White light is made of many colours mixed together. These colours are red, orange, yellow, green, blue, indigo, and violet. Together, they make white. This group of colours is called the **spectrum**.

You cannot see the colours in normal sunlight. They are all mixed together. But when light goes through something like water or glass, the colours separate. They **split** apart. Each colour goes in a slightly different direction. This is how a rainbow is born.

What Happens Inside a Raindrop

Here is what happens, step by step. A **ray** of sunlight hits a raindrop. The light goes into the raindrop. When it goes in, it slows down. And when light slows down, it **bends**. This bending is called refraction.

Inside the raindrop, the light hits the back wall of the drop. It **reflects** — it bounces back, like a ball hitting a wall. Then the light travels back through the raindrop and goes out the other side. When it goes out, it bends again.

Here is the important part. Each colour bends a different amount. Red bends the least. Violet bends the most. So the colours spread out. They split into a fan of colours. One white ray of light goes in. Seven colours come out. This happens in millions of **droplets** at the same time. And that is what makes a rainbow.

The Seven Colours

A rainbow always has the same colours in the same order. From the outside to the inside, they are: red, orange, yellow, green, blue, indigo, and violet. Red is always on top. Violet is always at the bottom.

There is an easy way to remember the order. Many people use the name "Roy G. Biv." Each letter stands for a colour: R = Red, O = Orange, Y = Yellow, G = Green, B = Blue, I = Indigo, V = Violet. Say it a few times: Roy G. Biv. Now you will never forget the colours of the rainbow!

Are there really only seven colours? Actually, no. A rainbow has millions of colours. They blend into each other smoothly. But our eyes see seven main groups. The seven colours are just the ones that are most **visible** to us.

Why Is a Rainbow Curved?

A rainbow is always curved. Why? Because of the **angle**. The light that makes a rainbow always comes to your eyes at the same angle — about 42 degrees from the direction of the sunlight. Every raindrop that sends light to your eyes at this angle adds colour to the rainbow. All these drops together make a circle shape. You only see half the circle because the ground is in the way.

But if you are very high up — in a plane, for example — you can sometimes see a full circle rainbow! Pilots sometimes see this. It is very rare and very beautiful.

You Can Never Reach a Rainbow

Have you ever tried to walk towards a rainbow? If you did, you noticed something strange. The rainbow moves. When you walk forward, the rainbow moves forward too. You can never reach it. You can never stand at the end of a rainbow.

Why? Because a rainbow is not in one place. It depends on where you are standing. The rainbow you see is made by the raindrops between you and the sun. A person standing next to you sees a slightly different rainbow, made by different raindrops. Everyone sees their own rainbow. That is a beautiful thought.

This is also why the old story about a pot of gold at the end of a rainbow is just a story. There is no end. There is no pot of gold. But the rainbow itself is better than gold!

Double Rainbows

Sometimes you see two rainbows at the same time. This is called a double rainbow. The first rainbow is bright and clear. The second rainbow is above the first one. It is lighter and harder to see.

The second rainbow happens when light reflects twice inside the raindrop instead of once. Because it bounces twice, the colours come out in the opposite order. In the second rainbow, red is on the bottom and violet is on the top. Look carefully next time you see a double rainbow. The colours really are reversed!

The area between the two rainbows is often darker than the sky around it. This dark area has a name. It is called "Alexander's Band," after Alexander of Aphrodisias, a Greek philosopher who first wrote about it almost 2,000 years ago.

Rainbows Without Rain

You do not always need rain to see a rainbow. You just need sunlight and water drops. You can see small rainbows in a garden when someone uses a hose. You can see them near waterfalls. You can see them in the spray from the sea. You can even make a rainbow yourself. On a sunny day, stand with your back to the sun. Use a hose to spray water into the

air. Look at the spray. You will see a rainbow!

There are also rainbows at night. They are called "moonbows." Moonlight is just reflected sunlight, so it can make rainbows too. But moonbows are very faint. They usually look white to our eyes because the light is too weak for us to see the colours. They are very rare.

Why Rainbows Make Us Happy

People all over the world love rainbows. In many cultures, a rainbow is a sign of good luck or hope. After a storm, a rainbow **appears** and the world looks beautiful again. It says: the rain has stopped. The sun is back. Everything is okay.

Rainbows do not last long. After a few minutes, the rain stops or the sun moves. The rainbow begins to **fade**. The colours get lighter and lighter. Then it is gone. But that is what makes rainbows special. They are short. They are surprising. They are free. And every single time you see one, it feels like a gift from the sky.

Next time it rains, do not feel sad. Wait. Watch. The sun will come out soon. And when it does, turn your back to the sun, look at the sky, and look for the **moisture** in the air. A rainbow might be waiting for you. Seven colours. One sky. Pure magic — made by science.

Vocabulary

#	Word	Definition
1	rainbow	a curved line of colours in the sky that you see when the sun shines through rain
2	sunlight	the light that comes from the sun
3	raindrop	one small drop of rain
4	bend	to change direction; to make something curved
5	split	to break or divide into smaller parts
6	reflect	when light bounces back from a surface, like a mirror
7	curved	not straight; having a round shape, like part of a circle
8	visible	something you can see with your eyes
9	ray	a thin line of light from the sun or a lamp
10	spectrum	the band of colours that white light splits into: red, orange, yellow, green, blue, indigo, violet
11	angle	the space between two lines that meet at a point
12	droplet	a very small drop of water
13	appear	to become visible; to start to be seen
14	fade	to slowly become less bright or less strong
15	moisture	very small drops of water in the air or on a surface

Comprehension Quiz

1. What two things do you need to see a rainbow?

- A) Wind and clouds
- B) Sunlight and raindrops
- C) Snow and ice
- D) Moonlight and stars

2. How many main colours are in a rainbow?

- A) 3 colours
- B) 5 colours
- C) 7 colours
- D) 10 colours

3. What happens when sunlight goes into a raindrop?

- A) The light disappears
- B) The light bends and splits into different colours
- C) The raindrop turns into ice
- D) The light becomes darker

4. Why can you never reach the end of a rainbow?

- A) Because it is too far away
- B) Because rainbows are hot and dangerous
- C) Because a rainbow moves when you move — it is not in a fixed place
- D) Because rainbows only last one second

5. What is special about a double rainbow?

- A) It has more colours than a normal rainbow
- B) The second rainbow has the colours in the opposite order
- C) It only happens at night
- D) The second rainbow is always brighter

Answer Key

Q	Answer	Question
1	B	What two things do you need to see a rainbow?
2	C	How many main colours are in a rainbow?
3	B	What happens when sunlight goes into a raindrop?
4	C	Why can you never reach the end of a rainbow?
5	B	What is special about a double rainbow?