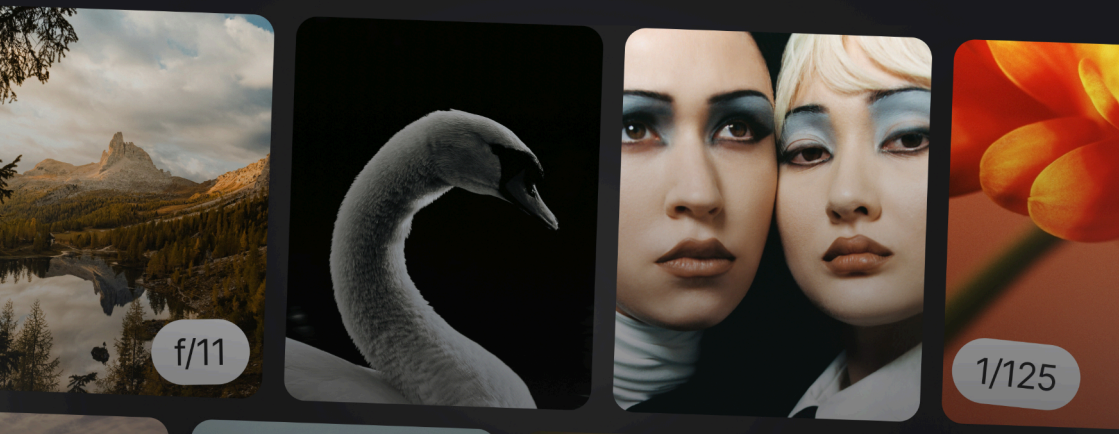
Camera Settings

Aperture, shutter speed & ISO



Visual Guide

CameraSetup

Digital Edition

Before we begin

Introduction

Photography is both an art form and a technical process. When you take a photo, you're working with both sides at once.

You see something worth capturing. Maybe it's the way light falls across a scene, a fleeting moment, or the mood of a place. You form an idea of what the photo should look like: what should be sharp, how bright it should be, whether motion should be frozen or blurred. That's the creative side.

But to actually create that photo, you need a camera. And your camera doesn't think creatively. It measures light, follows rules, and makes technical decisions based on what it detects. It's a precise tool, but it can't know what you're trying to express.

Visual concept: The two sides of photography.

Sometimes the result matches what you had in mind. Other times it doesn't. The image might be darker than you expected. A moving subject might appear blurred when you wanted it sharp. The background might stay distracting when you imagined it soft and out of focus.

When that happens, it's not because you did something wrong or because the camera failed. The camera made a technical decision that didn't align with what you were going for. Understanding how those technical decisions work, and how to control them, is what this guide is about.

What you'll learn

This guide is about gaining control over your camera's three main settings: aperture, shutter speed, and ISO. Throughout, we use visuals (images, diagrams, and reference sheets) to show you how they work.

We start with the fundamentals. You'll learn how a camera creates an image and how you can control that process through your settings.

From there, we go in depth on each setting individually. You'll see what each one does, the creative effects it gives you, and the trade-offs it introduces. We've included starting points to help you make quick decisions for when you're out in the field.

Once you understand how each setting works on its own, we bring everything together in the final section of the guide.

This is where you'll learn to balance the settings in manual mode. We'll walk through different creative priorities and show you how to adjust your settings based on what matters most in any given situation.

At the end, we help you put this knowledge into action. We'll introduce you to our biweekly photo assignments, which arrive every other Friday and give you ongoing practice. We'll also recommend specific past assignments for you to try as well.

How to follow along

Before we dive in, grab your camera if possible. This guide is designed for hands-on learning, so the best way to absorb what we're covering is to try it as you read.

If you can, set your camera to manual mode. This gives you full control over all three settings, making it easier to experiment and see exactly what each adjustment does. If manual mode isn't available or you're not ready for it yet, you can still follow along and learn the concepts. Just know that experimenting freely helps things click faster.

As we explain each setting, adjust it on your camera and watch what happens to your image preview. Try widening the aperture, then narrowing it. Speed up the shutter, then slow it down. Raise the ISO, then lower it. The visuals in the guide show you what to expect, but seeing it happen on your own screen makes it real.

Let's get started.

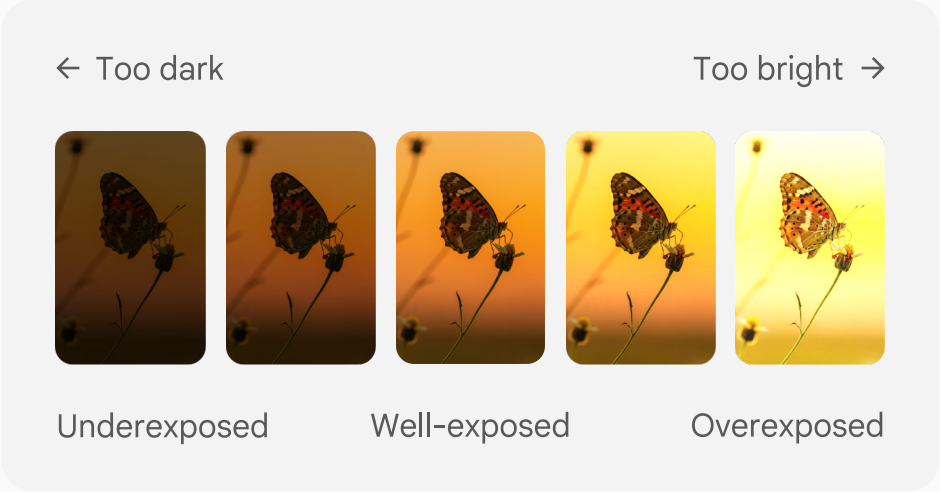
Table of contents

Fundamentals

Introduction

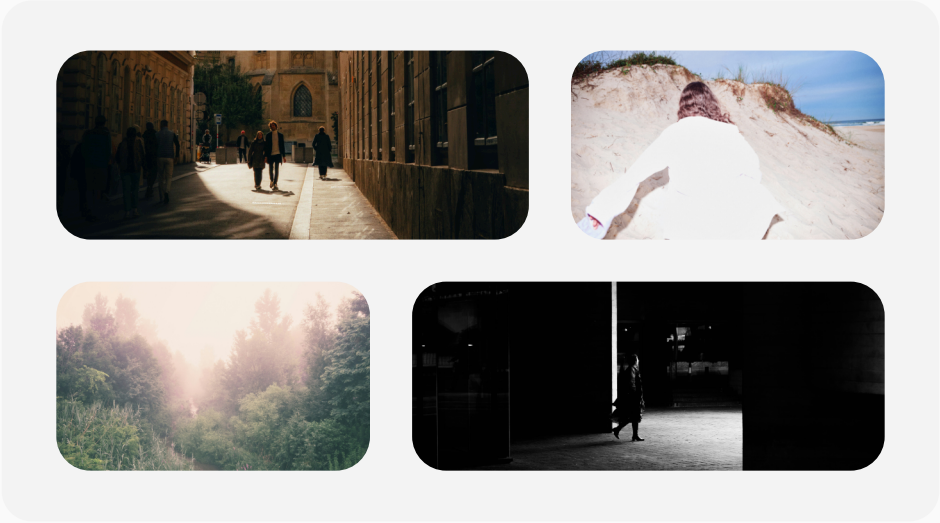
In photography, brightness is one of the first things we notice. Photos can appear across a wide range of tones: some very dark, others very bright, and many somewhere in between.

When a photo is very dark, details in the shadows may disappear entirely. When it's very bright, information in the highlights (the brightest areas) can be lost. Photos that fall between these extremes tend to retain detail across the entire frame. In technical terms, this balance is what's called a *well-exposed* photo.



Visual concept: Image appearance from darker to brighter, with a neutral middle.

Whether you're aiming for a well-exposed image or intentionally choosing something darker or brighter to match your vision, the underlying question is the same: how does your camera actually create these different levels of brightness? What's happening inside the camera that makes one image dark and another bright? Understanding this process is what gives you control over the final result.



Visual concept: Examples of intentional darker and brighter results, illustrating that there is not a single "correct" look.

To understand how a camera creates different levels of brightness, we need to look beyond the final image on your screen. Before we talk about settings and controls, let's start with the fundamental element that makes any photograph possible: light.

Light

Photography begins with light. The term *photography* itself comes from the Greek words phōs (light) and graphé (drawing). Quite literally, photography means "drawing with light". Every image you create, regardless of the subject, starts with this single element.

In any scene, light travels from a source (e.g. the sun, a lamp, a screen) and strikes the objects around it. When light hits an object, it reflects in different directions. Some of that reflected light travels toward your camera lens. This incoming light is the raw material your camera works with.

Not much light

The scene provides only a small amount of light for the camera to capture.

A lot of light

The scene provides a large amount of light for the camera to capture.

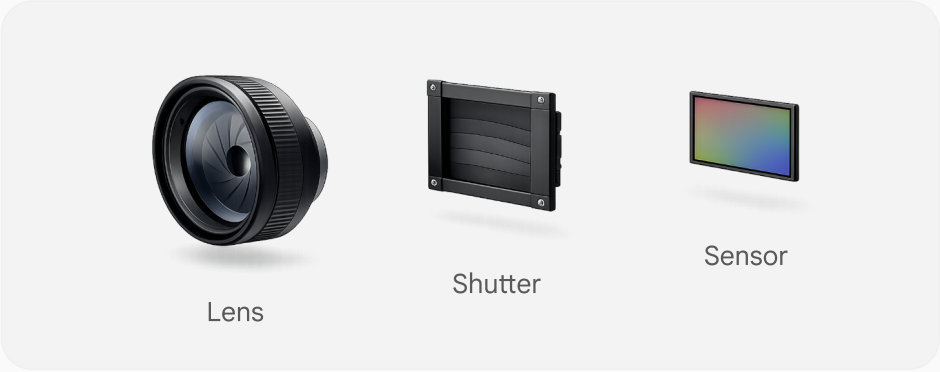
Visual concept: Scenes with different light intensity.

Here's something important to understand: the camera doesn't decide what the light is. It only receives it. You often can't

control the light source itself; the sun is going to do what it does, and streetlights are fixed in place. What you *can* control is how the camera handles the light it receives. What happens to that light once it enters the lens is what determines the final look of your photograph.

How the camera captures light

To understand how an image is made, we need to follow what happens to light once it enters the camera.



Visual concept: Light path through the camera.

When you press the shutter button, light from the scene passes through the lens. Inside the lens sits the aperture, which controls how much of that light is allowed through. Think of it like a window that can be widened or narrowed.

From there, the light continues through a curtain-like shutter mechanism. The longer the shutter stays open, the more light is allowed through to accumulate on the sensor.

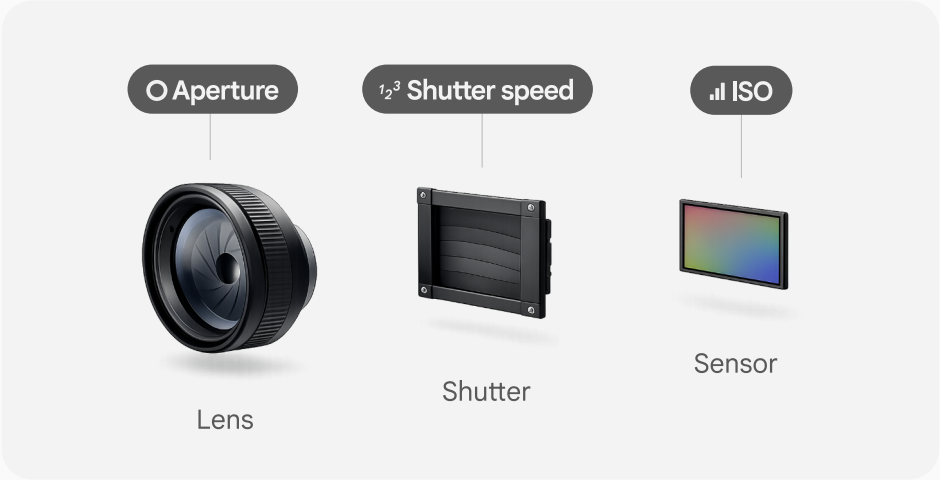
Finally, that light reaches the camera's sensor. The sensor is a digital surface that collects and records the light landing on it.

The amount of light available in the scene is the starting point. The aperture and shutter then shape how much of that light the sensor ultimately receives.

The settings

Now that you understand how light travels through the camera, we can talk about the controls you actually use to manage that process.

Your camera gives you three settings. Two of them control how light is captured, and one controls what happens to that light after it's been recorded.



Visual concept: Connecting the settings to the related camera parts.

Aperture controls the opening inside the lens. By widening or narrowing this opening, it determines how much light can pass through at any given moment.

Shutter speed controls the shutter mechanism inside the camera. It determines how long light is allowed to reach the sensor.

ISO works differently. It doesn't change the amount of light entering the camera. Instead, it amplifies the light that's already been captured, after it lands on the sensor. Think of it as turning up the volume on a recording that's already been made.

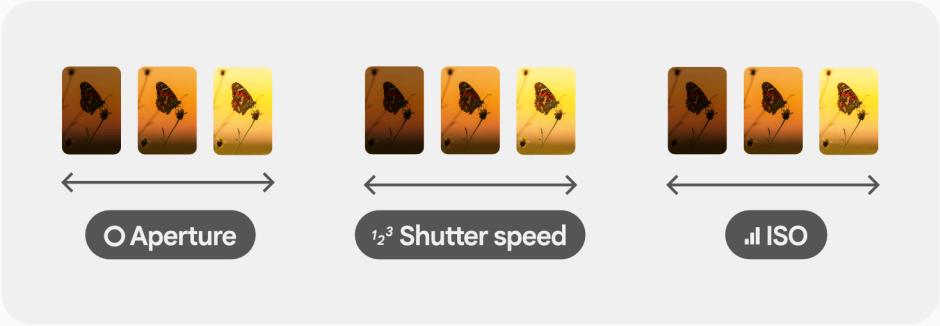
A note on exposure

Technically, the term *exposure* refers to the amount of light that reaches the sensor. This is controlled by aperture and shutter speed along the light path. ISO does not change that light.

In everyday photography, however, the term exposure is used more broadly. Exposure usually refers to how bright or dark the photo looks. An *overexposed* image is too bright, an *underexposed* one too dark, regardless of whether aperture, shutter, or ISO caused it.

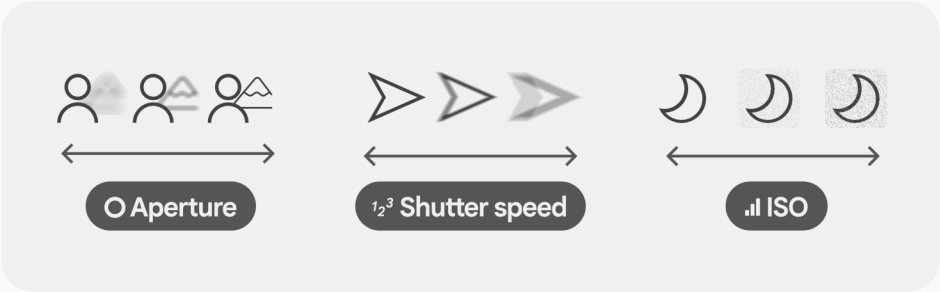
Because ISO affects the brightness of the image, just like aperture and shutter speed, all three are commonly used as exposure controls in photography.

When you adjust any of the three settings, the brightness of your image changes. Aperture and shutter speed change brightness by controlling the light itself. ISO changes brightness by amplifying what was already captured. The effect on the final image looks similar (it gets darker or brighter) but the way each setting achieves that result is fundamentally different.



Visual concept: Each setting changes how dark or bright an image looks

Aperture, shutter speed, and ISO do more than just control brightness. Each setting also affects the image in a distinct visual way. These effects are a direct result of how the light is captured and amplified.



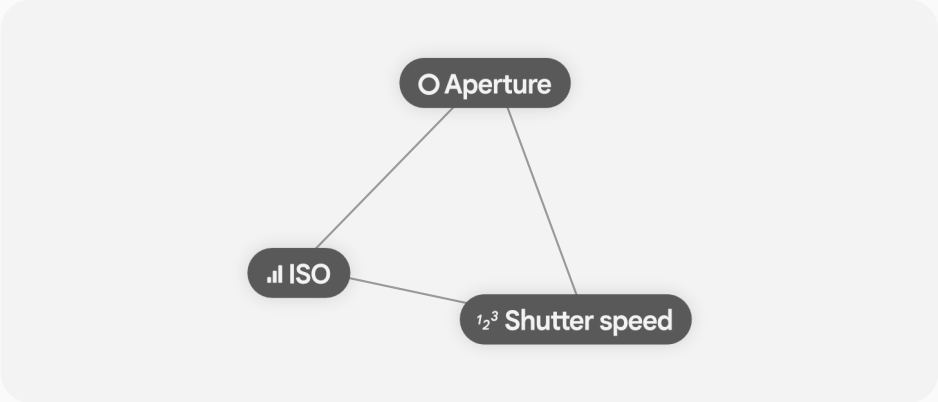
Visual concept: Each setting introduces a distinct visual effect.

Balance

We've now covered the fundamental mechanics of how a photograph is built. From the light in the scene, to how the camera captures it, to the three settings that control the final result.

How that light is captured can be shaped by decisions you make. How dark or bright should the image be? How much should be sharp? Should motion appear frozen or blurred? These are creative questions, answered through technical means: aperture, shutter speed, and ISO.

Because all three settings affect brightness, they're connected. Adjust one, and the others need to respond. Open the aperture to blur the background, and you're also letting in more light. You'll need to compensate by adjusting shutter speed or ISO to maintain your intended brightness.



Visual concept: Aperture, shutter speed, and ISO in balance.

This constant back-and-forth adjustment between settings in manual mode is what we call finding balance. Balance means all three settings are working together to give you both the brightness you want and the creative look you're after.

In the sections ahead, we'll examine each setting individually: what it controls, the visual effect it creates, and the trade-offs it introduces. After that, we'll bring them together to show you how to find that balance in practice.

Quick recap

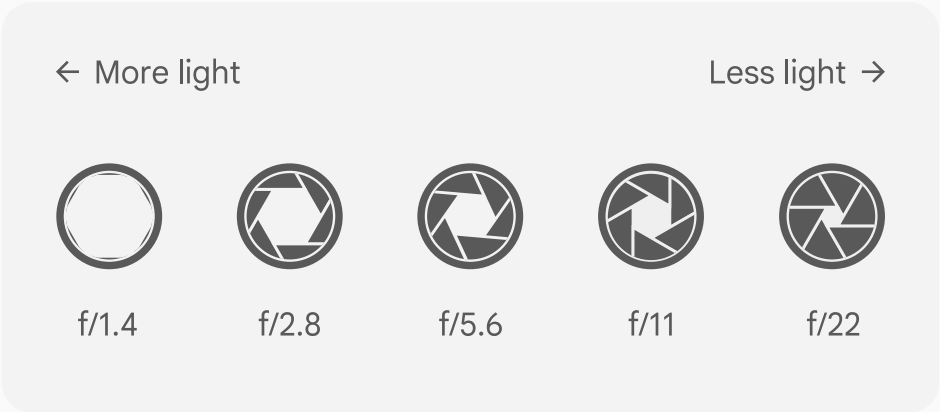
- **Light is the foundation** of every photograph.
- **Light travels from the scene** through the lens, through the shutter, and onto the sensor.
- **Your camera gives you three settings to control the final image:** aperture, shutter speed, and ISO.
- **Aperture and shutter speed** control how light is captured.
- **ISO** amplifies what the sensor has already recorded.
- **Each setting** affects brightness and creates a distinct visual effect.
- **Finding balance** means adjusting all three settings to match your creative vision.

Aperture

The opening inside the lens

A camera captures light through its lens. Inside that lens sits an adjustable opening that decides how much light can pass through at any given moment.

This opening is called the aperture. When you change the aperture, you're simply opening it wider or closing it down, letting more or less light into the camera.



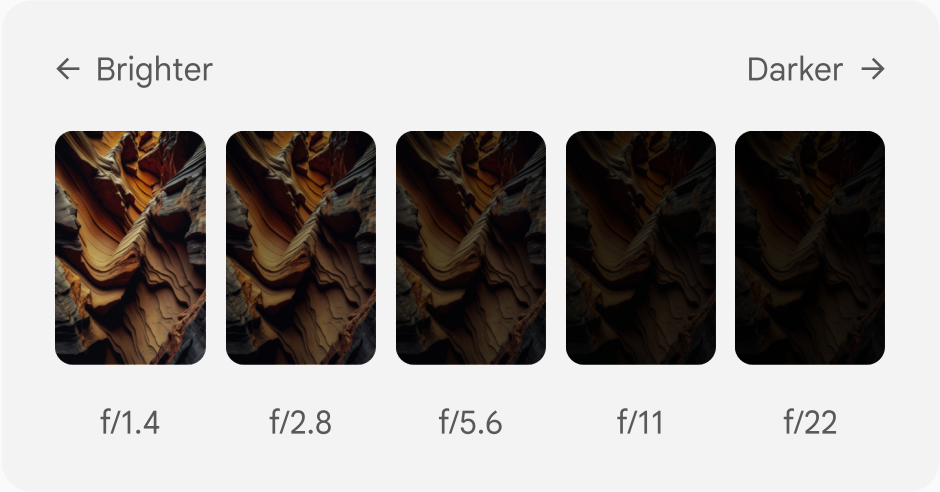
Visual concept: Aperture opening from wider to narrower.

The aperture values are called f-stops, and they represent the size of the opening. Low f-stops (e.g. f/1.4, f/2.8) mean larger openings, and higher f-stops (e.g. f/11, f/22) mean smaller openings.

Because aperture is a physical opening, the way it controls light produces two distinct effects on your image: (1) how bright or dark it appears, and (2) the depth of field.

Brightness

The brightness of a photo depends on how much light reaches the sensor. More light produces a brighter image, while less light results in a darker one.



Visual concept: Brightness spectrum from bright to dark.

When the aperture opening is wide, such as f/1.4 or f/2.8, a large amount of light passes through the lens, producing a brighter image.

When the opening is narrow, like f/11 or f/22, much less light passes through the lens, resulting in a darker image.

As you move from a wide to a narrow aperture, the image gradually becomes darker. But aperture doesn't only affect brightness. It also influences the depth of field, giving you a creative tool to guide the viewer's attention.

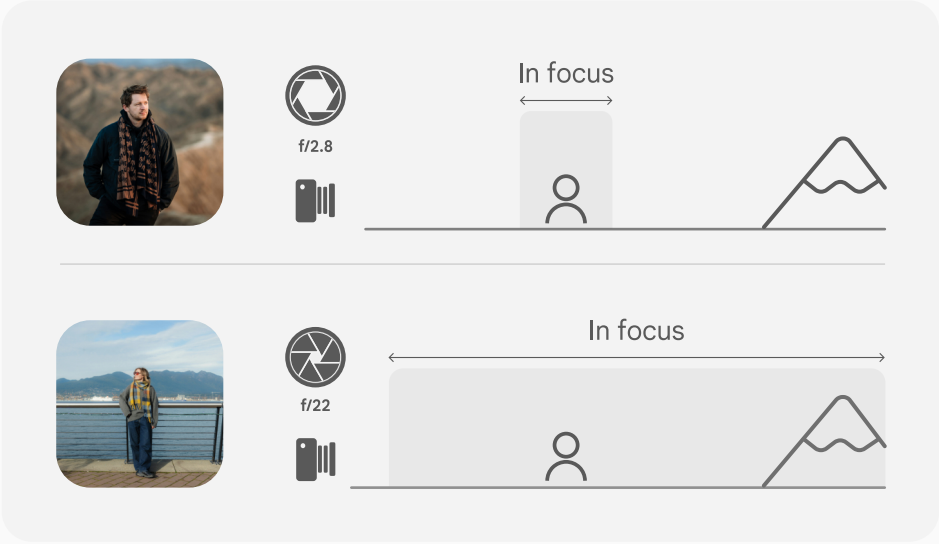
Visual concept: Introducing the look of a shallow depth of field.

Depth of field

When you use a camera, one of the first decisions you make is what you want to be sharp. You point at your subject, adjust the focus, and that subject becomes clear. This is where sharpness is anchored in your image.

But sharpness doesn't exist only at that exact point. Some distance in front of your subject might still appear sharp, and some distance behind it might too. As you move farther from that focus point, details gradually soften and blur.

This sharp area around your focus point isn't fixed. Sometimes it's shallow, sometimes it extends far into the distance. The size of this sharp, in-focus zone, is what we call the *depth of field*.



Visual concept: Side view, illustrating depth of field range.

Aperture is what influences the depth of field.

With a wide aperture (e.g. f/1.4, f/2.8), the depth of field is shallow. Only a narrow range around your focus point stays sharp and in focus. Everything in front of or behind that range blurs quickly. This is what creates that effect where your subject is crisp but the background melts into soft, creamy blur.

With a narrow aperture (e.g. f/11, f/22), the depth of field is deep. The sharp, in-focus zone expands, stretching farther in front of and behind your focus point. More of the scene, from foreground to background, stays clear at the same time.

Visual concept: Depth of field spectrum from shallow to deep.

By adjusting the aperture, you're deciding how much of your scene falls inside that sharp zone and how much falls outside it. You're choosing between isolating your subject with blur or keeping the entire scene detailed and clear.

Creative choice

Choosing between a shallow or deep depth of field is one of the most direct ways to shape how your image feels. It's not just about what's sharp. It's about where you guide the viewer's attention and what you want them to experience.

Shallow depth of field

Deep depth of field

Visual concept: Comparison of a shallow depth of field and a deep depth of field.

A shallow depth of field creates isolation. When only a narrow slice of your image stays in focus, everything else falls away into softness. The background blurs, and your subject stands alone, unmistakable. This is powerful when the scene around your subject is busy or distracting. By blurring it out, you remove the distractions and create a clear focal point. The image feels intimate and deliberate, drawing the viewer's eye exactly where you want it. There's no ambiguity about what matters in the frame.

A deep depth of field tells a broader story. When more of the scene stays sharp from front to back, you're showing context: everything connects and relates to one another. The image feels descriptive and layered, inviting the viewer to explore the entire frame rather than focusing on a single point.

Neither approach is inherently better. They're simply different ways of communicating what you see. One simplifies the frame to a single, clear focus. The other preserves the complexity and context of the full environment. Your choice depends entirely on what you want the image to express.

Starting points

Now that you understand how aperture shapes depth of field, you can use it as a creative tool. To help you make quick decisions while you're out taking photos, we've outlined eight common scenarios where depth of field plays a defining role in how the image looks. These examples give you a practical reference for choosing the right aperture.

After the examples, we'll also answer some of the most common technical questions about aperture. These quick answers will help clear up any confusion as you start working with aperture in practice.

Wide aperture

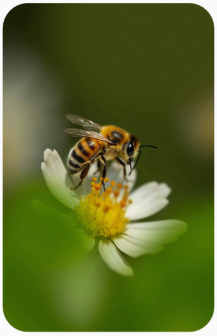
Shallow depth of field

f/1.4 f/2 f/2.8 f/4 f/5.6

Portraits

Flowers

Products



Wildlife

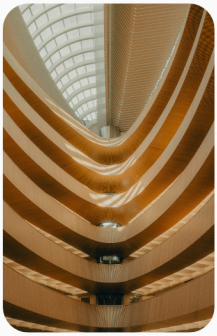
Narrow aperture

Deep depth of field

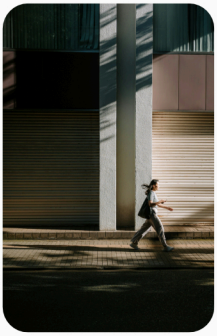
f/8 f/11 f/16 f/22 f/32

Landscapes

Groups



Architecture



Street

Questions

I see f/1.8 and f/8. Which one is the wider opening?

f/1.8 is the wider opening and f/8 is the narrower opening. Smaller f-numbers mean wider openings.

Why is the background not blurry, even when I use a wide aperture?

Background blur also depends on focal length and your distance to the subject. A wide aperture helps, but those two factors matter as well.

Why do my photos look less sharp when I use a very narrow aperture, like f/16?

At very small openings, light spreads as it passes through the aperture (diffraction). This can reduce overall sharpness, even though more of the scene appears in focus.

Why can’t I select f/3.5 anymore after zooming in?

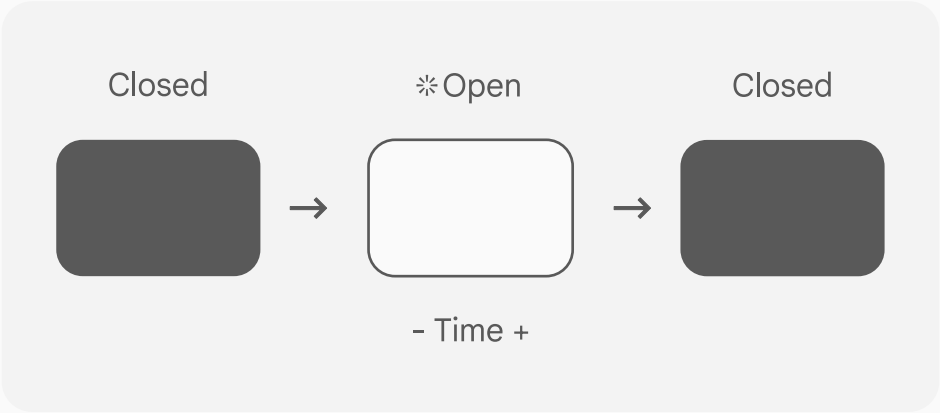
Many zoom lenses have a maximum aperture that changes as you zoom. When you zoom in, the widest available opening can become narrower, so the lowest f-number is no longer selectable.

Shutter speed

The time the shutter stays open

After light passes through the aperture, it reaches the shutter. The shutter is a curtain-like mechanism that sits in front of the sensor. For each photograph, the shutter opens to allow light through, then closes again to end the exposure.

The setting shutter speed determines the length of time the shutter remains open, defining exactly how much light is allowed to pass through to reach the sensor.



Visual concept: The shutter open-and-closing cycle.

The way the shutter controls light produces two distinct effects to your photo: (1) how bright or dark it appears, and (2) how motion is recorded.

Brightness

Shutter speed is expressed in seconds or fractions of a second. A value like 1/1000 means the shutter is open for one-thousandth of a second (very brief). A value like 2" means it stays open for two full seconds (much longer). The longer the shutter stays open, the more light reaches the sensor, and the brighter your image appears.

Visual concept: A brightness spectrum from dark to bright.

When the shutter stays open for a short period, like 1/250 of a second, a small amount of light reaches the sensor. As a result, the image will appear darker.

When the shutter stays open for a longer period, like 1/15 of a second, a much larger amount of light reaches the sensor. This will result in a brighter image.

Shutter speed can add (just like aperture) a creative dimension to your photos. It shapes how time itself is recorded in your image, giving you the ability to freeze action or show motion as blur.

Visual concept: Introducing the look of motion blur.

Motion blur

When the shutter opens, the sensor begins recording every bit of light that enters the lens, and it continues to do so until the shutter closes again.

Because the sensor records light continuously during this window, it captures everything that happens in the scene.

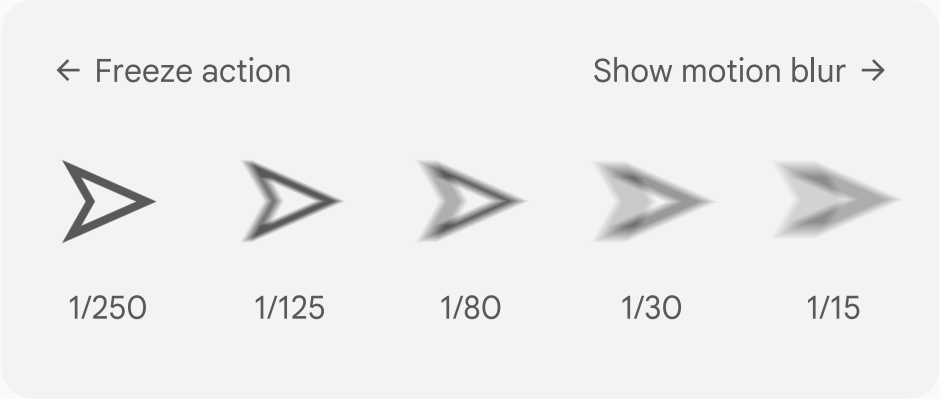
If something in the scene moves while the shutter is open, whether it's a person walking or a tree swaying in the wind, that change in position is recorded as well. Since these moving elements are still reflecting light into the lens, the sensor captures that light at every point along their path.

The result is a visible trace of light across the image, which we call *motion blur*.

No motion blur

Visible motion blur

Visual concept: Comparison of freezing action and showing motion blur.



Visual concept: A motion spectrum from frozen to blurred.

If you want to avoid motion blur, the period of time the sensor is recording must be so brief that elements in the scene do not have time to change position significantly. This is achieved with a fast shutter speed, such as 1/250 or faster, where the shutter is open for a very short duration.

If you want to use this effect creatively to show movement, you need a shutter speed slow enough for motion blur to appear. This is achieved by keeping the shutter open longer, for example 1/30 of a second. By extending this time, the sensor records the subject's change in position, allowing the motion to become a visible part of the story you're telling.

Creative choice

Choosing your shutter speed is about deciding how you want to represent time in your image. Do you want to freeze a single, precise instant, or show movement as it unfolds?

Fast shutter speeds are the most common choice because they capture moments with absolute clarity. When you freeze action (e.g. a splash of water mid-air, an athlete at the peak of a jump, a bird's wings fully extended) you're revealing details that happen too quickly for the eye to catch in real time. Everything in the frame appears still and sharply defined, preserving a split second with perfect precision.

Show motion as blur

Freeze action

Visual concept: Comparison between showing motion blur and freezing action.

Slower shutter speeds open up different creative possibilities. When you allow motion to blur, you're no longer capturing a single instant, but the passage of time itself. A runner becomes a streak of energy, a waterfall turns to smooth flowing silk, city traffic dissolves into trails of light. Rather than revealing detail, motion blur suggests movement, atmosphere, and duration.

Whether you freeze the moment or embrace motion blur, you're deciding what becomes a permanent, detailed record and what

becomes a suggestion of movement and change. Your choice shapes how the viewer experiences the photo, and ultimately, what story it tells.

Starting points

Choosing the right shutter speed value always depends on what is happening in your scene. How fast your subject moves, the subject distance, how far you're zoomed in, and how steady your camera is all influence the shutter speed you need.

To give you a practical foundation, we have outlined seven common situations and the shutter speeds that tend to work well for each. You will find them on the next page, from freezing fast action all the way to capturing light trails.

After the starting points, we will answer the most common practical questions about shutter speed.

Fast shutter speed

Freeze action

Extremely fast subjects - birds, sports

1/4000 1/2000

Fast subjects - running, bikes

1/1000 1/500

Everyday motion - portraits, groups

1/500 1/250 1/125

Slow shutter speed

Motion blur

Panning - cars, bikes, people

1/60 1/30

Blur movement - crowds, traffic

1/15 1/8 1/4

Silky smooth - water

1/4 0.5" 1" 5"

Light trails - traffic

1" 15" 30"

Questions

What do shutter speed numbers like 1/250 mean?

These numbers are fractions of a second. They describe how long the shutter is open, letting light through to the sensor.

Why shouldn't we just always use 1/4000 for freezing action?

Ultra-fast shutter speeds freeze everything, including the natural motion that gives a photo energy and life. Plus, the amount of light that reaches the sensor will be so small that you need to compensate heavily in the other settings to end up with a well-exposed image.

Why does motion blur occur when I use a shutter speed of 1/125?

Motion blur isn't caused by shutter speed alone. Other factors are subject speed, subject distance, focal length, and camera shake. At 1/125s, any of these can still introduce motion blur.

What is an ND filter?

An ND (neutral density) filter reduces the amount of light entering the lens. Photographers use it to achieve slower shutter speeds and wider apertures in bright scenes.

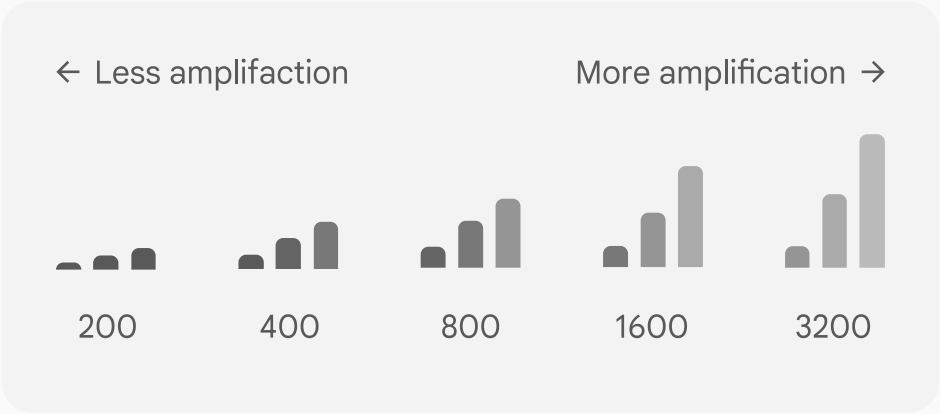
ISO

Amplification of the signal

After light passes through the lens and shutter, it finally reaches the sensor. The sensor is the surface inside the camera where light is captured during the exposure.

When the sensor captures this light, the camera translates what it saw into something it can store and display. The camera does this by converting the light into an electronic signal. This signal carries all the image information (the brightness, the colors, the shadows) that will become your photograph.

ISO controls the strength of this signal. It determines how strongly the camera amplifies it before the image is produced.



Visual concept: Amplification strength at different ISO levels.

ISO is expressed as numbers such as ISO 200, ISO 400, ISO 800, or ISO 3200. These numbers indicate how strongly the camera amplifies the electronic signal.

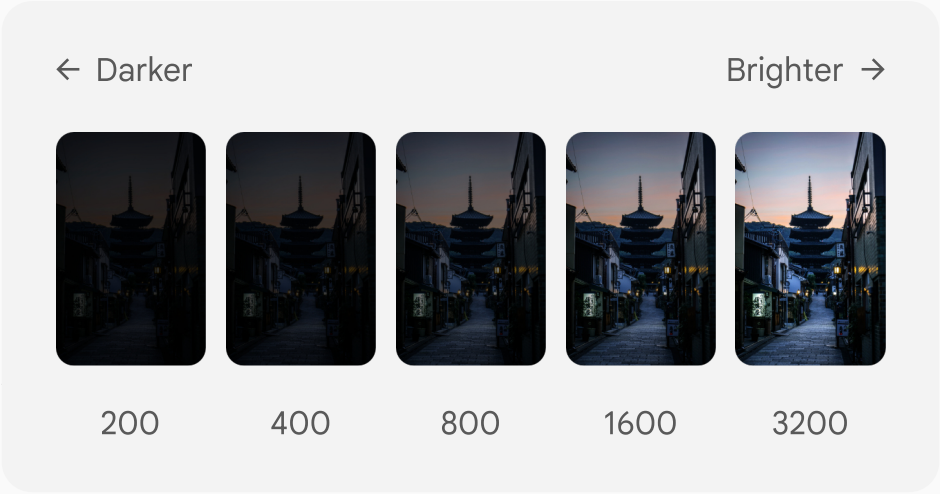
The way ISO amplifies the signal produces two effects to your photo: (1) how bright or dark it appears, and (2) how much noise becomes visible.

A note on ISO

You may also come across the terms "ISO sensitivity" or "ISO speed" in your camera. These are simply different names for the same setting, used by different camera brands.

Brightness

ISO influences the brightness of your image, just as aperture and shutter speed do. What makes ISO unique is how it achieves that. Rather than controlling the light that physically reaches the sensor, it works electronically to make your image brighter.



Visual concept: A brightness spectrum from dark to bright.

At lower ISO values, for example ISO 200, very little amplification is applied. The signal remains close to its original strength.

As you increase your ISO, for example from ISO 200 to ISO 3200, the amplification becomes stronger, which makes the image gradually appear brighter.

Noise

As you increase the ISO to make your image brighter, another change gradually becomes visible.

At first, you may notice a fine grain or sandy texture appearing in parts of the photo, especially in darker areas or smooth surfaces such as skies and walls. As the ISO value continues to rise, this texture becomes more noticeable.

Visual concept: Example images demonstrating visible noise.

This grainy texture is what we call *noise*. And to understand why noise appears, we need to look again at what happens inside the camera when light is recorded.

When the sensor captures light, the camera converts that light into an electronic signal. This signal contains all the information that will ultimately become your photograph. But because the

sensor and its circuitry are electronic components, the signal is never perfectly "clean". A very small amount of electronic interference is always present.

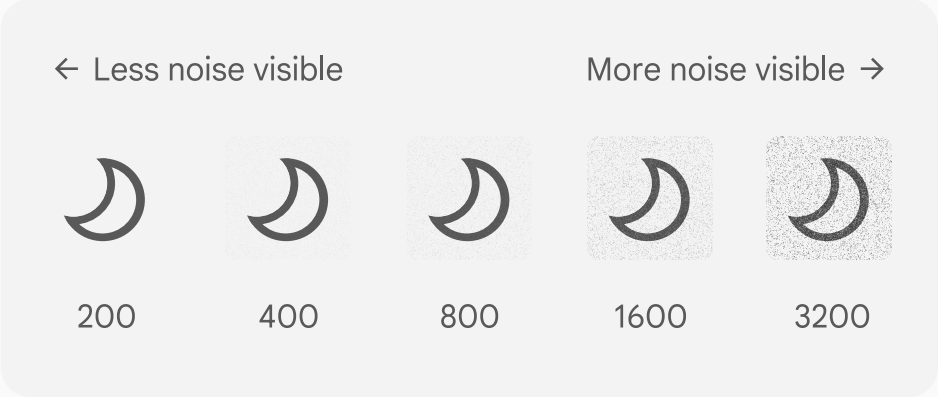
When you increase the ISO value, the camera amplifies the signal. But because that signal already contains small variations from electronic interference, both the image information and the interference are amplified together.

Comparison

Think of it like a radio. Even when you're tuned to a clear station, there's always a tiny amount of background static. If the signal is strong, you don't hear it. But if the signal is weak and you turn up the volume to hear the music, you're also turning up the static. The louder you make that weak signal, the more noticeable the static becomes. You can't amplify just the music. You amplify everything.

As the amplification becomes stronger, these variations become easier to see in the final image. What first appears as a subtle grain can gradually become a rougher texture. Fine details may start to soften, and edges that once looked crisp can appear slightly less defined.

At very high ISO values, the interference can also affect color. This may appear as small speckles of purple, green, or other colors scattered across the image.



Visual concept: Noise spectrum from clean to grainy.

Trade-off

In many situations, adjusting the image brightness isn't always straightforward. Aperture and shutter speed are often already set for a specific purpose:

Aperture may be set to create a deep depth of field to keep everything in focus. Achieving that requires a narrow aperture, which lets in less light. Similarly, a fast shutter speed may be needed to freeze action or avoid camera shake, but a faster shutter speed also limits how much light reaches the sensor.

When these settings are constrained, ISO becomes the remaining way to increase brightness. A higher ISO allows you to capture a brighter image without creating a shallower depth of field or introducing motion blur.

The trade-off is simple: increasing ISO brightens the image, but makes noise more visible.

Questions

When should I raise ISO?

When you need more brightness but can't change aperture or shutter speed without compromising the final image.

Can I reduce noise in editing?

Yes. Modern noise reduction tools can reduce noise while preserving detail.

What is base ISO?

Base ISO is the camera’s lowest native ISO setting (often ISO 100). At base ISO, you'll have the highest dynamic range possible and capture the cleanest images with minimal noise.

What's a safe ISO to use?

Most modern cameras produce clean images up to ISO 3200-6400. Test yours to see where noise becomes too noticeable.

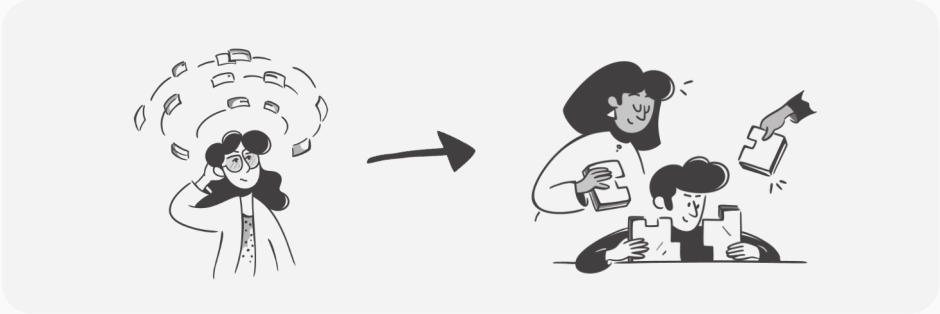
Finding balance

Introduction

You now know how a camera captures light. You understand that aperture and shutter speed control how much light reaches the sensor, and that ISO amplifies the signal. You've seen how each setting affects not just brightness, but also the look of your image: depth of field, motion blur, and noise.

That's all valuable to know. Really. Once you understand how your camera actually works, the settings start to make sense instead of feeling random. But we're not here just to learn about the technical side of the camera. We're here to use it.

Now we're putting it all together. Because when you're manually adjusting these settings, they don't work in isolation. They work as a system. Change one, and you'll need to adjust the others.

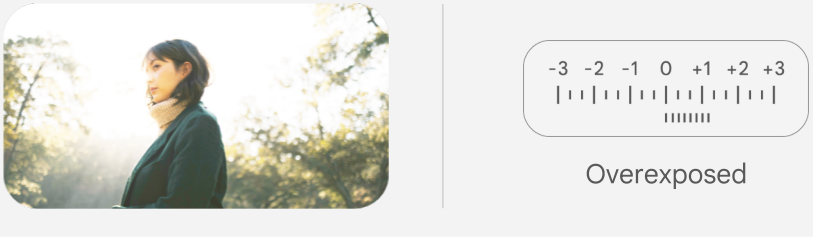


Visual concept: The pieces coming together.

Here's the plan. First, we'll show you how the balancing works in manual mode and the adjustments you make along the way. After that, we'll give you workflows based on common situations, so you're not wondering where to begin when you pick up your camera.

Balancing in manual mode

Imagine you're photographing a portrait. Your goal is to create a sharp, well-exposed image, with a soft, blurred background. To get that background blur, you open your aperture to f/2.8.



Visual concept: A bright preview with an exposure meter indicating overexposure.

The moment you do, the preview on your screen brightens noticeably. Too bright. Right now, the exposure meter sits at +1 EV, indicating that the image will be overexposed.

Exposure meter

At the bottom of your viewfinder and your screen, you'll find an exposure meter. An exposure meter measures light in the scene,

which can be used to determine whether your current settings will produce a well-exposed image. The scale runs from -3 EV to +3 EV, with 0 EV in the middle. 0 EV means a balanced exposure. Anything going towards plus means the image will be too bright. Anything going towards minus means it will be too dark.

To capture a sharp portrait, you need a shutter speed fast enough to freeze any movement from your subject and camera shake. You set it to 1/125 of a second.

Underexposed

Visual concept: A dark preview with an exposure meter indicating underexposure.

Now the exposure meter swings in the opposite direction. The image will be too dark. By using a faster shutter speed, not enough light will reach the sensor. To end up with a well-exposed image, you raise your ISO from 100 to 160.

Balanced

Visual concept: A balanced preview with an exposure meter indicating a correct exposure.

The exposure meter moves to 0 EV. Finally, the brightness is balanced. This way, you have a well-exposed image with your desired soft background, avoiding any motion blur.

But the process doesn't always stop there. As you review the image, you might decide you want the background even softer. So you open the aperture further to f/2. The preview brightens again. You minimize ISO to 100 to compensate, and use a faster shutter speed of 1/180 just to lower the brightness. You check again, make another small adjustment, and continue refining until everything feels right.

This back-and-forth cycle is what working in manual mode actually looks like. You adjust, evaluate, and readjust. You're managing a relationship between settings, and that relationship shifts as you refine your vision.

One decision leads to another, and the process continues until the image aligns with what you want.

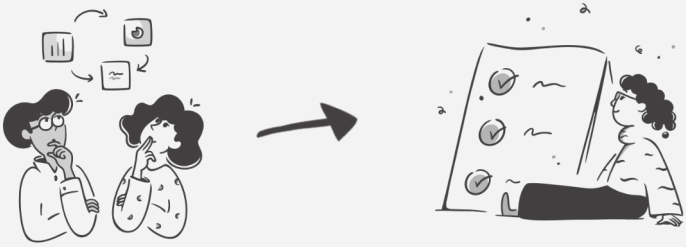
Appendix A: Stops

Behind the back-and-forth cycle you just experienced is a precise unit of measurement, called stops, that makes adjusting your settings predictable and exact. Appendix A builds directly on everything you have learned here, explaining what stops are, how they apply to each setting, and how to use them to compensate between aperture, shutter speed, and ISO with precision.

Working with priorities

When you're using manual mode, figuring out all three settings at once can feel overwhelming. Here's a method that makes it easier: start with the setting that controls the most important look for your image, then work the other two around it.

Maybe you want a blurred background, so aperture matters most. Maybe you're freezing motion, so shutter speed comes first. By anchoring one setting based on what you're trying to achieve, you simplify the process. Instead of juggling three variables simultaneously, you lock in one and balance the remaining two.



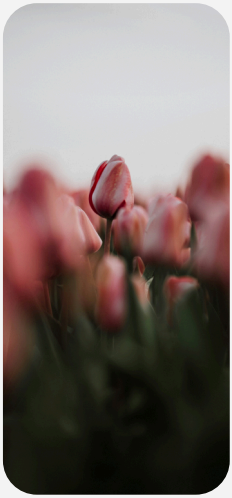
Visual concept: Simplifying the process of balancing the settings in manual mode.

We've identified four common creative priorities that photographers encounter regularly: shallow depth of field, deep depth of field, showing motion blur, and freezing action. For each, we've included a simple workflow to give you guidance when you're just starting out.

Priority 1: Shallow depth of field

You're standing in a field of flowers and one catches your eye. You want a well-exposed photo, where one single flower appears sharp while everything around it falls away into a soft blur. To get that, you need a shallow depth of field, which means opening your aperture wide.

Here's how you can approach it:



Start with aperture: Open it wide (f/1.4–f/5.6) to create the blur you're after.

Then balance shutter speed and ISO:

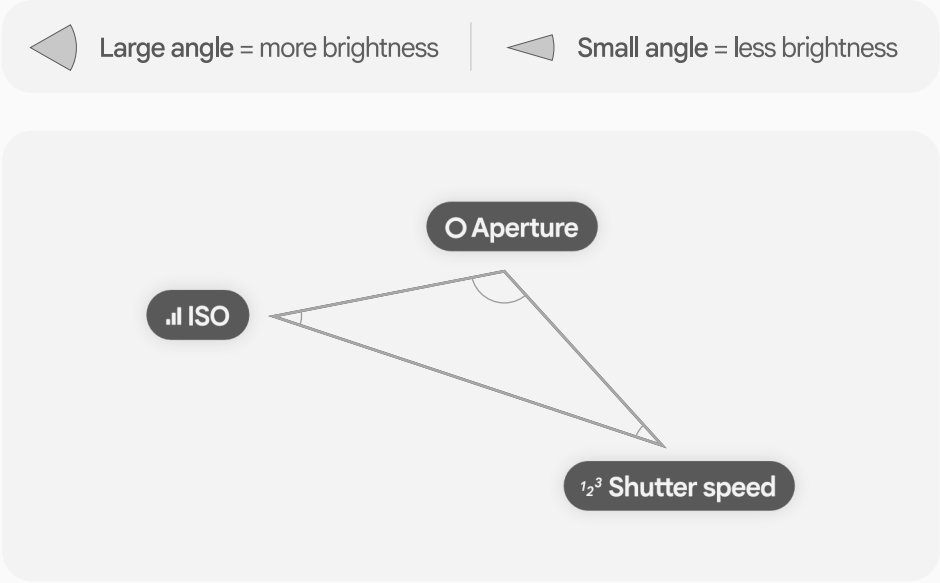
- Shutter speed needs to be fast enough to avoid unwanted blur from camera shake or subject movement (1/125 or faster).
- Keep ISO as low as possible. Raise it only if the image is still too dark.
- Balance these two until the exposure meter indicates 0 EV.

Common use: Portraits, flowers, products, wildlife.

Once you open up your aperture, a lot of light enters your camera. The preview on your screen becomes very bright, often overexposed. To end up with a well-exposed image, shutter speed and ISO need to contribute less brightness.

A useful way to see how brightness is balanced in a well-exposed photo is with a triangle. Each corner of the triangle is connected to a camera setting.

The size of the corner angle shows how much brightness that setting adds to the photo. A large angle means that the setting adds a lot of brightness. A small angle means it adds only a little.



Visual concept: A triangle showing each setting's contribution to image brightness.

In the triangle, the aperture angle becomes large because it lets in a lot of light. This makes the image very bright.

To keep the photo from becoming too bright, the other settings must contribute less brightness. You will typically need a faster shutter speed to limit how long light reaches the sensor, a low ISO to minimize any electronic amplification, or both.

Priority 2: Deep depth of field

You're photographing a landscape. You want a well-exposed image and everything needs to be sharp: from the foreground all the way to the mountains in the background. To get that, you need a deep depth of field, which means closing your aperture.

Here's how you can approach it:

Start with aperture: Close it down (f/8–f/16) to keep everything sharp.

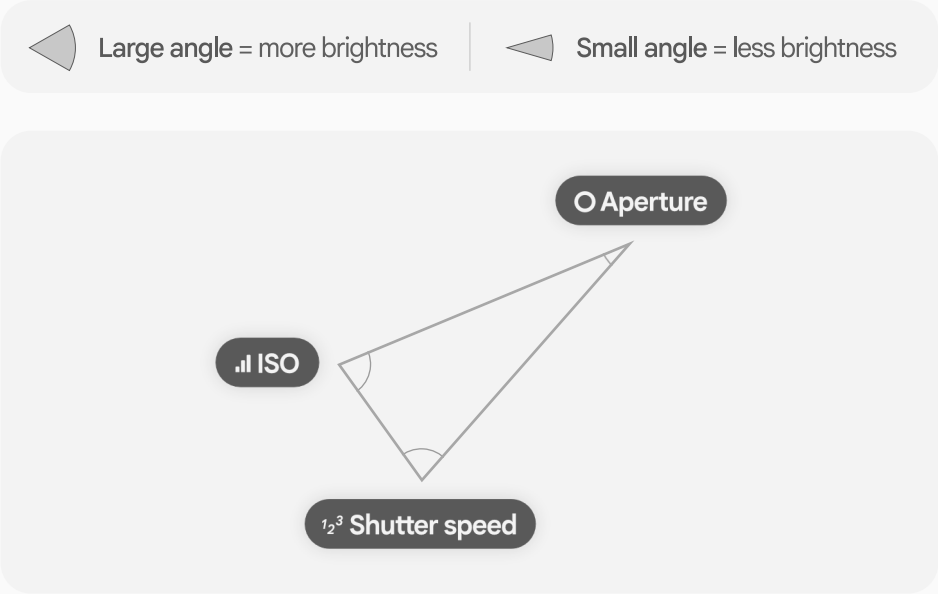
Then balance shutter speed and ISO:

- Shutter speed needs to be fast enough to avoid motion blur from camera shake or subject movement (1/125 or faster).
- For landscapes on a tripod, you can use slower shutter speeds since nothing is moving.
- Keep ISO as low as possible. Raise it only if the image is still too dark.
- Balance these two until the exposure meter indicates 0 EV.

Common use: Landscapes, groups, architecture, street photography.

When you close down your aperture, you're restricting how much light can enter your camera. Your image becomes darker, sometimes significantly underexposed. To bring the brightness

back for a well-exposed image, shutter speed and ISO need to contribute more brightness.



Visual concept: A triangle showing each setting's contribution to image brightness.

Notice how the aperture corner has shrunk. It's barely contributing any brightness now.

The other two corners expand to compensate. To end up with a well-exposed image, you will typically slow down your shutter speed to allow more light to reach the sensor, a high ISO to amplify the signal, or both.

Priority 3: Show motion blur

You're standing by a waterfall and want to capture that silky, flowing effect in the water. To capture motion as blur, you need a slow shutter speed that lets the subject move while the shutter is open.

Here's how you can approach it:

Start with shutter speed: Slow it down (often 1/30s to several seconds) to capture motion as blur.

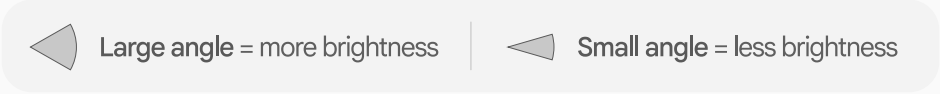
Then balance aperture and ISO:

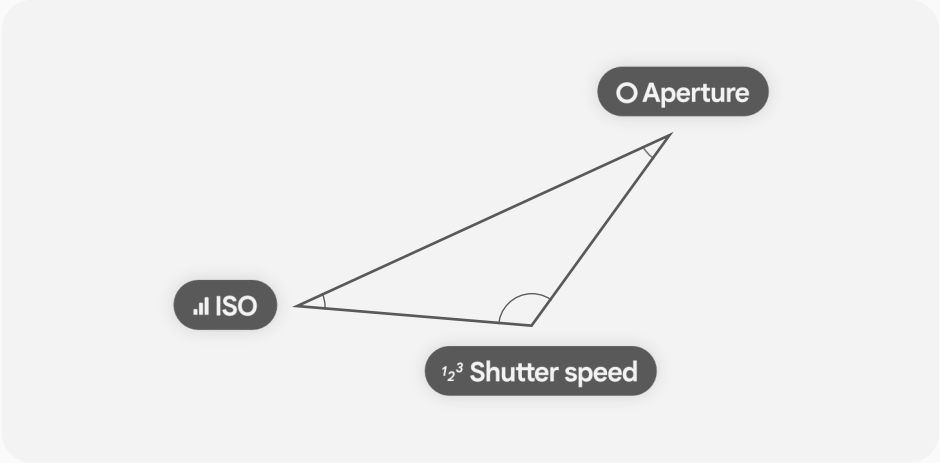
- In bright conditions, you'll likely need to close down your aperture to prevent overexposure.
- You may need an ND filter to limit the amount of light entering your lens.
- Keep ISO as low as possible. Raise it only if the image is still too dark.
- Balance these two until the exposure meter indicates 0 EV.

Common use: Panning, blur, silky, light trails.

A slow shutter speed keeps the shutter open longer, giving moving subjects time to blur across the frame. But all that extra time also means the sensor is exposed to light for much longer.

The image can easily become overexposed, especially in daylight. Aperture and ISO need to compensate by contributing less brightness.





Visual concept: A triangle showing each setting's contribution to image brightness.

The triangle shows this clearly. The shutter speed corner is large because it's contributing a lot of brightness. The aperture and ISO corners become small to compensate.

To end up with a well-exposed image, you will typically need to use a narrower aperture to limit the amount of light that passes through, a low ISO to minimize any electronic amplification, or both.

Priority 4: Freeze action

You're photographing a bird in flight and need every feather sharp. To freeze motion completely, you need a fast shutter speed that captures the subject before it has time to move.

Here's how you can approach it:

Start with shutter speed: Speed it up (1/1000s or faster) to freeze the action.

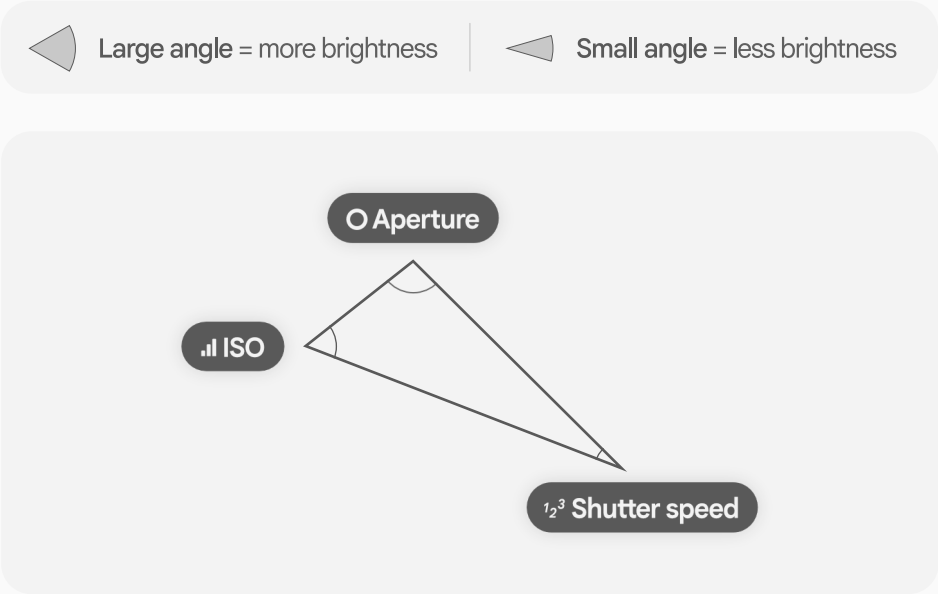
Then balance aperture and ISO:

- You'll likely need to open your aperture wide to let more light in.
- Raise ISO if needed to bring the brightness up.
- Balance these two until the exposure meter indicates 0 EV.

Common use: (Extremely) fast subjects

A fast shutter speed freezes motion by giving the subject almost no time to move while the shutter is open. But it also means the sensor is barely exposed to light.

The image will often be too dark, especially in shade. Aperture and ISO need to contribute more brightness to compensate.



Visual concept: Putting the knowledge into practice.

The triangle shows this relationship. The shutter speed corner is small because it's contributing very little brightness. The aperture and ISO corners become large to compensate.

To end up with a well-exposed image, you will typically need to open your aperture wide to allow more light to pass through, a high ISO to amplify the signal, or both.

Quick recap

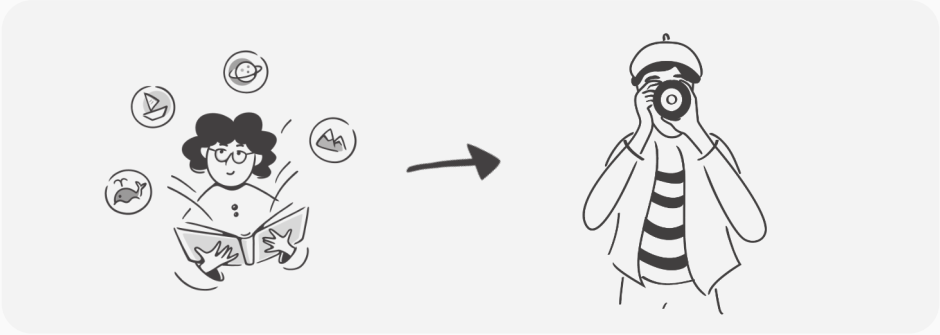
- **All three settings affect image brightness.**
- **Aperture affects depth of field**, determining how much of your image appears sharp or blurred.
- **Shutter speed affects motion**, controlling whether movement appears frozen or blurred.
- **ISO affects noise**, which appears as grain in the image.
- **In manual mode, the three settings work together as a system.** When you change one, the others often need to be adjusted.
- **Balancing is a back-and-forth process.** Adjust a setting, check the exposure meter, and refine until the brightness looks right.
- **Working with priorities simplifies this process.** Choose the setting that controls the most important look in your image, then balance the other two settings around it.
- **For a shallow depth of field:** start with a wide aperture.
- **For a deep depth of field:** start with a narrow aperture.
- **For motion blur:** start with a slow shutter speed.
- **For freezing action:** start with a fast shutter speed.

What's next

Introduction

You've learned how your camera captures light, what each setting does, and how to balance them based on your creative priorities. The technical foundation is there. What comes next is practice.

Knowledge alone doesn't make great photographs. The real work happens when you pick up your camera and start using what you've learned.



Visual concept: Turning inspiration into action.

Photo assignments

Every other Friday, we release a new photo assignment where you can put these settings to work. Everyone tackles the same

creative challenge, then shares their results in the community gallery. It's a chance to experiment, stay creative, and see how different photographers approached the same brief.

Three assignments to start with:

- **The Motion Blur Project** - Practice shutter speed by blurring movement
- **The Nature Edition** - Practice aperture by controlling depth of field in natural scenes
- **The Absence of Light** - Practice creative underexposure to capture mood through shadows

All past assignments are available here.

The more you use the settings, the more intuitive the balancing act becomes. The adjustments that feel deliberate now will eventually happen without thinking. You'll spend less time managing settings and more time focusing on what you're actually trying to create.

We hope this guide has given you the clarity to get there.

Best,
The CameraSetup Team

P.S. We added some reference sheets at the end of this visual guide for you, which may come in handy if you're still starting out.

Appendix A: Stops

1. Introduction

Balancing aperture, shutter speed, and ISO in manual mode is a back-and-forth cycle. Once the brightness level is balanced, you may still want to change a setting: to change the depth of field, to freeze movement, or to show motion blur. Every change to one setting disturbs the brightness balance, and at least one other setting needs to compensate.

Behind that compensation is a precise unit of measurement called stops, that makes every adjustment predictable and exact.

This appendix defines the stop, explains how it applies to aperture, shutter speed, and ISO, and shows how to use it to compensate between these settings with precision.

About this appendix

Appendix A builds on the main guide. It is more technical, giving you a deeper understanding of the mechanism behind compensating between settings.

2. What a stop is

Your camera organises the values of aperture, shutter speed, and ISO into deliberate scales. Looking at those values, you may notice that the steps between them grow larger as the values increase. Behind that pattern sits a unit of measurement called a stop.

A stop is a unit of change in the amount of light reaching the sensor. Every step of one stop changes this amount by a factor of two. Adding one stop means twice as much light reaches the sensor. Removing one stop means half as much light reaches the sensor.

Add one stop → The amount of light is doubled

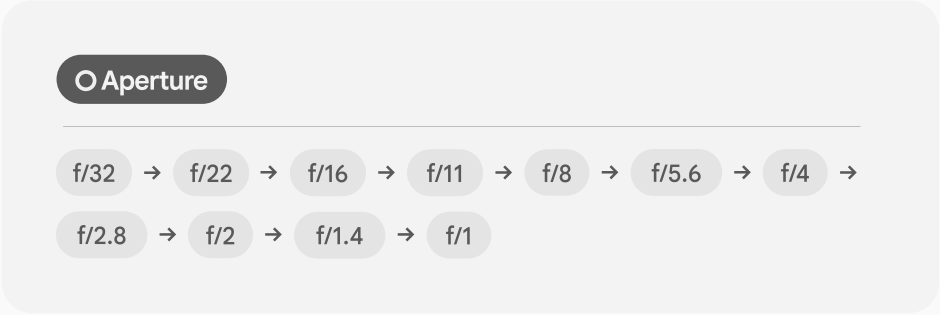
Remove one stop → The amount of light is halved

Because the scales of aperture, shutter speed, and ISO are built around this same unit, they share a common structure. For example, a one-stop change on the aperture scale has the same effect on brightness as a one-stop change on the shutter speed scale. That shared structure is what makes it possible to compensate between settings with precision.

3. How stops apply to the settings

3.1 Aperture

The aperture values below are spaced one full stop apart. Each step to the right doubles the amount of light passing through the lens. Each step to the left halves the amount of light passing through the lens.



Change	Light on sensor	Stops
f/2.8 → f/2	Doubled	+1
f/2.8 → f/4	Halved	-1
f/2.8 → f/1.4	Quadrupled	+2
f/2.8 → f/5.6	Quartered	-2

3.2 Shutter speed

The shutter speed values below are spaced one full stop apart. Each step to the right doubles the amount of light passing through the shutter. Each step to the left halves the amount of light passing through the shutter.

Change	Light on sensor	Stops
1/250 → 1/125	Doubled	+1
1/250 → 1/500	Halved	-1
1/250 → 1/60	Quadrupled	+2
1/250 → 1/1000	Quartered	-2

3.3 ISO

The ISO values below are spaced one full stop apart. Each step to the right doubles the amplification strength. Each step to the left halves the amplification strength.

These steps produce approximately the same change in image brightness as one stop of light of aperture or shutter speed.

ISO

100 → 200 → 400 → 800 → 1600 → 3200 → 6400 → 12800 → 25600

Change	Light on sensor	Stops
400 → 800	Doubled	+1
400 → 200	Halved	-1
400 → 1600	Quadrupled	+2
400 → 100	Quartered	-2

4. Stops are interchangeable

Because all three settings operate in stops, they share a common unit. One stop of aperture is equivalent in brightness to one stop of shutter speed, which is equivalent in brightness to one stop of ISO.

This makes compensating between settings precise and predictable. If you close the aperture by one stop, you can restore the same brightness level by slowing down the shutter speed by one stop, or by raising the ISO by one stop.

Example (full stops):

Your settings produce a balanced brightness level at f/2.8, 1/250, ISO 400. You want a deeper depth of field, so you close the aperture from f/2.8 to f/5.6. That is two stops less light. To compensate exactly, you could:

1. Add two stops by slowing down the shutter speed:
1/250 → 1/60

Setting	Change	Stops
Aperture	f/2.8 → f/5.6	-2
Shutter speed	1/250 → 1/60	+2
Result		**0**

2. Add two stops by raising the ISO: 400 → 1600

Setting	Change	Stops
Aperture	f/2.8 → f/5.6	-2
ISO	400 → 1600	+2
Result		**0**

3. Or combine: add one stop by slowing down the shutter speed (1/250 → 1/125) and add one stop by raising the ISO (400 → 800)

Setting	Change	Stops
Aperture	f/2.8 → f/5.6	-2
Shutter speed	1/250 → 1/125	+1
ISO	400 → 800	+1
Result		**0**

All three options restore the same image brightness level. Which you choose depends on your creative priorities. Depth of field, motion, and noise are each affected differently.

5. Full stops, half stops & third stops

5.1 Finer control

Full stops are the foundation, but cameras do not limit you to them. Most cameras let you work in half-stop or third-stop increments, giving you finer control over each setting and the balance between them.

A single stop is the base unit. A half-stop increment divides a single stop into two equal parts. A third-stop increment divides a single stop into three equal parts.

Your camera's menu lets you set which increment to use, typically under a setting called exposure level increments. The default on most cameras is a third-stop increment.

5.2 Increments

The tables on the next page show how each increment setting divides a single stop for aperture, shutter speed, and ISO.

Aperture and shutter speed can be set to full-stop, half-stop, and third-stop increments. ISO is standardised to full-stop and third-stop increments.

Aperture

Increment	Full stop	In between		Full stop
1-stop	f/8			f/5.6
1/2-stop	f/8	f/6.7		f/5.6
1/3-stop	f/8	f/7.1	f/6.3	f/5.6

Shutter speed

Increment	Full stop	In between		Full stop
1-stop	1/250			1/125
1/2-stop	1/250	1/180		1/125
1/3-stop	1/250	1/200	1/160	1/125

ISO

Increment	Full stop	In between		Full stop
1-stop	400			800
1/3-stop	400	500	640	800

5.3 Interchangeable

Compensation for half-stop and third-stop increments works the same way as with full stops, just in smaller increments. Below are two examples of using half-stops and third-stops.

Example (half-stops):

Your settings produce a balanced brightness level at f/8, 1/125, ISO 800. You open the aperture from f/8 to f/6.7. That is half a stop more light. To compensate exactly, you need to remove half a stop by using a faster shutter speed: 1/125 → 1/180.

Setting	Change	Stops
Aperture	f/8 → f/6.7	+1/2
Shutter speed	1/125 → 1/180	-1/2
Result		**0**

Example (third-stops):

Your settings produce a balanced brightness level at f/8, 1/125, ISO 800. You open the aperture from f/8 to f/7.1. That is a third of a stop more light. To compensate exactly, you could:

1. Remove one third of a stop by using a faster shutter speed: 1/125 → 1/160

Setting	Change	Stops
Aperture	f/8 → f/7.1	+1/3
Shutter speed	1/125 → 1/160	-1/3
Result		**0**

2. Remove one third of a stop by lowering the ISO: 800 → 640

Setting	Change	Stops
Aperture	f/8 → f/7.1	+1/3
ISO	800 → 640	-1/3
Result		**0**

6. Stops in practice

6.1 The exposure meter

The exposure meter measures light and expresses the result in exposure values (EV). The scale runs from –3 EV to +3 EV, with 0 in the centre. The EV numbers on the scale represent full stops.

A reading of 0 EV means the exposure is balanced. At +1 EV the image is *one stop* overexposed, at +2 EV *two stops*, at +3 EV *three stops*.

Every increment below zero works the same way in the opposite direction: –1 EV is *one stop* underexposed, –2 EV *two stops*, –3 EV *three stops*.

Exposure meter

A tool which can be used to determine whether your current settings will produce a well-exposed image.

The exposure meter reflects the exposure level increment setting of your camera. When you switch to half-stop or third-stop increments, additional marks appear between the EV values. Each interval represents half a stop or a third of a stop.

1/2-stop increment

Each mark between the EV numbers represents half a stop.

1/3-stop increment

Each mark between the EV numbers represents one third of a stop.

6.2 Using stops

There are different ways to work with stops in practice. Some photographers memorise the full-stop values for each setting, and calculate changes. When a setting needs to move two stops, they know exactly which value to move to.

Another approach is by *counting clicks*. Every click of the control dial moves one increment. At a third-stop increment, three clicks are one full stop. To compensate with another setting, move that dial the same number of clicks in the opposite direction. If you move the aperture four clicks to get the depth of field you want, you need four clicks back from shutter speed, ISO, or a combination of both.

Which setting you use to compensate is your decision, and that decision is where the creative work happens. One stop added to aperture, shutter speed, or ISO produces the same change in

brightness. What they do not share is the effect on your image.

Opening the aperture by one stop increases brightness, but produces a shallower depth of field. Slowing down the shutter speed by one stop increases brightness, but makes motion blur more likely to appear. Raising ISO by one stop increases brightness, but makes noise more visible.

Quick recap

- **A stop is a unit that describes a change in the amount of light reaching the sensor.** One stop doubles or halves that amount.
- **Aperture, shutter speed, and ISO** can all be measured in stops.
- **Because all three settings operate in stops**, compensating between them is exact and predictable.
- **Cameras let you work in full-stop, half-stop, or third-stop increments.** Smaller increments give you finer control over each setting and the balance between them.
- **The exposure meter displays stops.** The EV numbers on the scale represent full stops.
- **Which setting you move determines the effect on your image.** Aperture affects depth of field, shutter speed affects motion, and ISO affects noise.

Definitions

Exposure

The total amount of light that reached the camera sensor.

Exposure time

The duration the sensor is exposed to light during the capture process.

Well-exposed photo

A photo where brightness levels accurately represent the scene.

Underexposed photo

A photo that appears too dark, causing loss of detail in the shadows.

Overexposed photo

A photo that appears too bright, causing loss of detail in the highlights.

Exposure meter

A tool that measures light, helping you to determine the ideal camera settings for a well-exposed photo.

Aperture

The setting that controls the opening in your lens, determining how much light passes through.

f-stop

The numerical value representing the size of the aperture opening.

Wide aperture

A large aperture opening that allows more light to pass through.

Narrow aperture

A small aperture opening that allows less light to pass through.

Shallow depth of field

A narrow zone of acceptable sharpness in front of and behind the focus point.

Deep depth of field

A wide zone of acceptable sharpness in front of and behind the focus point.

Shutter speed

The setting that controls the length of time the shutter remains open, exposing the sensor to light.

Fast shutter speed

A brief exposure duration that allows only a small amount of light to reach the sensor.

Slow shutter speed

A longer exposure duration that allows more light to reach the sensor.

Freeze action

Capturing moving objects sharply, with no motion blur.

Motion blur

A visible trace of light from a moving object.

ND filter

A neutral density filter that reduces the amount of light entering the lens.

ISO

The setting that controls how strongly the signal is amplified to affect image brightness.

Amplification

A process applied to the signal to produce a brighter image.

Low ISO

Low amplification of the signal, resulting in a darker image with less visible noise.

High ISO

Strong amplification of the signal, producing a brighter image with more visible noise.

Noise

A grainy, sandy texture caused by electronic interference in the signal.

Noise reduction

Post-processing technique that reduces visible noise while attempting to preserve image detail.

Wider aperture → Brighter image → Shallower depth of field

Slower shutter speed → Brighter image → More motion blur

Higher ISO → Brighter image → More noise visible

Narrower aperture

→

Darker image

→

Deeper depth of field

Faster shutter speed

→

Darker image

→

Less motion blur

Lower ISO

→

Darker image

→

Less noise visible

Aperture

← More light Less light →

f/1.4 f/2.8 f/5.6 f/11 f/22

Shutter speed

Closed Open Closed

- Time +

ISO

← Less amplification More amplification →

200 400 800 1600 3200

Aperture

← Shallow depth of field — Deep depth of field →

f/1.4 f/2.8 f/5.6 f/11 f/22

Shutter speed

← Freeze action — Show motion blur →

1/250 1/125 1/60 1/30 1/15

ISO

← Less noise visible — More noise visible →

200 400 800 1600 3200

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