How a Cloud Lets Go

By the rock. August 22, 2026. Grounded in National Weather Service definitions.

The short version

A cloud floats because its droplets are so small that the air wins: they sink slower than the gentlest rising air can lift them. Rain happens when droplets start colliding and merging, growing into drops heavy enough to fall out, and it takes roughly a million cloud droplets' worth of water to build one ordinary raindrop. Drop size is the whole difference between drizzle and a downpour, and drop size is set by how long the cloud can keep a drop up there growing.

The part the cloud lesson left hanging

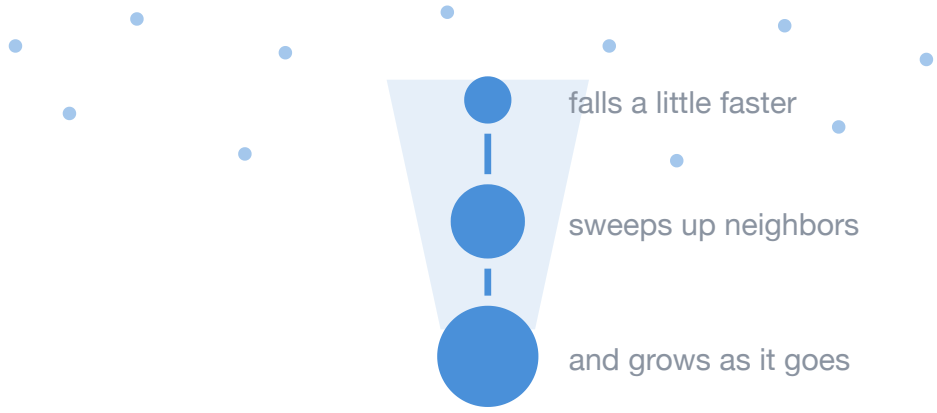
The how a cloud forms lesson builds the cloud: rising air, cooling, water turning to droplets. Fine. But that leaves a question hanging directly over your head. A cloud is water, water is heavy, and heavy things fall. So why does a cloud get to float around all afternoon, and what finally makes it let go?

The floating trick

A single cloud droplet is about two hundredths of a millimeter across. You could line up fifty of them across one millimeter, the smallest tick on a ruler. Something that small barely falls at all: the air drags on it so hard, compared to its tiny weight, that it drifts down slower than a feather in a sealed room. And the air inside a cloud is not still. It is rising, which is how the cloud got built in the first place, and even a gentle updraft outruns a droplet's lazy sink. The cloud is not weightless. It is just made of pieces too small to lose the argument with the air.

The merger

The argument turns when the droplets stop being loners. Droplets come in slightly different sizes, and the bigger ones sink a little faster than the smaller ones. So a big droplet drifting down overtakes small ones, bumps them, and swallows them. Every meal makes it bigger. Bigger means it falls faster. Falling faster means it sweeps up more droplets per second. It is a snowball rolling downhill, except made of water and falling through a cloud, and once it starts it runs away with itself.



Collision and merger, top to bottom. Each capture speeds the drop up, and speeding up raises the capture rate. The cloud never stood a chance.

Now for the arithmetic, which is more fun than it sounds. An ordinary raindrop is about two millimeters across: a hundred times wider than a cloud droplet. But water fills all three directions, so a drop a hundred times wider holds a hundred times a hundred times a hundred times the water. That is a million. Nobody counted the droplets one by one. The multiplication does it for you: one raindrop on your window is roughly a million cloud droplets that ran into each other.

Drizzle or downpour: size decides

Once drops are falling, their size writes the whole character of the rain.

Drizzle is the small end. The National Weather Service draws the line at drops smaller than 0.02 inch, half a millimeter: drops that left the merger early. They fall slowly, they land soft, and a drizzle can run all morning while barely filling a bottle cap. A downpour is the far end: fat drops a few millimeters wide that fall fast and hit hard enough to bounce.

What decides the size? Time in the growing machine. A thin, calm cloud lets its drops slip out the bottom while they are still small. A tall cloud with a strong updraft keeps shoving its drops back upstairs through droplet country, and every lap adds water, so what finally beats the updraft and falls is heavy artillery. Those updrafts are the thunderstorm recipe's department, which is why the fattest drops of your summer arrive with the loudest sky.

There is a ceiling on the whole business. A falling drop is not tear-shaped, whatever the cartoons say: small drops are round, and big drops get flattened by the air they are falling through until they look like a hamburger bun. Push much past a few millimeters and the air splits the drop in two, and each half starts over. That splitting is why rain arrives in drops instead of buckets, a policy the rock endorses from directly underneath.

The cold shortcut

One honest footnote: in tall clouds the top floors are far below freezing, and up there ice crystals grow fast, get heavy, and head down, melting on the way into ordinary raindrops. A lot of the rain that lands on you started as snow that lost the costume mid-trip. The committee-of-droplets story and the ice story both run in the same sky, sometimes in the same cloud.

The flour pan drop catcher

This experiment only works while rain is actually falling. Not maybe-rain, not radar-rain: rain you can hear. When it fires, the sky is handing you free samples, and you are going to take some.

First, the prediction, before the pan goes anywhere. Are raindrops all one size? Write down your answer: all the same, or mixed. And if you guessed mixed, guess again: mostly big with a few small, or mostly small with a few big?

Now fill a baking pan or pie plate with about an inch of flour and smooth the top. Hold it out in the rain: ten seconds or so in a hard rain, closer to a minute in a light one. You want scattered dots, not a swamp. Bring it in and let it sit a minute. Every drop that hit has rolled itself a little dough pellet, and the pellet keeps the drop's size for you, which is the entire trick: the rain just measured itself.

Pour the flour slowly through your fingers or a strainer, collect the pellets, and line them up smallest to biggest. Now check your prediction against the lineup. Then explain what you see: a mixed lineup means the cloud was releasing drops at different stages of the merger, some early leavers and some updraft veterans. And leave the guide with one standing assignment: run the pan once in a drizzle and once in a downpour, and compare lineups. The two pans should look like different weather, because they are.

A question for the grown-up to ask, no right answer attached: which pellet do you think had the longest life inside the cloud, and what do you suppose happened to it up there?

Check your understanding

1. A cloud is made of water, and water is heavy. Why does the cloud float?

- □ A. Clouds are lighter than air, like a balloon
- □ B. Its droplets are so small that air drag beats their weight, and rising air outruns their slow sink
- □ C. The wind holds clouds up

2. How does a cloud droplet become a raindrop?

- □ A. It swells up on its own like a sponge
- □ B. It collides with and swallows other droplets, roughly a million of them
- □ C. It freezes solid and drops

3. What is the real difference between drizzle and a downpour?

- □ A. The size of the drops
- □ B. The temperature of the rain
- □ C. The time of day

4. Why do thunderstorms drop the fattest rain?

- □ A. Lightning heats the drops and swells them
- □ B. Strong updrafts keep drops in the cloud longer, so they grow through more collisions before they fall
- □ C. Storm clouds hold saltier water

5. Why is there a biggest possible raindrop?

- □ A. Clouds run out of water
- □ B. Air flattens big drops and splits them in two around a few millimeters wide
- □ C. Gravity stops pulling on drops past a certain size

Answer key

1. A cloud is made of water, and water is heavy. Why does the cloud float?

B. Its droplets are so small that air drag beats their weight, and rising air outruns their slow sink — Each droplet sinks slower than the gentle updrafts inside the cloud rise. The cloud is heavy in total, but it is made of pieces too small to fall.

2. How does a cloud droplet become a raindrop?

B. It collides with and swallows other droplets, roughly a million of them — Slightly bigger droplets fall slightly faster, overtake their neighbors, and merge. Every capture speeds the process up, and about a million droplets' worth of water makes one ordinary raindrop.

3. What is the real difference between drizzle and a downpour?

A. The size of the drops — Drizzle is drops under half a millimeter that left the cloud early. A downpour is fat, fast drops that spent a long time growing. Same water, different careers.

4. Why do thunderstorms drop the fattest rain?

B. Strong updrafts keep drops in the cloud longer, so they grow through more collisions before they fall — A strong updraft shoves growing drops back upstairs lap after lap. Whatever finally falls out had to get heavy enough to beat that elevator.

5. Why is there a biggest possible raindrop?

B. Air flattens big drops and splits them in two around a few millimeters wide — Falling drops flatten into a bun shape, and past a few millimeters the air tears them apart. Each half starts over, so the rain stays drop-sized.

Questions people actually ask

Are raindrops really tear-shaped?

No. Small drops are round, held by the water's own skin. Big drops get flattened underneath by the air they fall through, ending up shaped like a hamburger bun, and past a few millimeters they split in two. The teardrop is an artist's invention.

Does rain start as snow?

A lot of it does. The upper floors of tall clouds sit below freezing, and ice crystals up there grow quickly, fall, and melt into raindrops on the way down. In warm shallow clouds, the collide-and-merge story does the whole job by itself.

Why does drizzle take so long to get you wet?

Drizzle drops are tiny, under half a millimeter, so each one carries almost no water and falls slowly. It is rain with the volume turned down: real, measurable, and in no hurry.

How much rain has to fall to officially count?

The measuring line is 0.01 inch in the gauge, which is the same threshold the chance-of-rain percentage is promising. A few stray drops that never darken the pavement do not count, however dramatic they felt.
