

# Special Theory of Relativity (In Simple English)

## 1. What is a Black Hole?

A black hole is a region in space where gravity is so strong that nothing, not even light, can escape from it. The boundary around a black hole is called the event horizon. Once something crosses the event horizon, it cannot get out.

Black holes form when massive stars collapse under their own gravity after they run out of fuel.

## 2. Types of Black Holes

There are several types of black holes, depending on their mass and how they were formed:

- a) Stellar Black Holes: Formed when a massive star dies. They usually have a mass between 5 and 20 times that of our Sun.
- b) Supermassive Black Holes: Found at the centers of galaxies, including our own Milky Way. They have millions or even billions of times the mass of the Sun.
- c) Intermediate Black Holes: These have masses between stellar and supermassive black holes. They are harder to detect but believed to exist.
- d) Primordial Black Holes: Hypothetical black holes that might have formed soon after the Big Bang. They could have very small masses.

## 3. How Are Black Holes Formed?

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Black holes are formed when a very massive star reaches the end of its life. Here's how it happens:

- A star produces energy through nuclear fusion. This creates a balance between gravity pulling in and pressure pushing out.
- When the star runs out of fuel, it can no longer produce enough pressure.
- Gravity wins, and the star collapses into a very small, dense point called a singularity.
- This creates a black hole with an event horizon around it.

In other cases, black holes can also form through collisions of stars or neutron stars.

### **4. What is Hawking Radiation?**

Hawking radiation is a theory proposed by Stephen Hawking in 1974. He said that black holes are not completely black but can slowly lose mass and energy.

- This radiation comes from quantum effects near the event horizon.
- Particle-antiparticle pairs are constantly being created in empty space.
- Near a black hole, one of the particles can fall in while the other escapes, making it look like the black hole is losing mass.

Over a very long time, a black hole can evaporate completely through Hawking radiation.

### **5. Fun Facts and Summary**

Here are some interesting facts about black holes:

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- Time moves slower near a black hole. This is called gravitational time dilation.
- Black holes do not suck everything in. You have to be very close to be pulled in.
- If our Sun became a black hole (without changing its mass), Earth would still orbit it the same way.

### Summary:

- Black holes are created from collapsed stars.
- There are different types: stellar, intermediate, supermassive, and primordial.
- Hawking radiation could make black holes shrink and disappear over time.