SPYROS HENIADIS

[SHP]

SELF HELP PHOTOGRAPHER

THE GUIDE TO SHOOTING IN MANUAL MODE

Table of Contents

INTRODUCTION

Hello! My name is Spyros Heniadis (Spear-ohs Hen-e-ah-dis). I'm a Wisconsin native with a Greek name and a mixed heritage. Half Greek, quarter German, a splash of Irish, a pinch of Bohemian. Salt and pepper to taste. My great passion in life is photography. I love nothing more than to create beautiful portraits and to share what I've learned in my years of shooting with photographers like you.

I am very excited to help you learn how your camera works so that you can use it to take the kinds of photos that you want to take.

I remember when I got my first DSLR camera and how excited I was to take photos with it. *I also remember the feeling of disappointment when I saw that my photos still sucked.*

This was incredibly frustrating. Here I had just spent $1,000 on this amazing camera, and my photos were still terrible.

For that amount of money, you would think that the damn thing would take the photos by itself but, the truth is, the camera is just a tool. *As photographers, we need to know how to use that tool.*

This tool can be very confusing. When I got my first DSLR, I had no idea what all of the mysterious modes on the dial were, how each one would make my photos look, or what all of the damn buttons and dials would do! So I started shooting in Auto which is how we all start out. However, the thing about shooting in Auto is that it's sort of like driving a high-performance race car to the grocery store.

You can drive a Ferrari to the grocery store, but that's not really how that car is intended to be used.

DSLRs, Mirrorless, and other advanced cameras are the same. You can shoot these cameras in Auto mode, but they're not really intended to be used that way.

Clearly you've already realized that which is why this is so exciting. Once you understand how to use your camera, your photography will be changed forever, and I am going to show you exactly how it works!

We are going to start with the basics of how cameras work. Once you understand the basics, we'll go into the fundamentals of photography. After that, we'll look at what settings change how your photos look. Then we will wrap it up by bringing everything together in an easy to use shooting method for you to practice with.

By the time you're done with this book and have practiced what you've learned, you will have the ability to pick up any camera and take amazing photos with it.

So what are we going to cover in this book?

In order to understand how cameras work, we have to understand the three pillars at the foundation of photography: ISO, Aperture, and Shutter Speed. We're going to look at each one of them separately to really understand them, and then we're going to see how all three of them work together. *(If you have read my Manual Mode 101 book, some of this will be review.)*

We're going to learn how to shoot in Manual mode.

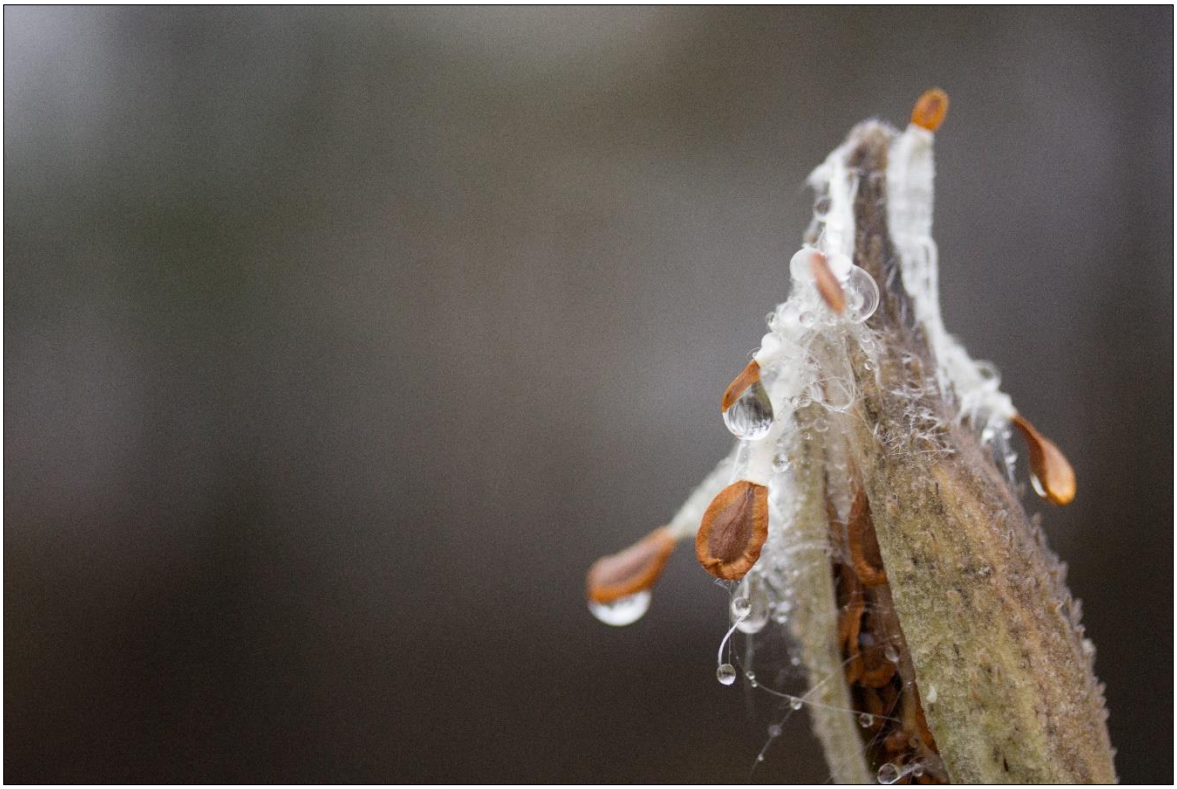
This is where you take total control over the camera and tell it to do exactly what you want it to do, but we're not just going to cover the function of shooting in Manual mode.

It's all well and good if you know how to change your settings, but that doesn't help a bit if you don't know WHY to choose the settings you might choose.

So we'll figure out how to decide what settings to use so that when you want a photo to look a certain way, you know exactly how to make that happen. That will give you the ability to take photos like this:

And this:

And this…



… anytime you want.

It is wonderful to create these photos.
I love photography more than just about anything else in the world.

I know you will too.

Before we jump into things, I want to encourage you to have your camera with you while you read. There will be times when I'll ask you to pick up your camera and follow along to learn a control, test a function, or illustrate a point.

Alright, let's get to it! We're going to start by breaking down what happens inside the camera when you take a photograph.

PART 1: UNDERSTANDING HOW YOUR CAMERA WORKS

HOW DO CAMERAS WORK?

When you take a photograph with your camera, a certain sequence of events occurs inside the camera. In order to understand what happens inside the camera, we first need to understand the basic parts that make up a camera.

These devices that we have are actually computers wrapped around a camera. This is awesome, because these computers offer us all sorts of features and functions that enhance our photography. But there is a very simple device underneath all of that computerization. That device is the actual camera. It is made up of four simple parts.

The first part is a box.

We need a closed box because inside that box is the second part which is called the image receptor.

In the case of our digital cameras, the image receptor is a light-sensitive microchip called an image sensor. We put the image sensor inside the box to protect it from light.

See, when we take a photograph, we're recording light. If we don't protect the sensor, it will be overwhelmed with all the light around us.

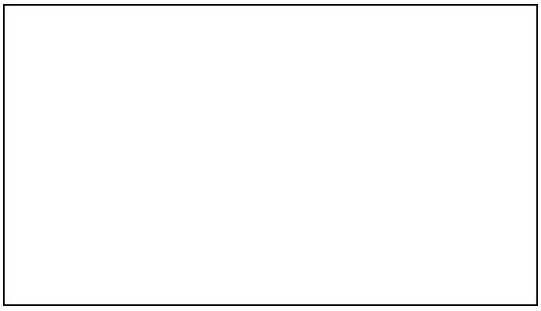
Just look around for a moment. There is light everywhere.

The word photograph comes from the Greek words Phos, *which means light, and* Graphé *which means drawing.*

It's coming from the screen of the device you're reading on, the sunlight streaming in through the windows, and the lights you have on in the room.

All of that light is too much light.

When we take a photo, we want the image sensor to record a specific amount of light. If the sensor isn't protected, it will record all of the light around us and give us a photo that is pure white/bright and looks like this:



The box keeps all of that light away from the image sensor.

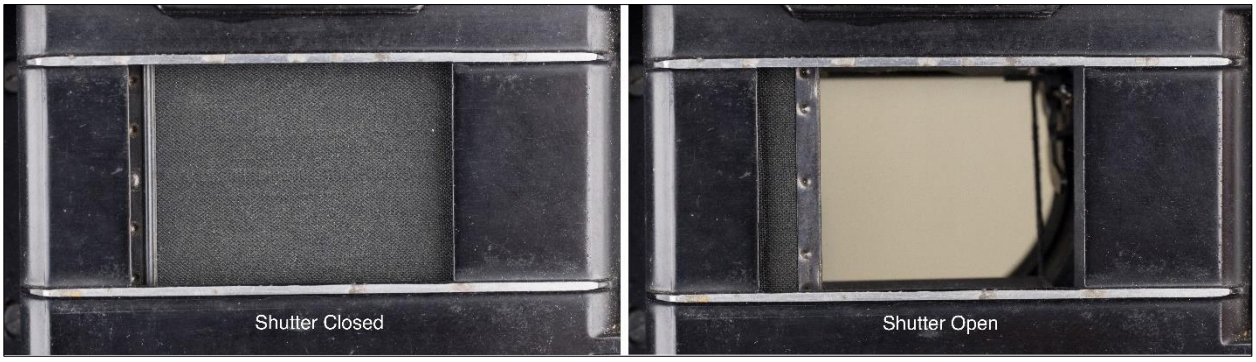
The next two pieces allow us to choose when and how much light is let into the box to be recorded for a photo.

One of those pieces is called the aperture. The aperture is a hole in the box that allows us to control how much light enters the box.

But with a hole in the box, we're back to capturing all that extra light because, once again, there's nothing to stop the light from getting into the box to the image sensor.

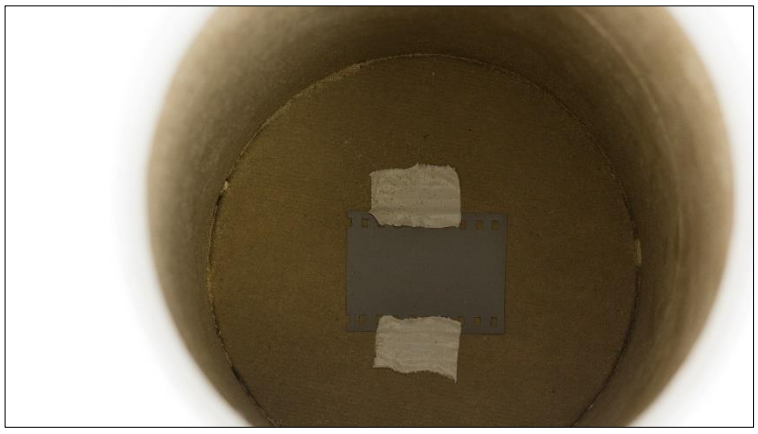
This is where the fourth piece comes in.

The fourth piece is called the shutter. The shutter is like a curtain that you put in between the opening in the box and the image sensor. The curtain protects the image sensor from the light that's coming in through the aperture opening.



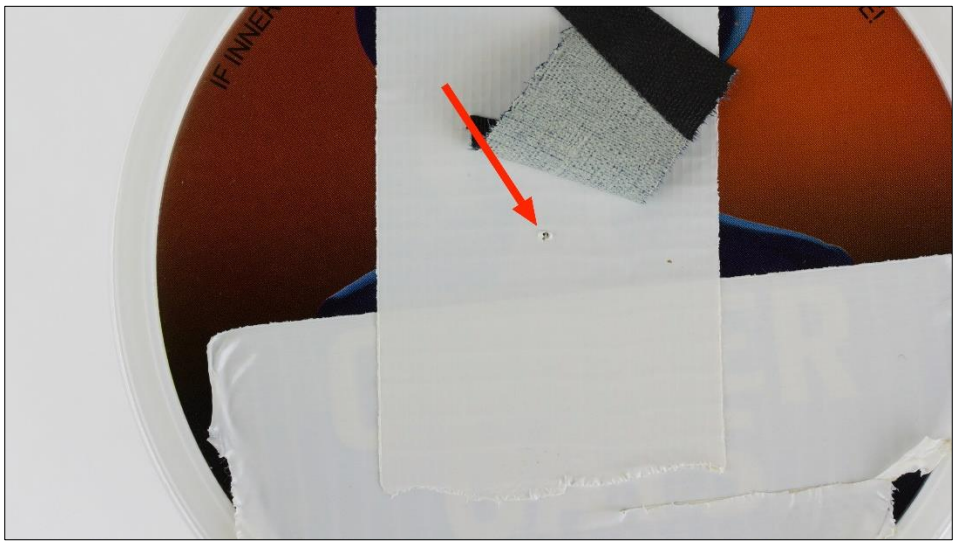
With those four pieces, you have a camera. *That's all you need to build a camera.* Everything else is extra.

In fact, this is a camera. Sure, it is a primitive camera, but it is still a camera.



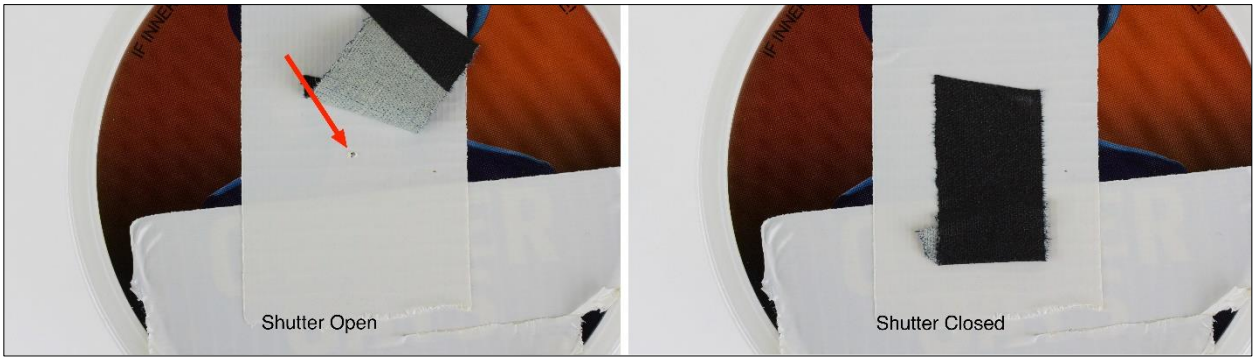
The oatmeal tin is the box. It's protecting the image receptor, a piece of film, that's inside the box.

The aperture opening is this pinhole you see right here.



The pinhole lets light into the tin to be recorded by the piece of film inside.

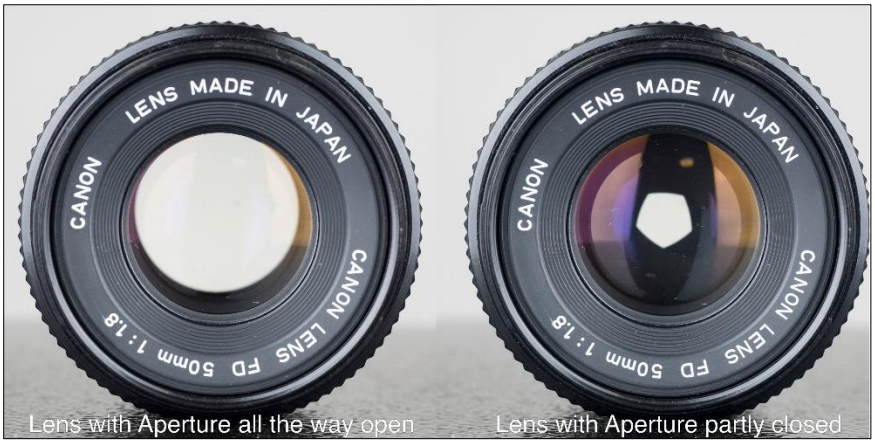
The piece of tape acts as the shutter. When the tape is removed, light is able to enter the camera through the pinhole. When the tape is replaced, no more light can get in and the photograph is done being recorded.



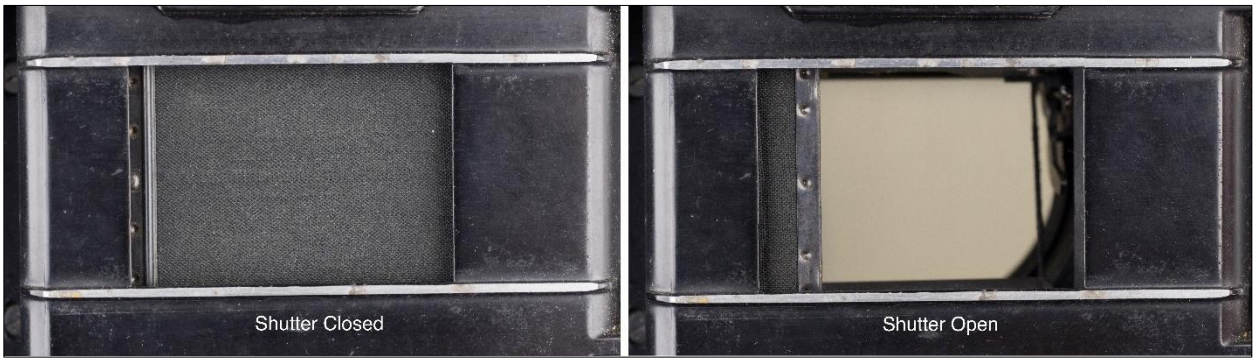
That is exactly how it works when you take a photo with your camera.

In the case of our cameras, the camera body is the box. On the front of the camera body is a great big opening but that's not actually the aperture.

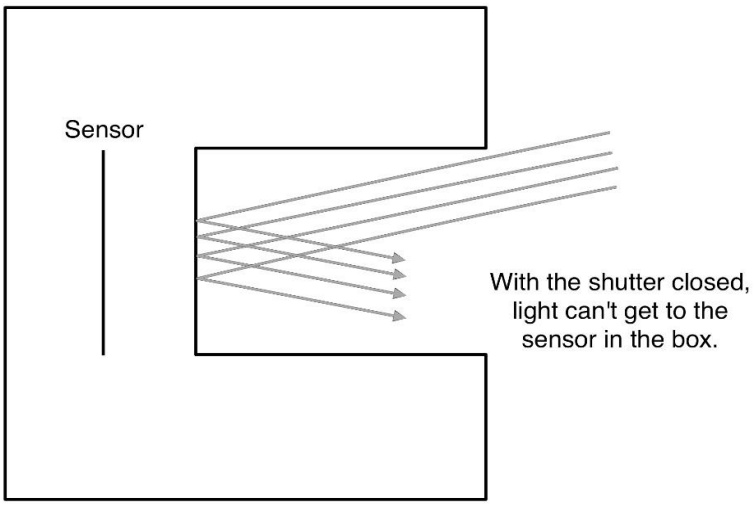
Instead, the aperture is in the lens.



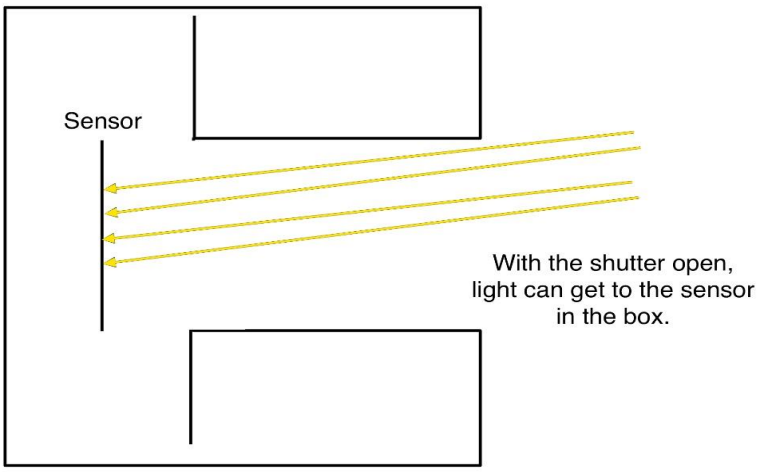
In this old film SLR, the shutter is a curtain that is in front of where the film would go. In a modern camera, the image sensor is where the film would be.



In a resting state when the camera is not being used, the image sensor is enclosed in the camera body and protected by the camera shutter. The aperture in the lens is open which lets light enter the camera, but that light can't strike the image sensor because of the shutter.



When you press the shutter button to take a photo, the shutter opens. The light that's already coming into the camera through the opening in the lens is now able to get to the sensor.



After a predetermined amount of time, the shutter closes and you've finished recording the photograph.

When we take a photograph like this, we record a specific amount of light. This is called an exposure.

As photographers, we can control the exposure which allows us to control how the resulting photograph looks. We control the exposure with three of the four pieces of the camera: the image sensor, the aperture, and the shutter.

Exposure: The total amount of light recorded by a camera for a single photograph.

The image sensor has a variable sensitivity to light which you can change via the ISO setting.

The aperture has a variable size which you can change with your Aperture setting.

The shutter can be opened for different lengths of time which you control with your Shutter Speed setting.

Understanding how ISO, Aperture, and Shutter Speed work and how they work together is the foundation of photography. While there are loads of extra features and functions on your camera, everything else in photography is built on top of those three things. If you understand them and how they work, *you'll be able to use any camera to take any kind of photo that you want.*

HOW ISO, APERTURE, AND SHUTTER SPEED WORK

ISO, Aperture, and Shutter Speed give us control over the amount of light captured for a photo. What we're going to do now is take a look at each one individually. Then we'll see how they work together.

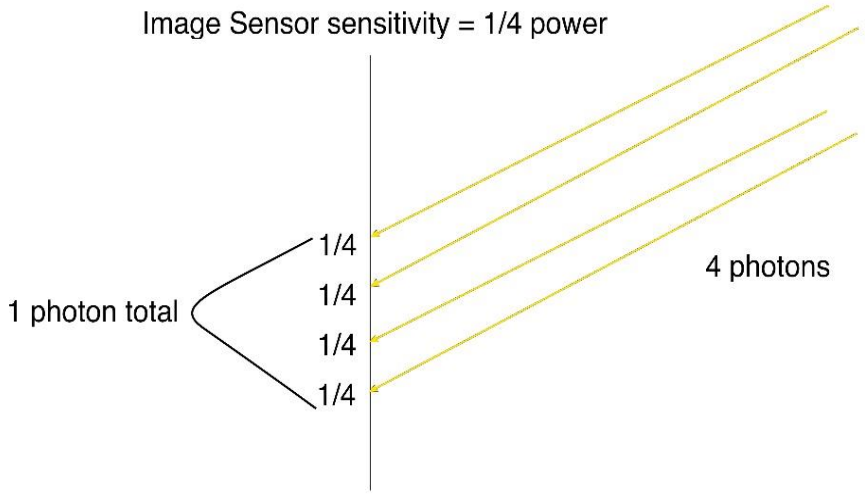
ISO

The ISO setting controls how much light the sensor is able to record by altering how sensitive it is to light.

For instance, let's say that 4 photons of light hit the camera's sensor.

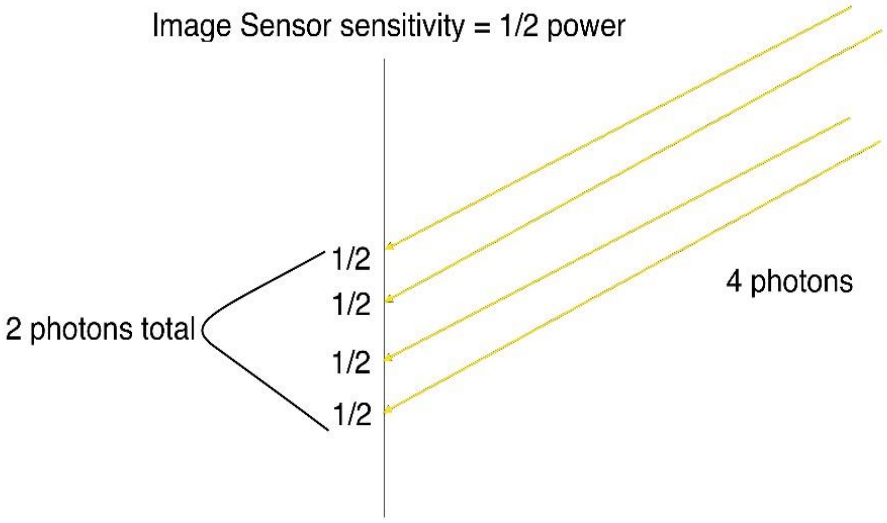
(Just to clarify, these are made up numbers I'll be using to help you understand how everything works.)

In this example, the ISO sensitivity is set so that each photon only registers at 1/4 power. If four photons strike the sensor and register at 1/4 power each, the total amount of light recorded by the sensor is just one photon.



4 photons x 1/4 power = 1 photon

If you change the ISO setting, it will increase the sensitivity of the sensor. Then, when those same four photons hit the sensor, they will register at 1/2 power instead of 1/4 power.



When the four photons hit the sensor, it will record a total of two photons, doubling the amount of light recorded for the exposure.

4 photons x 1/2 power = 2 photons

What this means is that you can increase or decrease the amount of light that the camera records in a photo by changing the ISO setting.

The important thing to understand is that, by changing the ISO, you can change the amount of light recorded for an exposure. When you increase the ISO setting, you increase the amount of light recorded. When you decrease the ISO setting, you decrease the amount of light recorded.

On our cameras, the ISO setting tells us how sensitive the sensor is. Most cameras have an ISO setting that starts at 100. That is the lowest ISO setting, also known as the Base ISO. At 100, the sensor is the least sensitive to light.

Not all cameras have the lowest ISO as 100. On some cameras it's 200, and on others it's 50. ISO 100 is the most common, but whatever the lowest ISO number is on your camera is your Base ISO.

The maximum ISO setting depends on your camera. For instance, the maximum ISO for the camera in this example is 51200. That is the camera's highest sensitivity level which allows it to record the most amount of light.

When setting your ISO, the lower the ISO setting, the less light you'll get in your photo. The higher the ISO setting, the more light you'll get.

CHANGING ISO

If you already know how to change your ISO, you can skip to **APERTURE**.

Now, grab your camera because we're going to figure out how to change the ISO setting.

But, before you can change your ISO setting, you've got to make sure your camera is in Manual mode. So, if you haven't already, change your mode dial on your camera so that the "M" (for Manual) is your selected mode.

Most cameras have a dedicated button for changing the ISO, and it's typically labeled "ISO". On some cameras, the button allows you to access two functions, so it might be labeled with more than one option.

Typically the button is either on the top right side of the camera near the shutter button. If it isn't there, then it's likely on the back side, often on one of the directional pad buttons.

However, if you have a Nikon D7000 series camera, it's on the back of the camera on the left side. If you have a Nikon D3000 or D5000 series camera, there is a function button on the left front side of the camera that accesses the ISO setting.

Once you've found your button, changing the ISO is going to work in one of two ways.

The first way it might work is that you press the button and the ISO option becomes active. Depending on your camera, you either change the ISO using the directional buttons on the back of your camera or you spin a control dial to change it. *(On many cameras, you can use both.)*

If you have a camera with one control dial like the Canon Rebel series and the Nikon D3000 and D5000 series, that control dial will change the ISO.

If your camera has two control dials like the 60D, Nikon D7000 series, or any Pentax DSLR, one of the two control dials will change the ISO for you. You may have to try both dials.

The second way that it might work is that you have to press and hold the ISO button. This is how changing the ISO works on all Nikon DSLRs. Most other cameras don't require you to hold the button down, but if you press the button and then release it and find the ISO option isn't available, then you may need to hold the button while spinning the control dial.

Now that we know how to access the ISO function, we have to figure out what we're looking at. Depending on your camera, you'll be able to see your ISO setting in a few different places.

What we want to see are numbers that look like this. *(Everyone will have the bolded numbers and, depending on your camera, you may have the non-bold numbers as well.)*

100 125 160 **200** 250 320 **400** 500 640 **800** 1000 1250
1600 2000 2500 **3200** 4000 5000 **6400** 8000 12000 **12800**

On pretty much every camera, the screen on the back should activate and show you your ISO options. If your camera has a screen on the top, you may also see it there.

ISO on back LCD.

ISO on top screen.

Finally, when you look in the viewfinder, you should see your ISO somewhere along the bottom of the display. It is usually on the right hand side.

Once you've found it, I want you to change your ISO to find your highest and lowest ISO settings and write them down.

When you write them down, write it like this *(your numbers will probably be different)*:

ISO: 100 - 12800

These numbers indicate the highest and lowest sensitivity settings for your camera.

We'll talk about ISO in more depth later. For now, I want you to add a little note beneath your ISO range.

Under your lowest number, put a little minus symbol. Under the highest number, put a little plus symbol.

ISO: 100 - 12800
"-" "+"

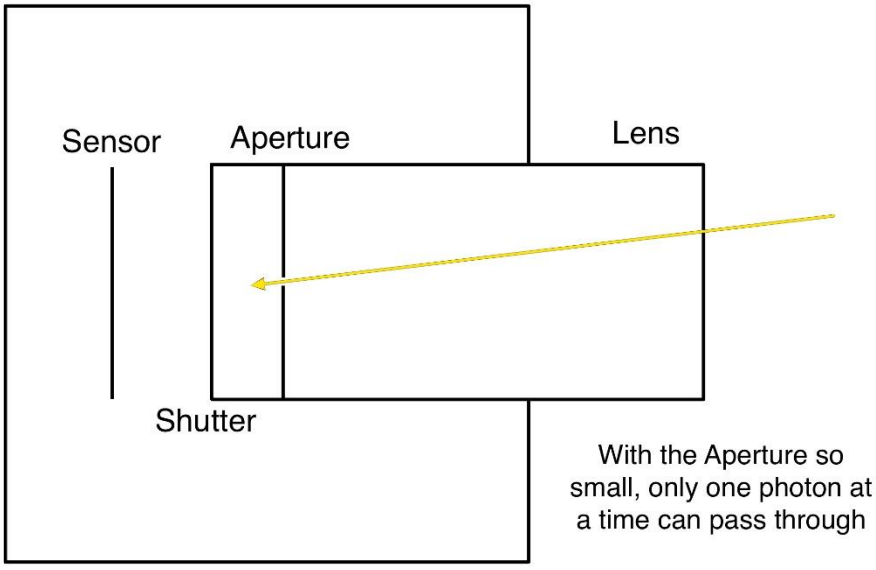
The plus and minus symbols indicate the impact of changing the ISO. Plus is more and minus is less. If you choose a lower ISO, it's like turning the volume down and you will get less light. If you use a higher ISO, it's like turning the volume up and you will get more light.

And a quick note while you're doing this: some cameras have extended ISO settings, like the HI and LO options on some Nikons. For now, don't worry about those extended options. Just write down the highest and lowest actual ISO numbers.

APERTURE

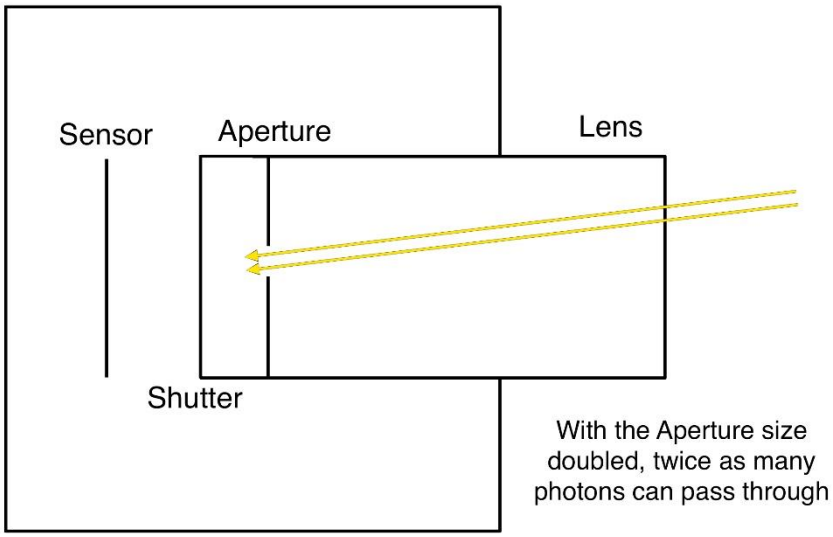
The size of the opening in the lens is the Aperture setting. This setting changes how much light gets to the sensor by varying the size of the opening in the lens.

For example, let's say that the opening is just large enough for one photon to pass through.



If the light is only coming in one photon at a time, that's a tiny amount of light being allowed into the camera to be recorded for your photo.

To increase the amount of light that's able to physically pass through the lens, you can increase the size of the aperture.



You change the size of the aperture by changing the Aperture setting. So, if the Aperture setting is changed to double the size of the opening, then two photons of light can pass through at a time, doubling the amount of light that is able to enter the camera for your photo.

Just as with the ISO, you can increase or decrease the amount of light recorded in your photo by changing the Aperture setting.

And, just as with the ISO, the Aperture setting tells you whether the aperture opening is small, letting in a little bit of light, or large, letting in a lot of light.

However, this doesn't vary from camera to camera, because the Aperture settings available for you to use depend entirely on the lens you are using.

For example, most DSLR cameras come optional with an 18-55mm zoom lens. On those lenses, the Aperture setting that makes the opening the BIGGEST it can be is f3.5. This is the Aperture setting that lets in the most amount of light possible for that lens.

On the rear screen of the camera, the Aperture setting is often shown with an "f" in front of the number, as in "f3.5". In the viewfinder or on the top LCD (if you have one), it is typically shown without the "f", as in "3.5".

On the 18-55mm zoom lens, the Aperture setting that makes the opening the SMALLEST it can be is typically f22, which lets in the least amount of light possible for that lens.

With your Aperture setting, the numbers are backwards. When you set your Aperture to a smaller number, the aperture opening is larger, letting in more light. When you set it to a larger number, the aperture opening is smaller, letting in less light. I'll explain why this is in the UNDERSTANDING APERTURE chapter.

CHANGING APERTURE

Alright, now we're going to learn how to change the Aperture setting. *(If you already know how to change this setting on your camera, you can skip ahead to* **SHUTTER SPEED***.)*

Grab your camera, make sure it's in Manual mode, and turn it on. If it's already on, press the shutter button halfway to wake up the camera.

This is important. If you don't press the shutter button down halfway before you start trying to change these settings, it might seem like nothing is happening. This is because the camera often goes into a sleep mode if you don't use it for a while.

If you have two control dials on your camera, then one of those two control dials will change the Aperture for you. It's commonly the rear control dial but it could be the front/top dial.

Start by spinning the front/top dial. When you spin the dial, you should see a number changing on the back screen or, if you have one, on the top LCD.

The number that's changing will likely be between 3.5 and 22, and it may have an "f" in front of it. If you see some other number changing that is in the hundreds or is a fraction, then the other dial changes your Aperture.

If your camera only has one control dial, you need to press and hold a button on your camera while spinning your control dial in order to change your Aperture.

The button will be marked with a symbol that looks like this:

Depending on your camera, the button will be either on the back or the top.

Wherever it is, press and hold that button while spinning your control dial. When you do that, you should see the Aperture number changing. *(Remember, if nothing is changing then half press the shutter button to wake up the camera.)*

Just as we found the highest and lowest ISO, I want you to find and write down the highest and lowest Aperture settings. But, before you do, I need you to do something else.

Take your lens and zoom it all the way back so the lens is at its widest zoom setting. If you have an 18-55mm kit lens, then zoom the lens to 18mm. If you're using a non-zoom lens, also called a prime lens, don't worry about this.

I'll explain why we're doing this when we look at Aperture in more depth.

Once your lens is properly zoomed, change your Aperture by spinning the control dial all the way to the left. Remember to press and hold the button with the symbol shown above if your camera requires it.

When the number stops changing, write that number down. If you have an 18-55mm kit lens, the number should be something like 3.5. If you have a different zoom lens or a prime lens, you may have a different number like 1.8, 2.8, or 4.

Underneath the number, write a little plus sign. This number indicates the Aperture setting for this lens which lets in the most light. Remember when I mentioned that the numbers for Aperture are backwards? The plus goes under the smallest number because that lets in the most light! This is fully explained in the **UNDERSTANDING APERTURE** chapter.

Now spin that dial all the way to the right until it stops changing again. Remember to press and hold that button if your camera requires it.

This number will be something like 22 or 32 but, again, it will vary depending on your lens.

Write that number down. Underneath that number, write a little minus symbol. This is the smallest possible Aperture for this lens which lets in the least amount of light.

So you should have these numbers written down and it should look something like this:

Aperture: 3.5 - 22
"+" "-"

And that's how you change the Aperture.

Now you need to make one more note. Remember that the Apertures available to use are determined by the lens you are using. This means when you change the lens on your camera, you change the largest and smallest Apertures you can use.

For example, with an 18-55mm kit lens, the Aperture range is 3.5 to 32. But if you also have a 50mm prime, then you've got a lens with an Aperture range of 1.8 to 22.

So in your notes mark which lens you are using next to the Aperture values you just wrote down. If you have other lenses, you may want to put them on your camera to figure out their Aperture range.

Aperture: 3.5 - 22 (18-55mm lens)
"+" "-"

Alright, now we know how to change the ISO and Aperture. Next, let's take a look at Shutter Speed.

SHUTTER SPEED

The third piece is how long the shutter is open. This is the Shutter Speed setting. This setting changes the amount of time the shutter is opened when recording a photo.

It's only when the shutter is open that light is actually able to strike the sensor and be recorded for a photograph. The longer the shutter is open, the more light is able to strike the sensor to be recorded for a photo.

For example, let's say the shutter opens for one second. During the one second that the shutter is open, four photons are able to pass through the aperture and strike the camera sensor.

If only four photons are able to strike the sensor, then you can only record four photons for your photo. *(In this example, we're ignoring the ISO setting.)*

To increase the amount of light for the exposure, you can leave that shutter open longer. If we leave the shutter open for twice as long - two seconds - then eight photons will now make it through the aperture to the camera sensor.

By keeping the shutter open for a longer period of time, more light can get to the sensor to be recorded for the photograph.

Just as when you change the ISO or Aperture setting, you can increase or decrease the amount of light recorded for a photo by changing the Shutter Speed setting.

Just as with ISO and Aperture, the Shutter Speed setting tells you how much or how little light you are getting. With Shutter Speed, the setting is actually the amount of time the shutter will be open, measured in seconds.

On most DSLRs and Mirrorless cameras, the longest Shutter Speed is 30 seconds. This is the setting that lets in the most amount of light. On your camera, that's shown like this: **30"**.

The shortest Shutter Speed will vary from camera to camera. For example, the shortest Shutter Speed on the camera in this example is 1/8000 of a second which lets in the least amount of light.

This is shown just as it is written, but sometimes it is shown just as a number instead of a fraction. So 1/8000 might be displayed like this: **8000**

If you remember from math in school, the top number in the fraction is the Numerator, and the bottom number in the fraction is the Denominator. Typically, the full fraction is shown on the back of the camera while only the Denominator is shown in the viewfinder and on the top LCD screen (if you have one).

CHANGING SHUTTER SPEED

If you already know how to change your Shutter Speed, you can skip to **HOW ISO, APERTURE, AND SHUTTER SPEED WORK TOGETHER**.

Now we're going to learn how to change the Shutter Speed so grab your camera and make sure it's in Manual mode. Turn it on or, if it's already on, press the shutter button halfway to wake up the camera.

Changing the Shutter Speed is pretty easy.

If your camera only has one control dial like the Canon Rebel series and the Nikon D3000 or D5000 series cameras, that dial changes the Shutter Speed by default.

This is the only control dial, and this changes the Shutter Speed.

If your camera has two control dials, then one of those two dials will change the Shutter Speed.

In that case, if you use the rear control dial to change your Aperture, then the front dial will control the Shutter Speed. If the front dial controls the Aperture, then the rear controls the Shutter Speed.

Just like with ISO and Aperture, let's find the Shutter Speed range and write it down.

Start by spinning the control dial to the left until the number stops changing. You should see a number on the rear LCD or the top screen changing. If no numbers are changing, remember to press the shutter button halfway down to wake up the camera.

On most cameras, the last number you see will be **30"** but, depending on your camera, the last option might be "**Bulb**".

We'll worry about Bulb later. If you see Bulb, go one click back to the right and you should see a number with a hash mark, like this:

Whatever your number is, this is the longest your shutter can be open to take a photo.

The hash mark you see after the number is the international standard notation for seconds. This tells us that the longest time the shutter can be kept open for a photo is 30 seconds.

Write that number down and underneath it write a plus symbol.

Now spin the dial to the right until the number stops changing again. And my apologies if I sound like a broken record but, if nothing is changing, press the shutter button halfway down to wake the camera up.

When it stops changing, you'll see a number that will look one of two ways.

If you're looking at the back of the camera, you'll probably see a fraction. In the example below, you can see that the number is 1/8000. You may have a different fraction such as 1/4000 or 1/2000. It all depends on your camera.

You most likely will not see a fraction on the top LCD. Instead, you'll just see the denominator of that fraction, like this:

Both numbers mean the same thing. They're just saving space by not putting the full fraction on the smaller top display. That fraction means a fraction of a second. In the case of the K-3, the shortest time the shutter can be open is 1/8000 of a second.

When you write this number down, write it down as a fraction. Under the fraction, put a little minus symbol. This is like turning the volume down, because only a tiny bit of light is going to be able to get to the sensor when the shutter is open for just 1/8000 of a second.

Shutter Speed: 30" - 1/8000
"+" - "-"

Now that we know how to change the ISO, Aperture, and Shutter Speed settings, let's use this information to take some photos!

HOW ISO, APERTURE, AND SHUTTER SPEED WORK TOGETHER

As you recall, when we take a photo we record a specific amount of light which is called an exposure. This is critical because we determine exactly how much light we're going to record by adjusting the ISO, Aperture, and Shutter Speed.

For example, let's say we want an exposure of 2 photons. *(Again, we're using made up numbers to illustrate the concepts.)*

The ISO is set to 100 which is typically the lowest sensitivity level on a camera. At ISO 100, let's say that each photon registers at ¼ power.

The Aperture is set to f22 which we'll say lets in one photon at a time.

Finally, the Shutter Speed is set to two seconds, and we'll say one photon will hit the sensor every quarter second (four photons per second).

So these are the current settings:

ISO: 100 (1/4 power per photon) + Aperture: f22 (one photon at a time) + Shutter Speed: 2" (four photons per second)

With our settings set, when we press the shutter button to take the photo, the aperture let's one photon through at a time. Over the two seconds the shutter is opened, eight photons will pass through the lens and strike the camera sensor. With the ISO at 100, the photons register at 1/4 power. The amount of light recorded will be 2 photons, capturing exactly the quantity of light that we wanted.

ISO: 100 (1/4 power per photon) + Aperture: f22 (one photon at a time) + Shutter Speed: 2" (four photons per second) = 2 Photons

8 photons x ¼ power = 2 photons

Now, let's make a change.

We still want to record two photons. The ISO is still set to 100, and the Aperture Setting is still f22, but now the Shutter Speed is set to one second.

So our settings look like this:

ISO: 100 (1/4 power per photon) + Aperture: f22 (one photon at a time) + Shutter Speed: 1" (four photons per second)

When we press the shutter button, the shutter opens for one second.

During that one second, only four photons will hit the sensor because the aperture is still only letting in one photon of light at a time, and the ISO setting is still only registering the photons at 1/4 power. That means that we've recorded just one photon of light.

If we want two photons for the exposure, this is not enough light.

ISO: 100 (1/4 power per photon) + Aperture: f22 (one photon at a time) + Shutter Speed: 1" (four photons per second) = 1 Photons

4 photons x ¼ power = 1 photon

By changing the Shutter Speed, we restricted the amount of time that light was allowed to get to the sensor which decreased the total amount of light recorded to one photon.

If we want to maintain an exposure of two photons, we will have to change either the ISO setting or the Aperture setting to increase the amount of light that's recorded during the one second Shutter Speed.

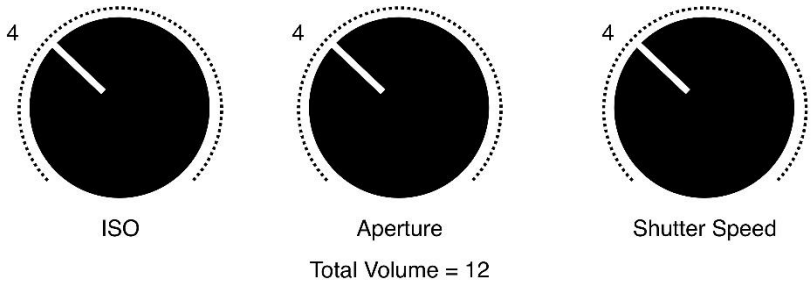
To compensate for the change in Shutter Speed, we can open up the aperture to allow two photons pass through at a time (f16). That doubles the amount of photons that can reach the sensor during that one-second Shutter Speed. With the ISO setting registering them at ¼ power, that brings our total exposure back to two photons which is right where we want it.

ISO: 100 (1/4 power per photon) + Aperture: f16 (two photons at a time) + Shutter Speed: 1" (four photons per second) = 2 Photons

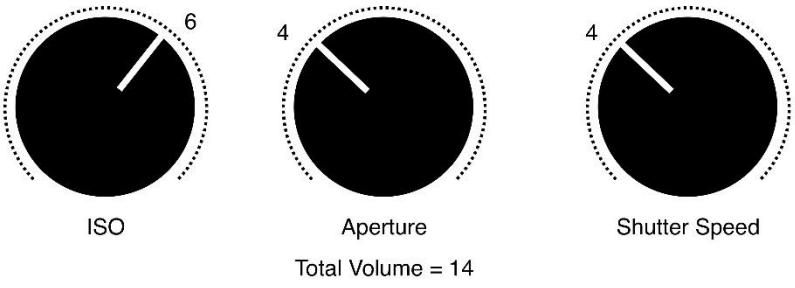
If you want to keep the amount of light recorded for your photo the same, when you change any one of your three settings (ISO, Aperture, or Shutter Speed) you have to change one (or both) of the other settings to compensate for the change in the first setting.

When taking a photo, we want to capture a specific amount of light, and we have THREE different controls that can alter the amount of light you can capture.

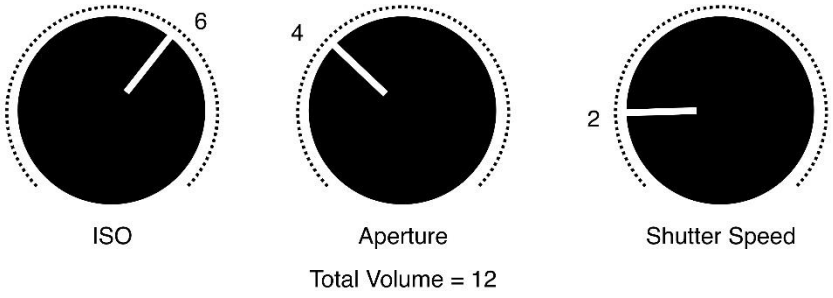
It's kind of like having three volume controls on your stereo. If you want the volume set at 12, you can set all three volume controls at 4 which will give you a total volume of 12.



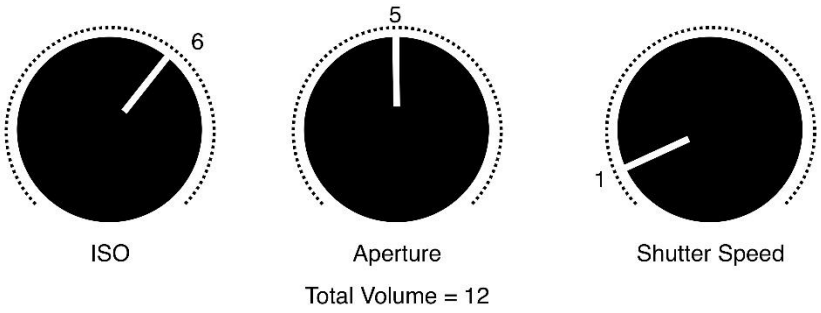
If you want the volume set at 12, you can't change volume one to 6 and leave volumes two and three set to 4, because then the total volume will be 14.



In order to keep the volume at 12 with volume one set to 6, you could keep the second volume at 4 and set the third at 2, resulting in a total volume of 12.



You could also have volume one set to 6, volume two set to 5, and volume three set to 1 (or in any other combination that adds up to 12).



ISO, Aperture, and Shutter Speed are the three volume knobs for our cameras and, as mentioned earlier, they create the foundation for all photography.

TAKING CONTOL OF YOUR CAMERA

Now, let's learn how to set those volume controls ourselves.

Up until this point, when shooting in Auto mode, the camera has been setting the ISO, Aperture, and Shutter Speed settings for you.

In the chapter on **HOW ISO, APERTURE, AND SHUTTER SPEED WORK**, we learned how to change these settings. Now we're going to learn how to set these settings in order to take a photo.

And just like when changing these settings, in order to control and set these settings to take photos, you need to put your camera into Manual mode.

In Manual mode, we are in total control of the camera and have total control over ISO, Aperture, and Shutter Speed.

This means we can set the settings however we want to in order to take a photo but, in order to set our settings, we need to know how much light we want to capture for the photo.

Fortunately, we don't have to guess at the amount of light we want to capture, because the camera tells us how much light we need with the **exposure indicator**.

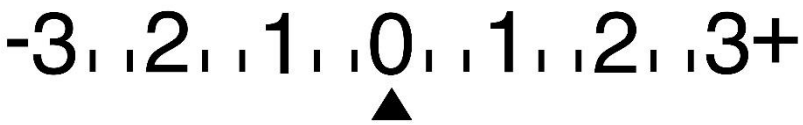
We know that an exposure is the specific amount of light that we capture when we take a photograph. The exposure indicator tells us what that amount is. It looks like this:

As you can see, there is a 0 in the middle of the indicator with positive and negative values on either side.

For the most part, your indicator will look something like that. However, some older Nikon cameras have it reversed so that the positive values are on the left instead of the right. It looks like this:

Regardless of the direction, here's how it works.

The camera calculates the amount of light that will be captured based on the current ISO, Aperture, and Shutter Speed settings. When the exposure indicator is pointing at 0 it tells you that, with the current ISO, Aperture, and Shutter Speed settings, the camera will capture what it thinks is the correct amount of light for the subject you are about to photograph.



Exposure indicator at “0”.

If the indicator is pointing at a positive value, such as +2, the camera thinks that the current settings will capture too much light which will result in a photo that is too bright.

Exposure indicator at “+2”.

If the indicator is pointing at a negative value, such as -2, the camera thinks that the current settings will capture too little light which will result in a photo that is too dark.

Exposure indicator at “-2”.

I keep saying, "the camera thinks", because what the camera thinks is the correct amount light doesn't always give you the results that you actually want.

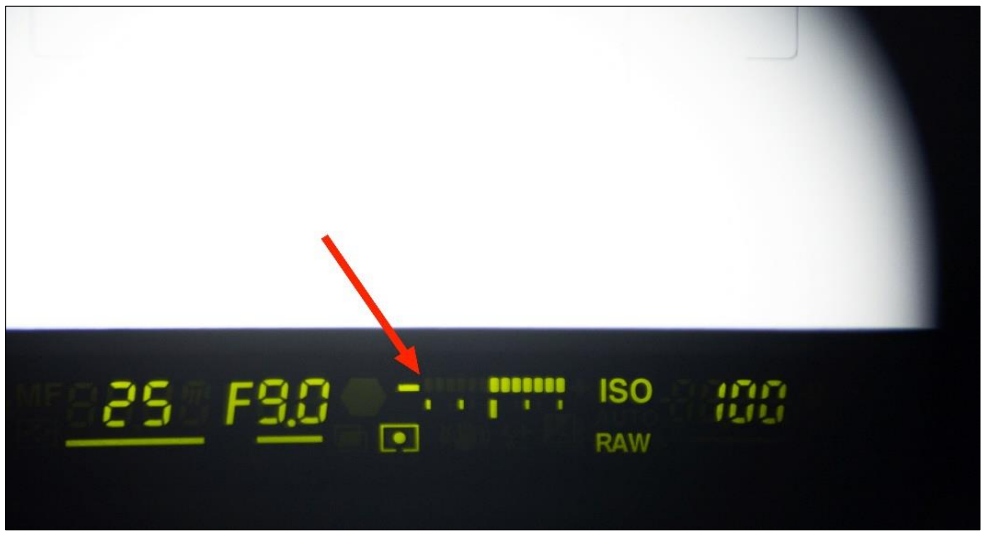
For now, because we're just getting started shooting in Manual mode, we're just going to work at getting the exposure indicator to read 0.

You can find the exposure indicator in one of three possible places.

Pretty much every DSLR shows the exposure indicator on the back screen of the camera.

If you have a top LCD screen, you may see the indicator there.

Finally, on all DSLRs, Mirrorless, and advanced point and shoots with viewfinders, you can see the exposure indicator in the viewfinder, typically at the bottom in the info display.



Take a moment and make sure you can find your exposure indicator.

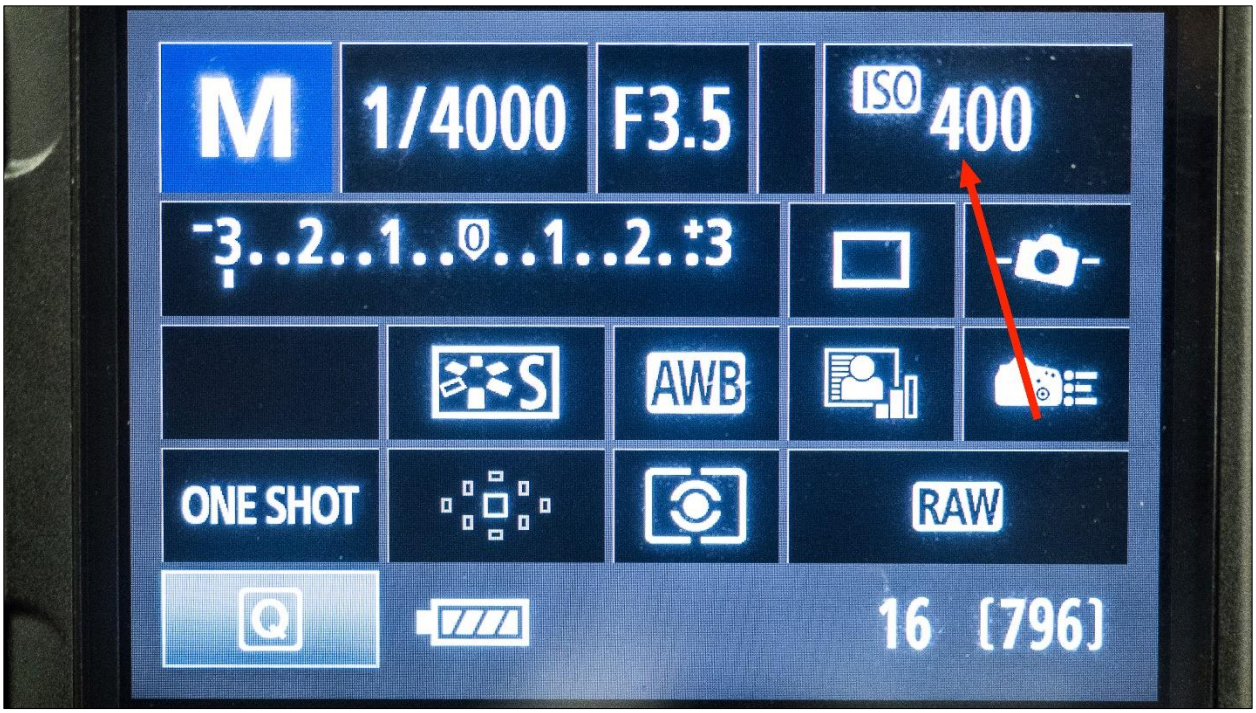
Now what we're going to do is go through the process of setting the settings so that the exposure indicator reads 0, and then we'll take some photos.

WARNING: These photos are going to suck. That's fine. Right now, we're just figuring out how all of this works. Also, your final settings will be different from the example settings given in this exercise.

Let's get started.

Grab your camera, take off the lens cap, turn it on, and make sure that it's in Manual mode.

First, we're going to set the ISO. To get started, I'd like you to set your ISO setting to 400.

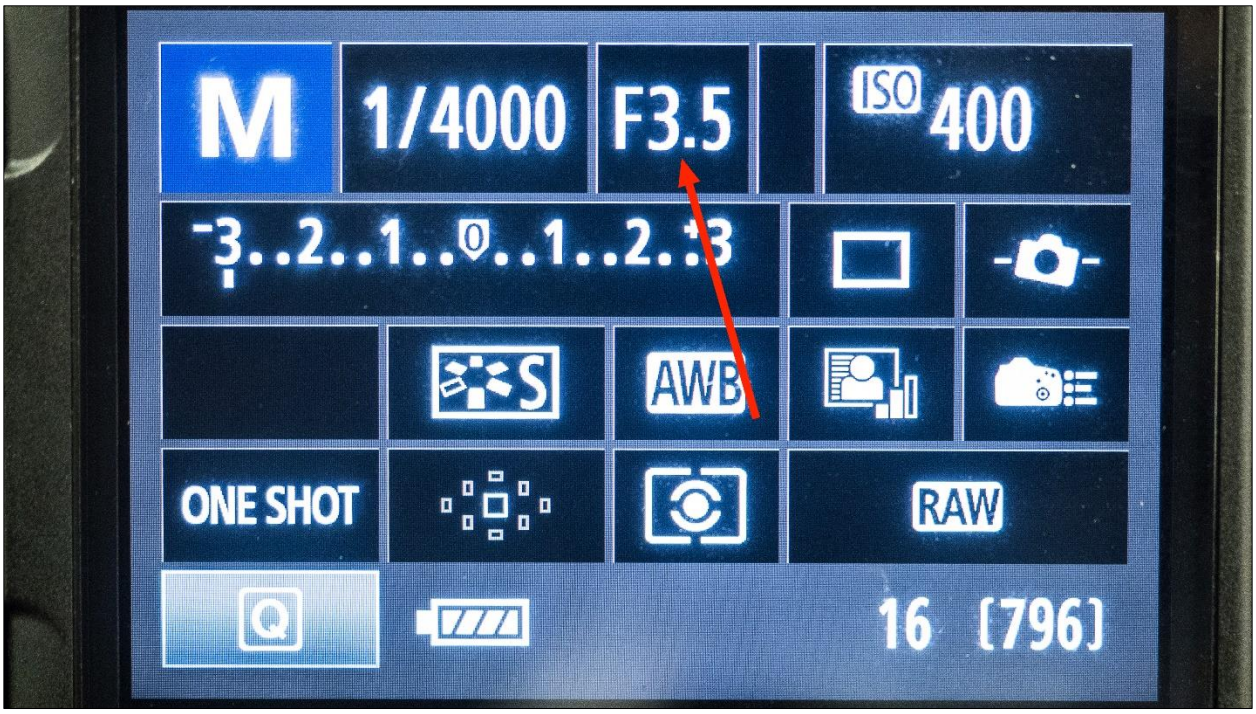


Remember, ISO is one of our three volume controls for light. At ISO 400, we're at a sort of medium low volume for ISO.

After setting the ISO to 400, we're going the change the Aperture.

Set your Aperture to the lowest number but, before you set your Aperture, make sure your lens is zoomed to the widest angle and press your shutter button halfway down to make sure the camera is awake.

The lowest Aperture number available to you will vary depending on the lens you are using. If you're using a kit lens that came with your camera, it will probably be something like f3.5.



With the ISO and Aperture set, all that's left is the Shutter Speed but, before we set the Shutter Speed, we need to check the exposure indicator.

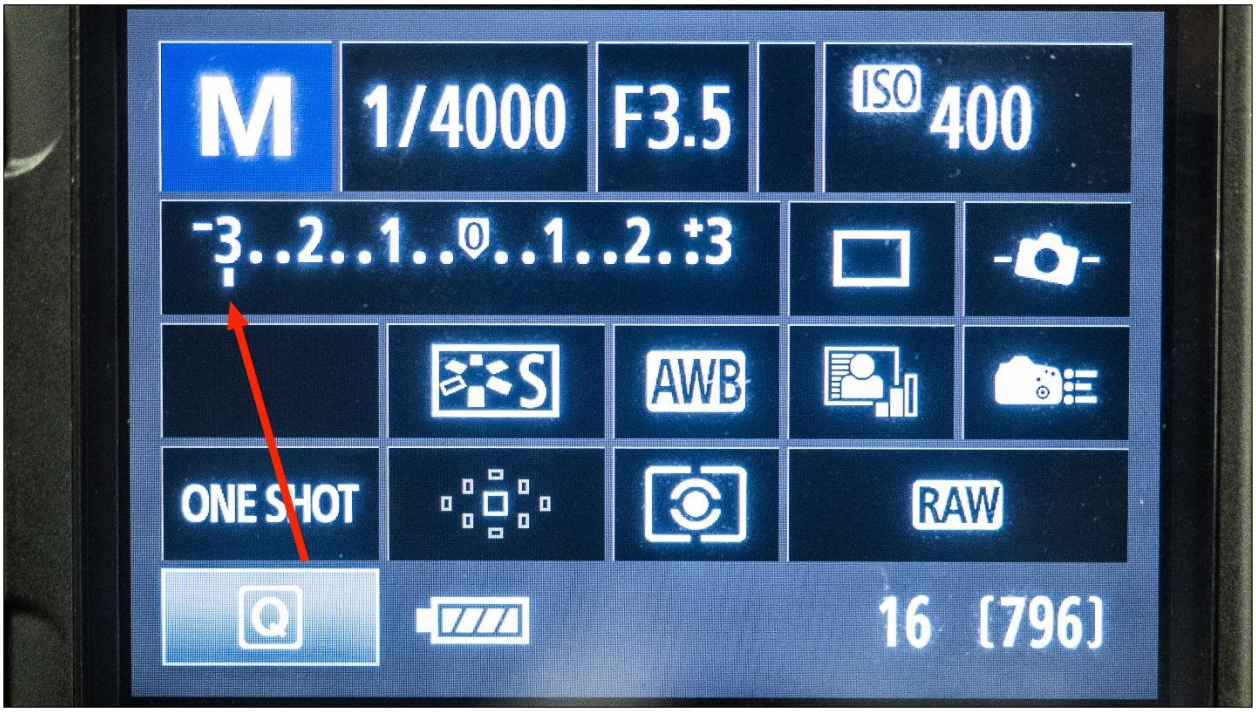
The Shutter Speed is our last volume control. When we set the Shutter Speed, we want the exposure indicator to end up on the 0. We need to see what the exposure indicator is reading because that will tell us what we need to do with the Shutter Speed.

And here I want to make a very important point. When you check your exposure indicator, you must be pointing the camera at the subject you are about to photograph.

This is because the camera calculates the amount of light based on whatever it sees through the lens. If you point the camera at the floor when you check the exposure indicator, you'll get a reading for what the exposure would be if you took a photo of the floor. This will be a completely different reading from the subject you actually intend to photograph. *(Unless you intend to photograph the floor!)*

So point the camera at whatever you want to take a photo of and then press the shutter button halfway down to wake up the camera.

Your exposure indicator should look something like this:



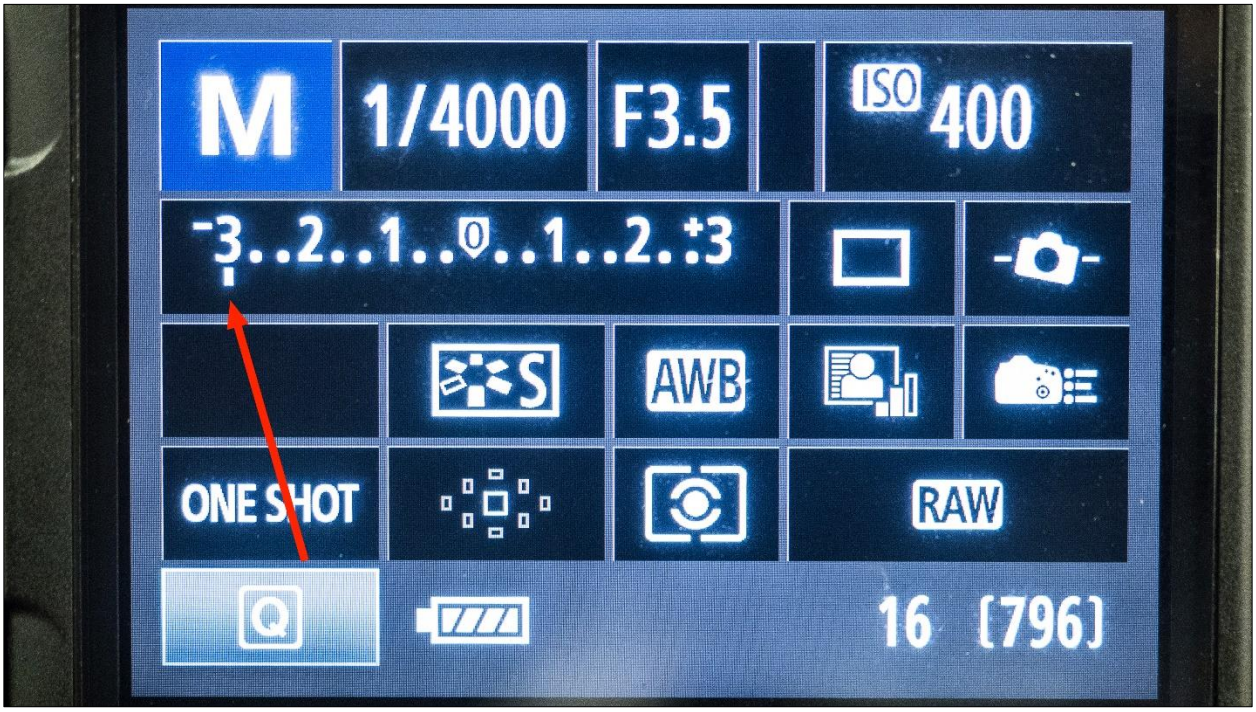
Your exposure indicator will likely show something different.
It may be on the “+” side or, if you’re lucky with your settings and subject, it could actually be at “0”.

In this example, the exposure indicator looks like it is -3 which tells us that the camera wants more light but this is actually telling us something different. Because this is a picture, what you can’t see is that the exposure indicator is blinking.

What that blinking means is that the exposure indicator can’t display the actual exposure reading. *(On some cameras, the little pointer will turn into an arrow. On most cameras, it will blink to indicate that it can’t give you a precise reading. On this camera, the pointer doesn’t change but it does blink.)*

When you see this it means that, at the current settings, the exposure is beyond what can be displayed on the exposure indicator. In other words, the reading is something like -6, -10, or -50, depending on the situation.

Every camera's exposure indicator has a display limit. On the camera in this example, the limit is +3 and -3. Your camera will have its own limit. Regardless of the limit, when you are beyond the limits of the exposure indicator your camera will give you an indication of that.



Right now, the important thing to recognize is that the exposure indicator is giving a negative reading in this example. This means that, at the current Shutter Speed, the camera will not get enough light for the photo and the photo will be too dark.

That means we need to turn up the volume on the Shutter Speed setting to get more light for the photo.

In this example, the Shutter Speed is currently set to 1/4000 which means that for this camera, the Shutter Speed volume control is turned all the way down, letting in the least amount of light.

What you are seeing on your camera will be different, but here's what's important to understand.

If the exposure indicator is showing a negative value, the camera needs more light. If the exposure indicator is showing a positive value, the camera needs less light.

Either way, unless your exposure indicator is at 0, you will need to change the Shutter Speed to let in more (or less) light.

Before you start changing it, press the shutter button halfway down to wake up the camera. If you don't do that, you won't see anything happening on the exposure indicator when you start changing the Shutter Speed.

Even with the camera awake, you won't see any changes on the exposure indicator right away if your exposure indicator is off the charts when you start changing the Shutter Speed.

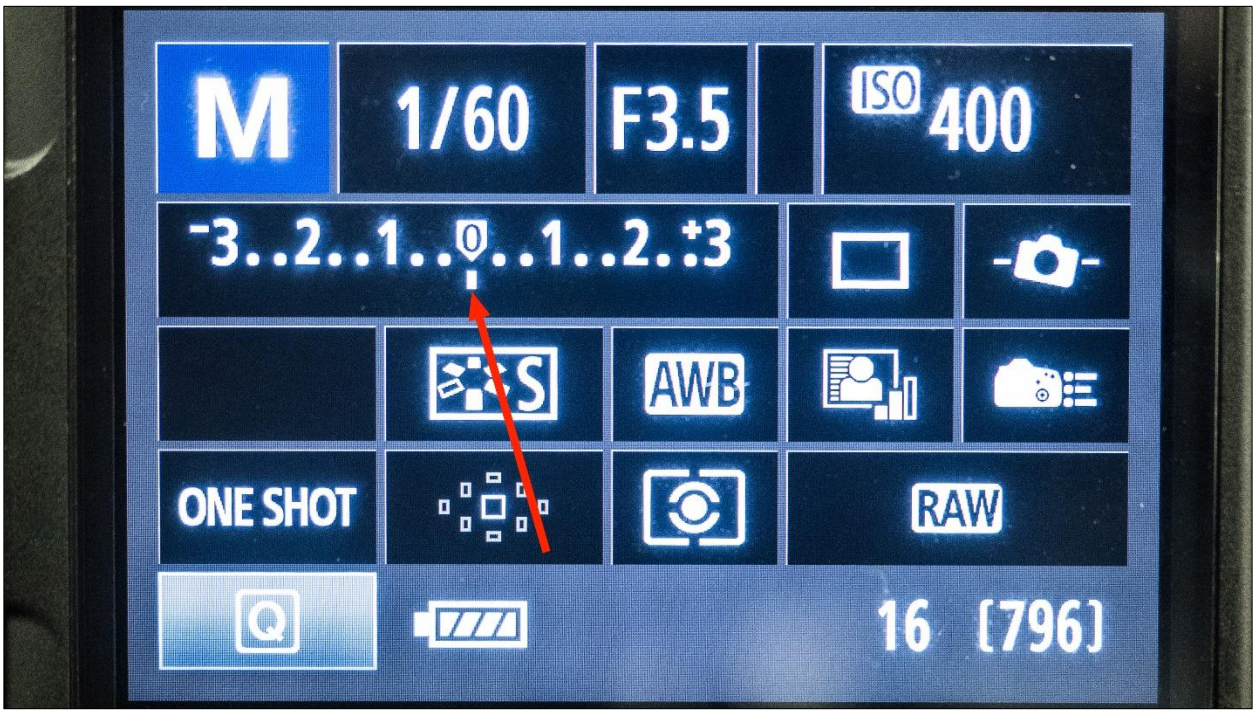
This happens because your exposure is so far off the charts that a big change in the Shutter Speed is required before it will start to show up on the exposure indicator.

For example, if I'm at -20 and I change the Shutter Speed to 1/1600, that's a pretty big change from 1/4000, but I might still be at -10. The exposure indicator only goes to -3 so it's going to keep showing that it's off the charts (and will also keep blinking). I've made a change, just not enough of a change.

So don't freak out if you don't see anything happening right away. As long as you pressed the shutter button halfway to wake up the camera, all you need to do is keep changing your Shutter Speed until you start to see your exposure indicator moving.

If you haven't done it already, half press your shutter button to wake up the camera, point it at the subject you want to photograph, and then change your Shutter Speed until your exposure indicator reads 0.

In this example, I started at 1/4000. I had to go to 1/60 to get to a zero exposure.



One thing you may notice as you get near 0 is that the exposure indicator keeps jumping around instead of staying exactly on 0.

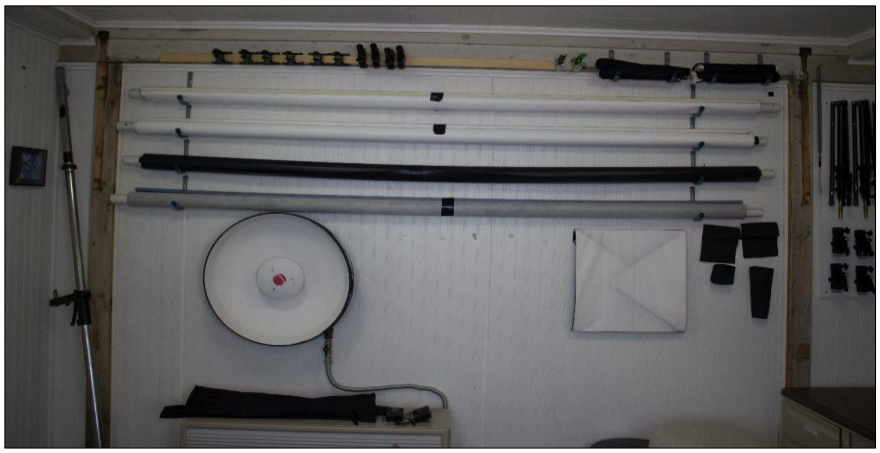
This is normal. When it’s active, the camera is constantly evaluating the exposure and giving you a new reading of the scene. When you're hand holding the camera, the tiny movements from you changing the settings or just holding the camera will cause the camera to re-calculate the exposure with those movements.

Don't keep trying to get it to 0, because every change will just cause it to bounce around more as the camera moves.

As long as it stays near 0, go ahead and take your shot.

Now you should have taken a photo, and it's entirely possible that the photo is all blurry.

If it’s blurry, that's fine. Remember, we knew we'd be taking crappy photos for this exercise.



Here's the 0 EV photo that I took for the example.

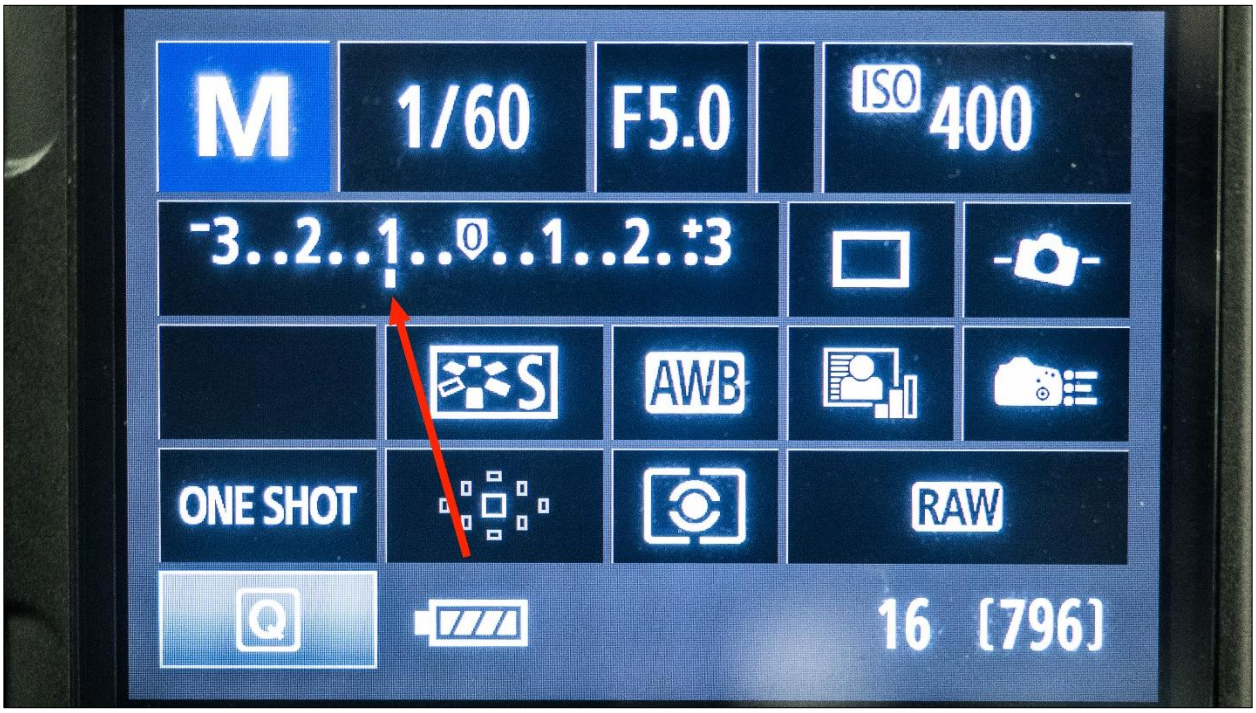
Now you're going to take another photo, but you're going to change a setting first.

I want you to change the Aperture by three clicks of the control dial.

We're going to turn down the aperture volume a little bit. Remember, the larger the Aperture number gets, the smaller the aperture opening is and the less light you get, so this change will make the Aperture number larger.

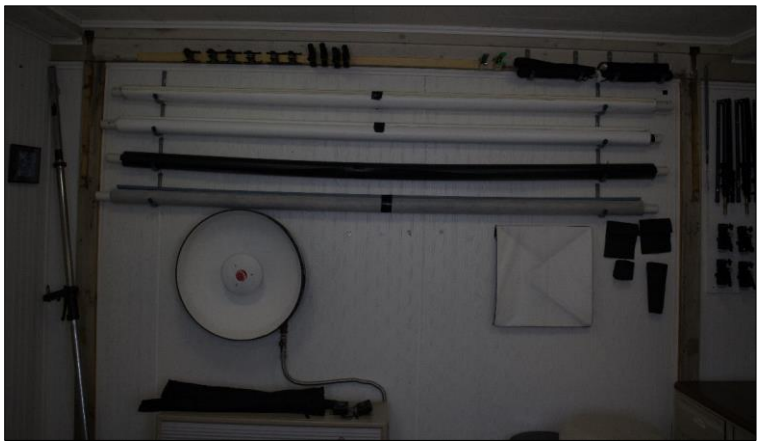
If you were at f3.5, you should end at f5. If your lowest Aperture setting was different, just change it by three clicks. Remember to half press the shutter button first to wake up the camera.

Now point your camera at the same subject you photographed before, and look at your exposure indicator. It should be reading around -1.



It may not be exactly -1, but it should be close to it. This is because we changed one of our volume controls. As a result, we changed how much light would be captured which resulted in a new exposure reading.

Go ahead and take the photo. It should be noticeably darker than the first photo.



-1 EV

Now I want you to change another setting. Change your ISO setting from 400 to 1600.

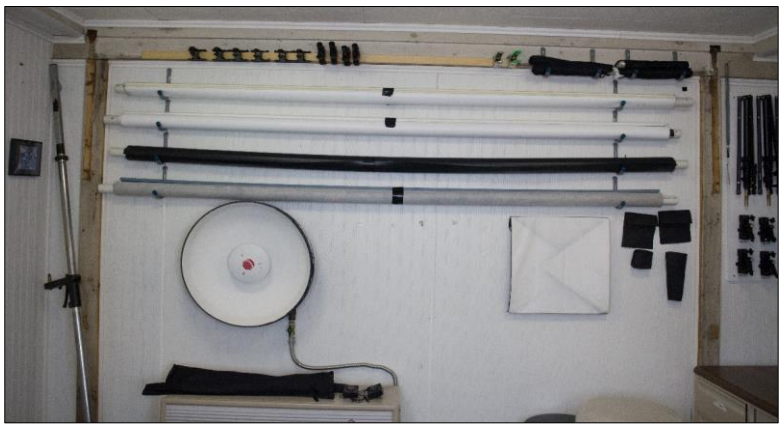
On some cameras, it will takes 6 clicks of the dial (or presses of the button) to go from 400 to 1600. On other cameras, it will only be two.

Either way, set your ISO to 1600. Then point the camera at your subject again and check your exposure indicator. You may need to press the shutter button halfway to wake up the camera.

Now it should be reading around +1.

Again, we changed a volume control. We changed the amount of light that would be captured which resulted in a new exposure reading.

If you haven't taken the photo yet, go ahead and take it. It should be noticeably brighter than both of the previous photos.



+1 EV

Now it's time to change the settings one more time to get back to 0.

Point your camera at the subject, press the shutter button halfway down to wake up the camera, and then change your Shutter Speed to give you a 0 reading on the exposure indicator.

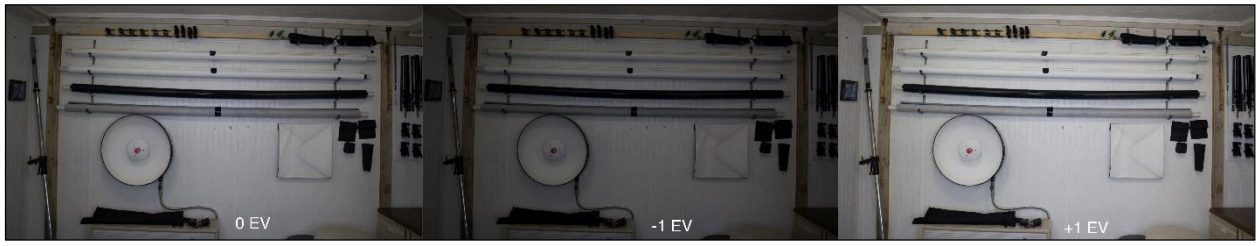
You have just used one of your volume controls, Shutter Speed, to compensate for the other changes made to bring your exposure back to 0.

Let's take a moment to compare those photos. The first photo was taken with the exposure indicator reading 0. This is called an **exposure value** of 0 (0 EV).

Exposure Value: The number shown on a camera's exposure indicator showing if the image is underexposed, overexposed, or properly exposed according to the camera's calculations.

The second photo was taken with an exposure value of -1 (-1 EV). This photo is darker than the first. If we were to actually measure how much darker, we would discover that it is twice as dark as the first photo.

The third photo was taken with an exposure value of +1 (+1 EV). This photo is brighter than the first. If we measured it, we would discover that it is twice as bright as the first photo. (It's four times as bright as the -1 EV photo.)



This is valuable information because now we have a unit of measurement to work with. The way the camera calculates how much light you need for an exposure value of 0 is kind of arbitrary. With the exposure indicator, we can see when we're at 0 but we never actually know how much light we're recording.

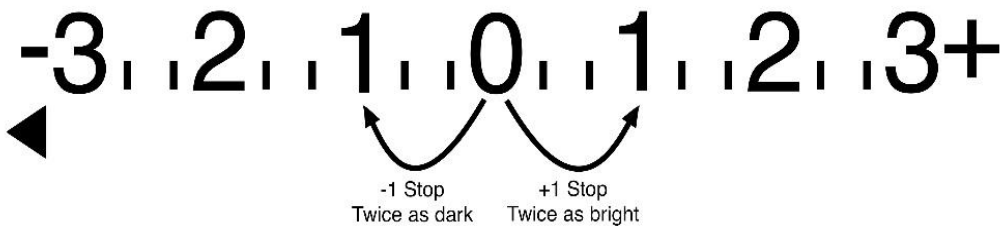
The good thing is that we don't really need to know how much light we're recording.

What we do need to know is how much the amount of light changes when we change our settings.

We know that going one step up the exposure indicator makes the image twice as bright, and going one step down the exposure indicator makes the image twice as dark. That change of twice as bright or twice as dark is called a **Stop**.

A Stop is how we measure the change in the amount of light captured when we change our settings. A one stop change makes the image either twice as bright or twice as dark.

Our exposure indicator measures light in stops.



When you are out shooting photos, you can use this knowledge to decide how and when you'll change your settings based on how you want the photo to look.

Let me show you an example. Let's say that you're taking a photo of a scene.

You set your settings to get a 0 EV and the photo looks like this:

Photo with 0 EV

And when you look at the photo, you think, *"Well, the camera thinks this is correct, but I think it's too dark. I'd like this to be about twice as bright."*

You know that, in order to make the photo twice as bright, you need to increase the amount of light captured for the photo by one stop.

Since you started with an exposure value of 0 (0 EV), you know that you need to change at least one of your settings (ISO, Aperture, or Shutter Speed) to give you an exposure value of +1 (+1 EV).

Photo with +1 EV

If that still wasn't bright enough, you could make it twice as bright again by changing at least one of your settings (ISO, Aperture, or Shutter Speed) to give you an exposure value of +2 (+2 EV).

Photo with +2 EV

An important thing to understand is that there is no right answer for how bright or dark any given photo should be. As the photographer, that is entirely up to you to decide based on what you want your final photo to look like.

The question is, how do you know how to make that choice? We're about to get to that.

But first you need to practice.

Up until this point, we've been focusing on how the camera functions. That part may be kind of boring, but it is really important. If you don't know how your camera functions, then you can't use it to create amazing photos.

At this point, you should know how to change your ISO, Aperture, and Shutter Speed. You should also know how to read your exposure indicator and set your ISO, Aperture, and Shutter Speed to take a photo with a "correct" exposure of 0 EV.

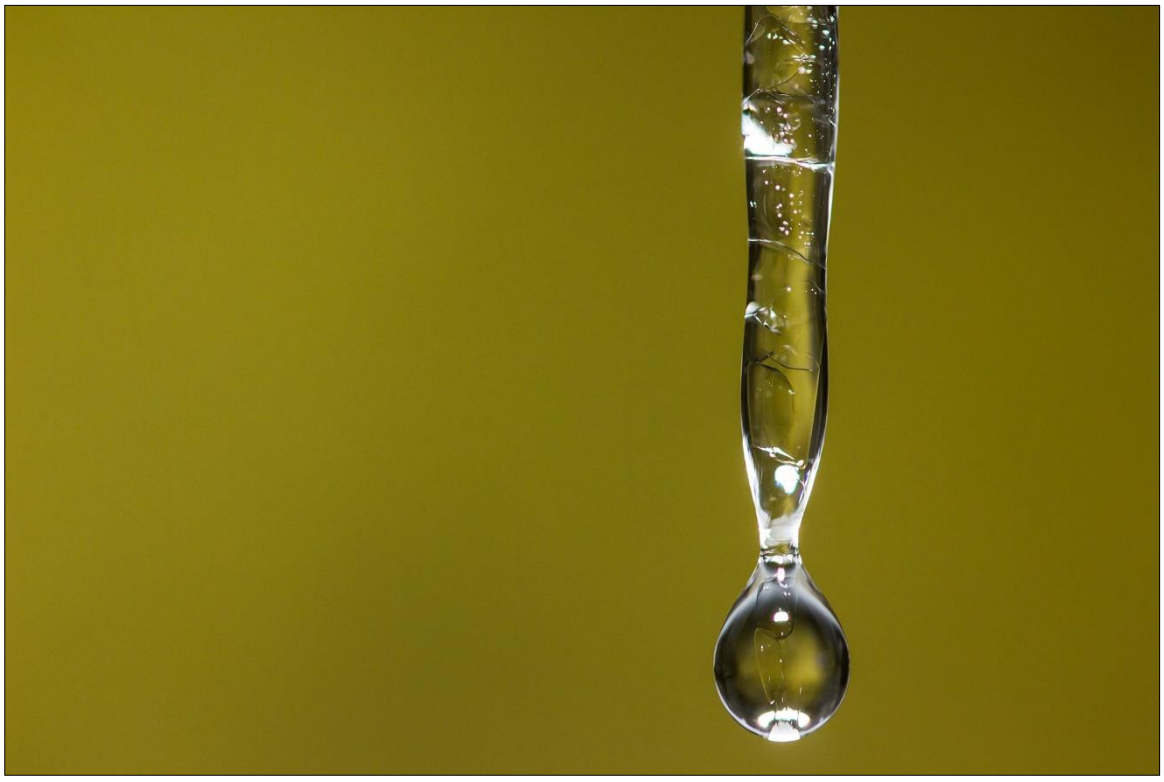
This is great, because it gives you control. This control is new to you which means you're not going to remember all of this right away. You might forget how to change a setting or what the Aperture or ISO number means, so you need to practice.

Go out and shoot to practice setting your settings to get a 0 EV exposure. Practice overexposing and underexposing on purpose, and practice changing the ISO, Aperture, and Shutter Speed settings to adjust your exposure.

When you do this, your photos will most likely suck, and that's okay. What's important here is getting comfortable controlling your camera. The more you practice, the quicker you'll be at changing your settings. With enough practice, you won't even have to think about it. You'll be able to change your settings instantly from muscle memory.

I know you're about to read on and that's great because we're about to get into the really good stuff. But please don't forget to get out there and practice controlling your camera as much as you can!

PART 2: USING YOUR CAMERA TO TAKE FANTASTIC PHOTOS



This is where we get to the good stuff, and the good stuff answers the question that you've probably been asking yourself:

How do I know which settings to set?

This is an excellent question, because realistically there are thousands of combinations of ISO, Aperture, and Shutter Speed that you could use to take any one photo. However, there's only ONE combination of ISO, Aperture, and Shutter Speed that will result in a photo that looks the way you want it to look.

So what we're going to do now is look at each one of those settings so that we can understand what they do to make our photos look the way they do.

Knowing how changing your ISO, Aperture, or Shutter Speed will change the way your photo looks will allow you to choose exactly what ISO, Aperture, or Shutter Speed you want so that the photo looks exactly the way you want it to look!

If you don't have your camera handy, grab it, because you're going to need it!

UNDERSTANDING ISO

We're going to start with the ISO setting. *(By the way, this isn't really important, but ISO is pronounced "eye-so" rather than "I-S-O".)*

We know that ISO is one of the settings that allows us to control how much light we capture when taking a photo, and we know that it does this by controlling how sensitive the camera sensor is to the light that hits it. You should also already know the minimum and maximum ISO for your camera.

In this example, the lowest ISO is 100. The highest ISO is 12800.

These numbers indicate the level of sensitivity.

100 125 160 **200** 250 320 **400** 500 640 **800** 1000 1250
1600 2000 2500 **3200** 4000 5000 **6400** 8000 12000 **12800**

Looking at the full range of this camera, we can see that ISO 100 is the lowest sensitivity level. As you increase the ISO, it increases the sensitivity.

So a lower number means lower sensitivity. As a result, the camera captures less light. A higher number means higher sensitivity. As a result, the camera captures more light.

In the above example, the bold numbers represent full stops. Some cameras only allow you to change your ISO in full stops, while others allow you to change your ISO in 1/3 stop increments.

The option to change your ISO in 1/3 stop increments is really nice, because it allows you fine-tuned control over your exposure.

We know that increasing the ISO by one stop will make the image twice as bright, but what if you don't want it twice as bright? What if you just want it a little bit brighter?

Being able to change your ISO in 1/3 stop increments gives you that option.

If you don't know if your camera lets you change in 1/3 stop increments, take a quick look. If you see numbers like the ones in the example above, you can change in 1/3 stops.

If you see only the bolded numbers, your ISO changes in full stops.

Don't worry if your camera only changes in full stop increments. You'll still have the ability to make tiny changes with your Aperture and Shutter Speed settings.

So we know that lower ISOs mean less light and higher ISOs mean more light. We also know that a stop is how we measure the change in light when we change our settings.

But what does this mean to us when we're shooting? When do you use ISO 100? When do you use ISO 3200?

When I'm shooting, the first setting that I set is ISO, and I set it based on the lighting conditions that I'm shooting in. To set your ISO, all you need to do is look at the light you are shooting in and choose your ISO based on how bright or dark it is.

For example, when I go outside on a nice, bright, sunny day, I'll set my ISO pretty low, usually to 100 or 200. When it's very bright, we don't need a lot of sensitivity because there is plenty of light!

On the other hand, if I'm indoors where it's dim, I'll use an ISO around 1600 or 3200 because there isn't much light to work with. That extra sensitivity will help me get the light I need for my photos.

There are also varying conditions in between. If it's an overcast day, I might set my ISO to 400 or 800 because it's not really bright or dark but right in between.

Now, aside from allowing you to capture more or less light based on the ISO you choose, you might be wondering what impact does ISO have on how your photo actually looks? It's a good question because when you're dealing with ISO you need to be aware of the noise. Noise is what happens in a digital image when you increase the ISO.

WHAT IS NOISE?

If you have ever shot film, you're probably familiar with something called grain. In film, grain showed up in your images when you used higher ISO film and looked kind of like sand sprinkled all through your image.

See, with film, there were millions of tiny pieces of crystal embedded in the plastic film strip, and it's actually those crystals that captured the light for a photo.

To make a piece of film more sensitive, they would use larger crystals in the film. Because the crystals were larger, you could see them in the photo, kind of like your photo was printed on very fine sand, making it look grainy.

A similar sort of thing happens with a digital image, but with an image sensor, you can't change the size of the photo receptors that receive light to make it more sensitive.

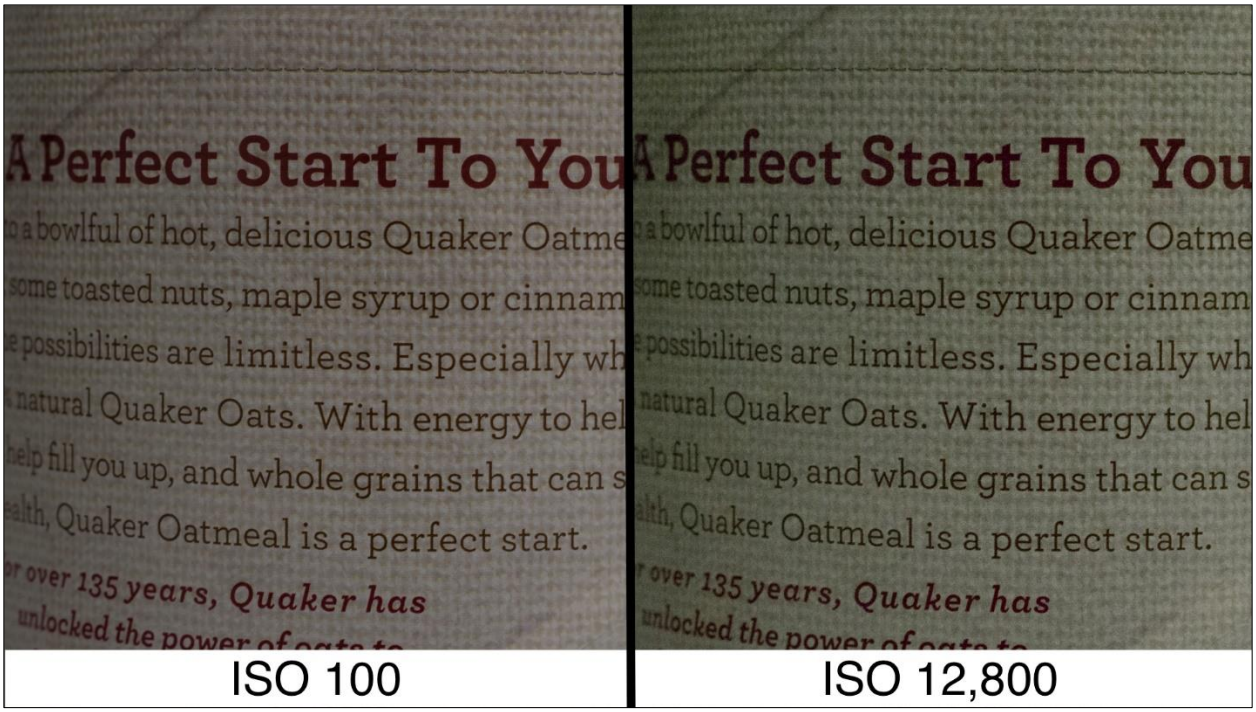
When light strikes the image sensor, the computer in the camera converts that light into a digital signal. In order to increase the ISO sensitivity of the sensor, that signal is amplified.

In fact, amplifying the signal is exactly what happens when you turn up the volume on a radio.

So when you increase your ISO, you are amplifying the signal that is being sent from the image sensor to the camera's memory. Whenever you amplify a signal, you also amplify the noise that's contained in that signal.

There is noise in any transmitted electronic signal. Noise is garbage data in that signal, and the more the signal (and the noise) is amplified, the more the noise obscures the actual signal.

It looks like this. On the left, you see a photo shot at ISO 100. On the right, the same photo shot at ISO 12800



ISO 100 ISO 12,800

Here is the same area of both photos zoomed in to 100%.

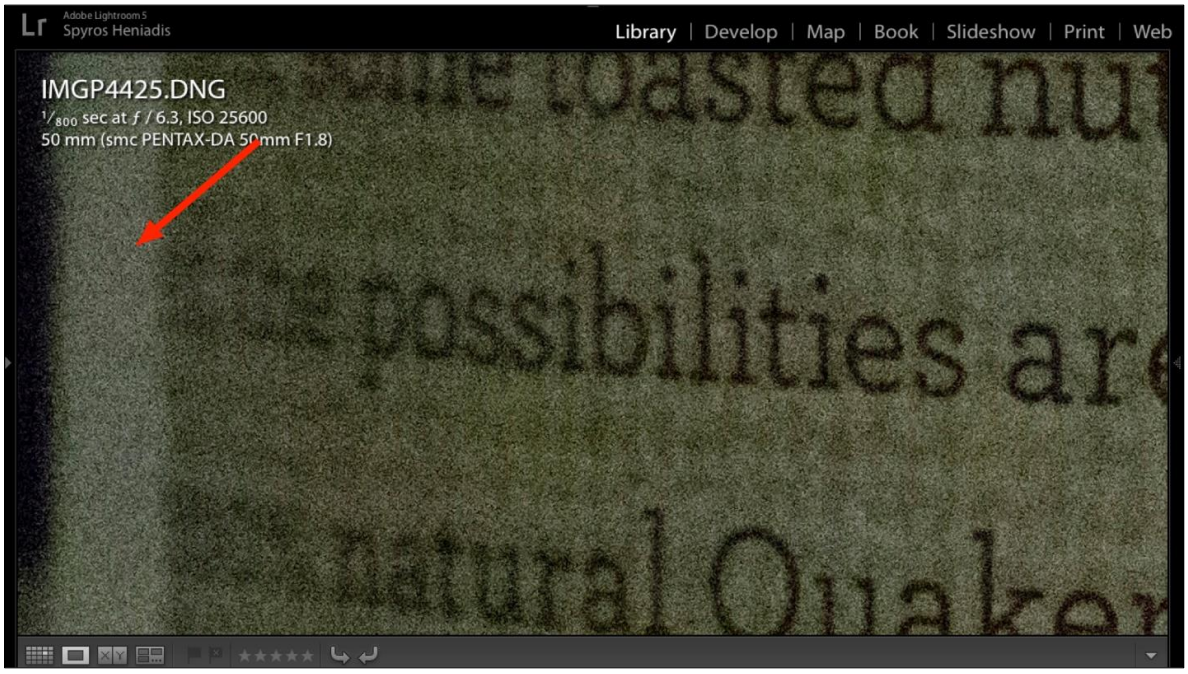
On the left is the ISO 100 shot. As you can see, the details are clean, crisp, and sharp and the colors are smooth.

On the right is the ISO 12800 shot and what you see here is noise. At very high ISOs like ISO 12800, the noise is really visible.

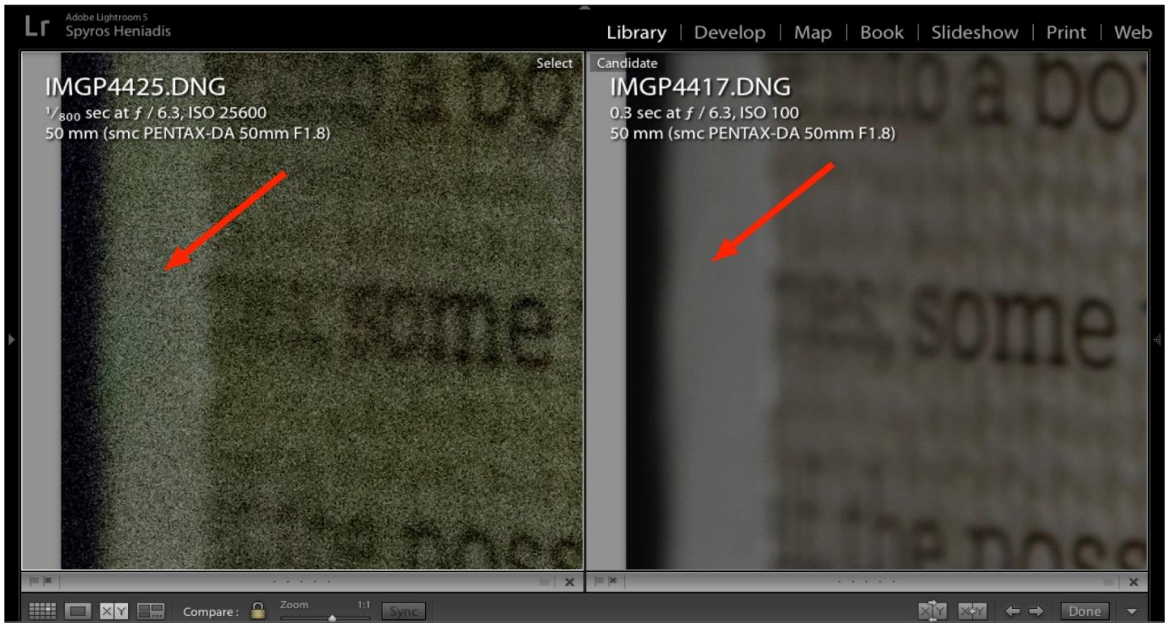
There are two types of noise that can show up in your images: Luminance Noise and Color Noise.

Luminance Noise shows up as variations in the brightness of pixels in your image.

Here's an example. This image was shot at ISO 25600.

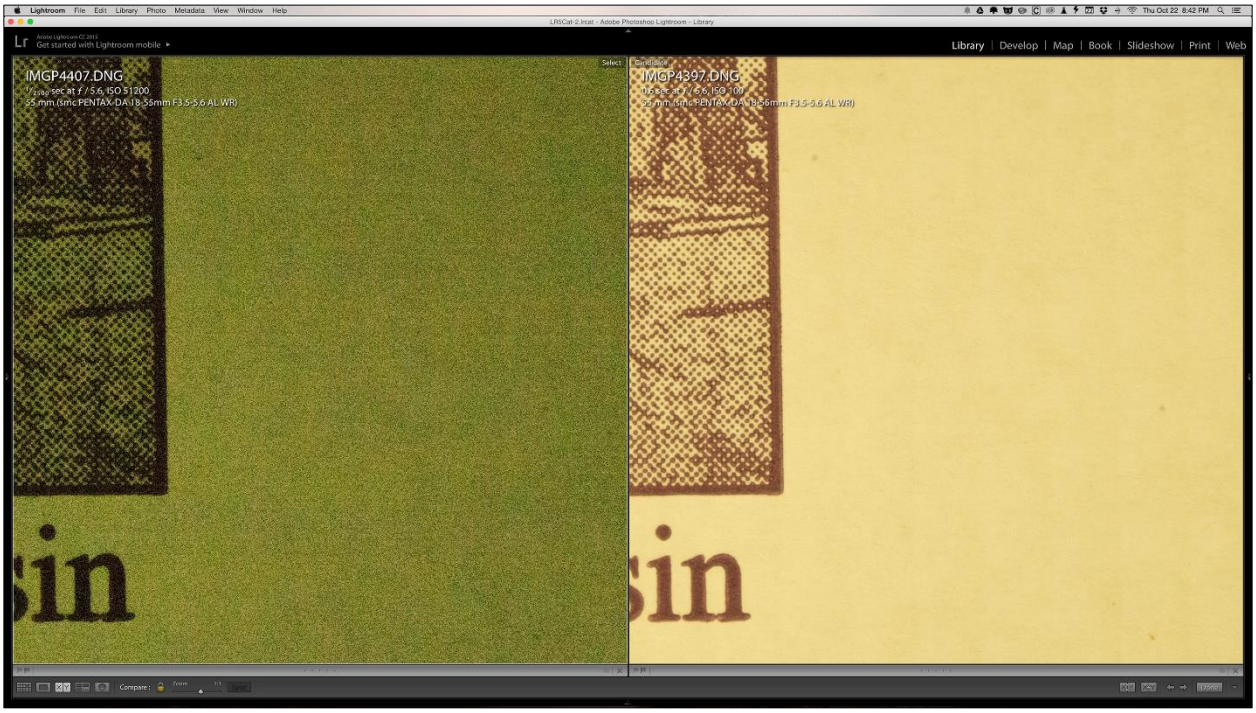


Looking at 100%, we can see the fluctuations in brightness in the different pixels in an area where the brightness should be consistent.



In the same photo, shot at ISO 100 on the right, we can see that this area is clean and consistent in brightness.

Color Noise is variations in color in different pixels where color should be consistent.



Again at 100%, we can see Color Noise showing up as the red and blue spots and blotches. We can compare it to the shot on the right at ISO 100 which has smooth and consistent color throughout.

Now noise isn't necessarily a good or a bad thing. There are some people who might tell you that you should never shoot above something like ISO 800, because you'll have too much noise. They'll try to tell you that noise in your image is wrong and that having noise like that is not okay.

I say that's bullshit for a couple of reasons.

First of all, when you take a photo it is your creation. Only you can decide how much noise is too much noise.

Second, sometimes you have no choice but to use a high ISO to get a shot.

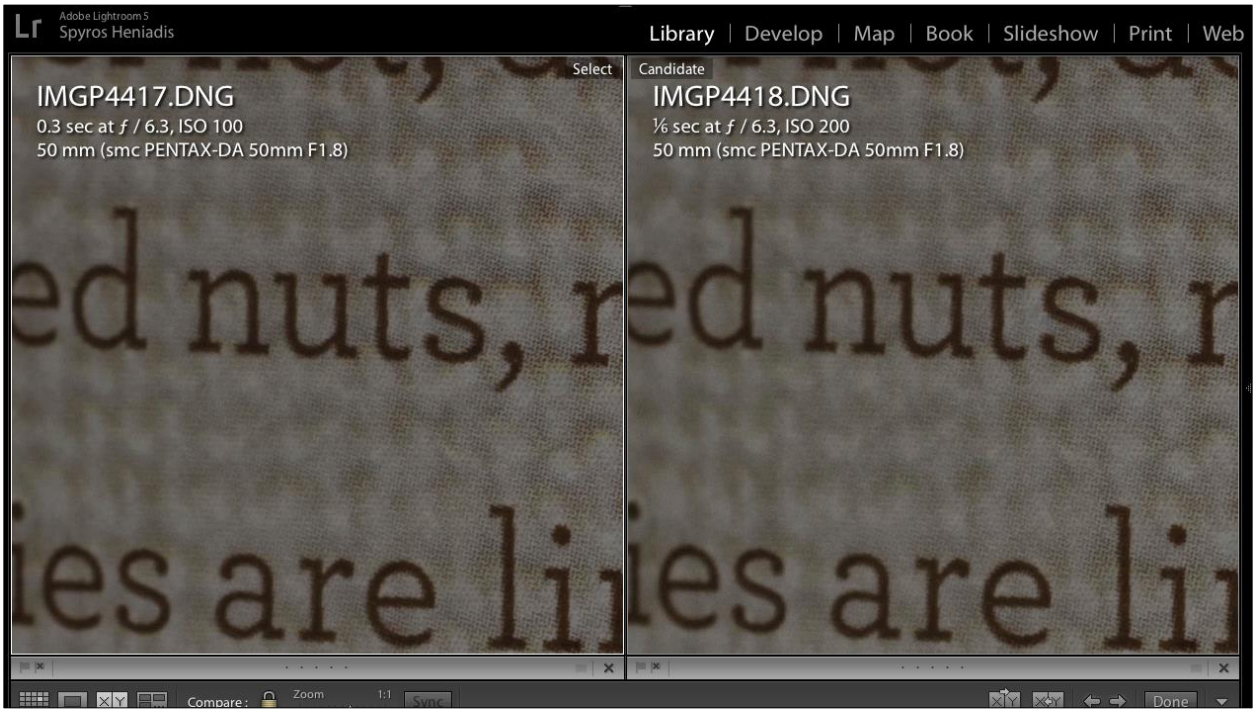
This is a personal choice, but I know that I would much rather take the shot and have it even if it does have a lot of noise. In my opinion, that's better than not having a shot at all, especially if it's an important, once in a lifetime shot.

The last thing I want to address here is the extended ISO options that some cameras have. For instance, some Nikon cameras have ISO options of HI1, HI2, and HI3. Other cameras, like the Pentax K-3, tell you in the manual that you have a maximum ISO of 25600, expandable up to 51200.

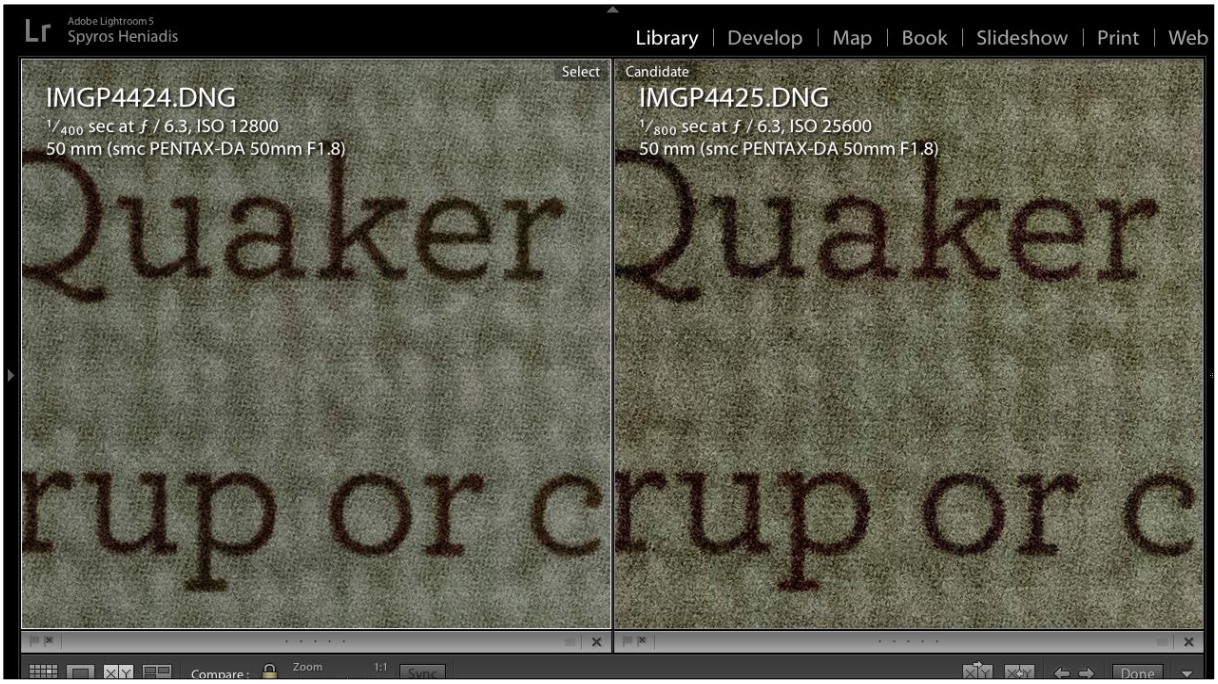
The reason for these expandable ISO options is that camera manufacturers want to pack in as many features as they possibly can into these cameras. It sounds really impressive when you can say your camera has a maximum ISO of 51200 or, like the Nikon D4s, a maximum ISO of 409600!

But these extended ISO options significantly degrade image quality. In your normal ISO range, you can obviously see a significant difference in quality between your minimum and maximum ISOs. We saw that in the examples we just looked at.

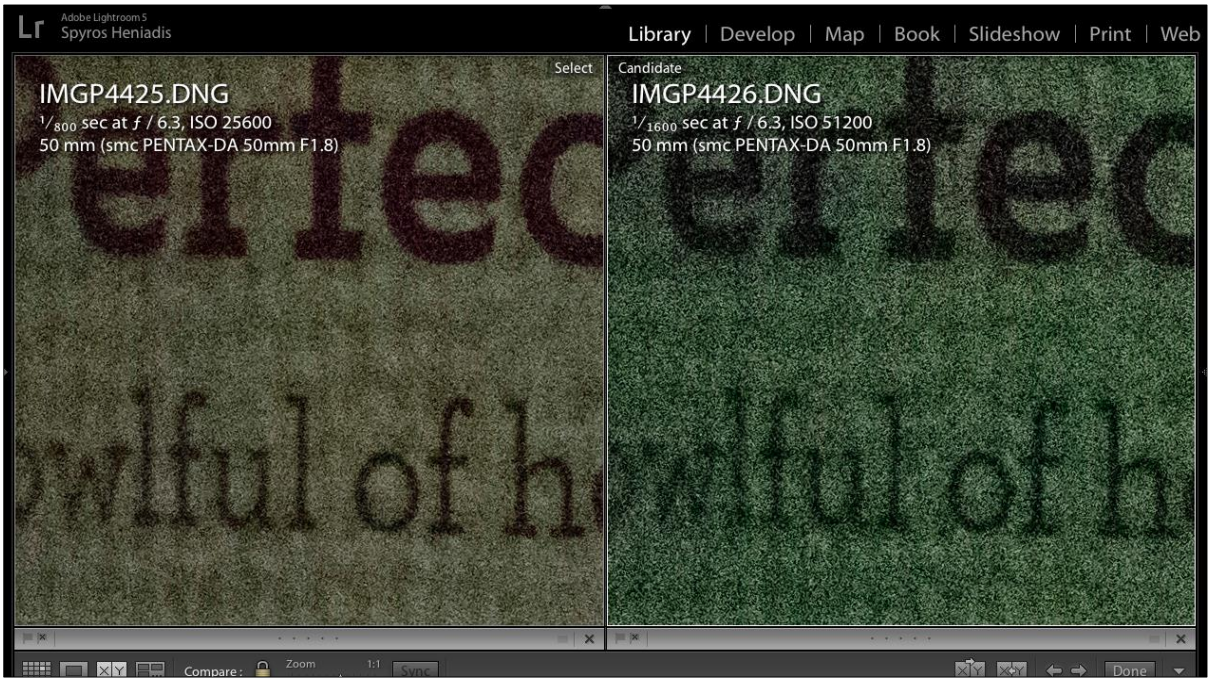
If you look at the difference between ISO 100 and ISO 200, you won't see much difference.



If you look at the difference between ISO 12800 and ISO 25600 on the K-3, you can see a difference but it's not an enormous difference.



But when we compare ISO 25600 and ISO 51200, there is a significant decline in the quality.



Most camera manufacturers include these "extended" ISOs because it sounds good but, practically speaking, they don't perform to acceptable standards as far as image quality goes. In some cases, using these extended ISOs will cause you to actually lose resolution in your image.

For instance, if you have a camera with a 24 megapixel sensor, your images are the full 24 megapixels when you use any ISO in your normal range. However, in order to achieve the extended ISO, the image resolution might be changed by the camera to 16 megapixels. This is because they can't yet make the camera sensor work successfully at the extended ISO and at the full resolution of the image sensor. So, in order to include that ISO, they force the camera to capture a lower resolution image.

This is something you definitely want to know about. However, as I said earlier, if the only choice to get an important shot is to use the extended ISO options, then use them. I'd still rather have the shot.

Let's recap this one more time.

- The ISO setting lets you change how sensitive the camera sensor is to light. The lower the ISO setting, the less sensitive and the less light you capture.
- You'll generally use lower ISO settings in bright lighting situations, like on a bright, sunny day. Lower ISO settings produce less noise.
- The higher the ISO setting, the more sensitive the camera sensor is and the more light you can capture.
- You'll generally use higher ISO settings in low light situations, such as indoors at a wedding or in a gym. Higher ISO settings produce more noise which can degrade image quality at high levels.

UNDERSTANDING APERTURE

Now let's take an in depth look at Aperture.

We know that Aperture, like ISO, is one of the settings that allows us to control how much light we capture when taking a photo.

We know that the aperture is an opening in the lens and that light enters the camera through the aperture.

We also know that we can change the size of the aperture. It's being able to change the size of the aperture that allows us to control how much light comes into the camera.

You can see it here. The larger the opening is, the more light is able to enter the camera. When the opening is smaller, less light is able to enter the camera.

Just as the numbers on the ISO scale indicated the sensitivity level, the numbers on the Aperture scale indicate how large the aperture opening is.

Let's take a look at the Aperture scale.

1.4	1.6	1.8	**2**	2.2	2.5	**2.8**	3.2	3.5	**4**	4.5	5	**5.6**	
6.3	7.1	**8**	9	10	**11**	13	14	**16**	18	20	**22**	25	29	**32**

APERTURE SCALE

On this Aperture scale, the bold numbers indicate full stops. The in between numbers are the 1/3 stop increments.

With ISO, some cameras can change in 1/3 stops and some can't. That's not the case with Aperture. EVERY changeable lens camera can change the Aperture in 1/3 stop increments. *(As well as many advanced point and shoots.)*

As you recall, when you see the number on your camera it may have an "f" in front of it.

Whether there's an "f" or not, this number indicates the size of the aperture. You should already have your largest and smallest Apertures written down in your notes.

Before we go on, I want to take a moment to talk about this number because it's a little confusing.

First of all, in photography this number is called the f-stop.

This is confusing because the f-stop is easy to confuse with a stop. A stop is how we measure the change in light while f-stop refers to the current Aperture setting.

Because this is confusing, I will not use the term f-stop. I will just call it the Aperture.

Just remember if you hear someone talking about the "f-stop", they are referring to the Aperture setting.

The second reason the Aperture number is confusing is because of what the numbers mean.

On the ISO scale, a smaller number indicates that you will capture less light. A larger number indicates more light. This is logical because a larger number is a larger quantity.

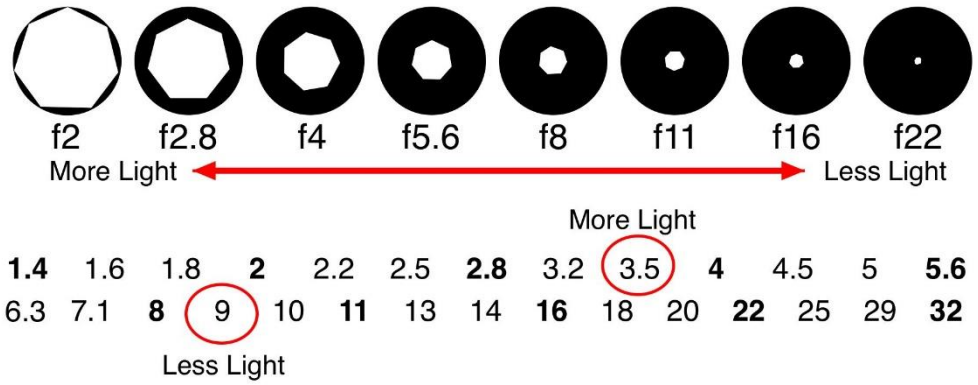
200 is greater than 100 so it makes sense that ISO 200 means more light than ISO 100.

For Aperture, this is reversed. With your Aperture setting, the lower the number, the more light you will get.

Let me just repeat that. If you are taking notes, write this down:

The lower the Aperture number, the more light you will get.

If we're looking at the Aperture scale that means that an Aperture of f3.5 lets in MORE light than an Aperture of f9. This seems stupid but it is the way it is because of how the Aperture number is calculated.



APERTURE SCALE

The Aperture number is calculated by taking the focal length of the lens and dividing it by the diameter of the aperture.

$$\text{f-number} = \frac{\text{focal length}}{\text{aperture diameter}}$$

For instance, if we take a lens with a focal length of 50mm, when the aperture of this lens is open so that the diameter is 25mm, the Aperture number is 2 or f2.

$$\text{f-number} = \frac{\text{focal length}}{\text{aperture diameter}}$$

$$\text{f-number} = \frac{50}{25} = 2$$

50 divided by 25 is equal to two, giving an Aperture of f2.

If we take the Aperture and make it smaller so that the diameter is 12.5mm, we get f4. 50 divided by 12.5 is equal to four, giving us f4.

$$\text{f-number} = \frac{\text{focal length}}{\text{aperture diameter}}$$

$$\text{f-number} = \frac{50}{12.5} = 4$$

This is why larger Aperture numbers indicate smaller aperture openings and smaller Aperture numbers indicate larger aperture openings.

This little bit of math makes the numbers work the reverse of what we'd expect. Logically it would make sense that a larger Aperture number would indicate a larger aperture opening. Instead, because of the math, as the diameter gets smaller, the number gets bigger.

What we've seen here is how the Aperture number changes based on the size of the aperture itself and how a lower number means you will capture more light.
In these previous examples, I was using a 50mm prime lens which is a lens that does not zoom.

However many of us have zoom lenses on our cameras. The 18-55mm kit lens that comes with DSLRs is very common. So is the 18-105mm lens, the 55-300mm zoom, and a variety of other zoom lenses.

Somewhere on that zoom lens, there is some information about your aperture.

On this Pentax 18-55mm kit lens, it's printed on the front of the lens. The information we're looking for is where it says "1:3.5 - 5.6".

The numbers after the colon, “3.5 - 5.6”, are Aperture numbers. They indicate the largest available Aperture range for this lens.

All zoom lenses have a variable maximum Aperture. By maximum Aperture, I mean the largest opening (which would be the lowest Aperture number).

The reason this number is variable is because this is a zoom lens.

If the formula for calculating the Aperture is the focal length divided by the diameter of the aperture, then when we change the focal length, this will change the resulting Aperture number. Just like it changed when we changed the diameter of the aperture.

Here's the math again. We already know that with a focal length of 50mm and an aperture diameter of 25mm we get f2.

$$\text{f-number} = \frac{\text{focal length}}{\text{aperture diameter}}$$

$$\text{f-number} = \frac{50}{25} = 2$$

Now let's change the focal length of the lens.

If we change the focal length to 100mm, we now get f4.

$$\text{f-number} = \frac{\text{focal length}}{\text{aperture diameter}}$$

$$\text{f-number} = \frac{100}{25} = 4$$

100 divided by 25 is 4, giving us f4.

This is something important to understand. When you zoom your lens, the Aperture changes. This impacts the amount of light you are letting into the camera for your photo.

Let me show you what I mean.

If you have a zoom lens, grab your camera and put that zoom lens on the camera if it isn't already. Turn on the camera, make sure it's in Manual mode, take of the lens cap, and start by zooming your lens to the widest focal length.

With the lens zoomed to the widest focal length, press your shutter button halfway down to wake up the camera and then set your Aperture to the smallest Aperture number *(which corresponds to the largest possible size opening for that lens).*

Jot down that number. If it's a kit lens, the number is likely f3.5.

Now zoom the lens all the way to the narrowest focal length.

Press your shutter button halfway down to make sure the camera is awake and then look at your Aperture number.

Did it change?

If you have an 18-55mm kit lens, it should have, and it most likely changed to f5.6

It changed because the variables in the formula changed. That change has a real impact on the photos you take.

I want to stress this point. This change in Aperture is real. We know that smaller Aperture numbers indicate that less light is able to pass through the lens for the photo.

So when you zoom your lens to 55mm and the Aperture automatically changes from f3.5 to f5.6, you get less light. Specifically 11/3 stops less light.

Let's take a moment to look at the math.

At 18mm with an Aperture of f3.5, we can determine the aperture's diameter by dividing the focal length by the f-number.

$$18 / 3.5 = 5.14$$

That tells us that at 18mm the aperture's diameter is 5.14mm.

When we do the same math to figure out the diameter at 55mm, we find that the diameter is 9.82mm.

$$55 / 5.6 = 9.82$$

I know what you're thinking.

How does a physically larger opening result in less light?

f5.6 definitely lets in less light than f3.5, but 9.82mm is definitely a larger diameter than 5.14mm.

The reason for this has to do with the way the lens is constructed. I'm not going to go deep into it, but I do want you to have a basic understanding. This has a big impact on your photography and it's important to know.

On a zoom lens, you use different percentages of the surface area of your lens to gather light at different focal lengths.

When you're at 18mm, you're using the entire surface area of the glass in your lens to gather light.

Using 100% of the surface area allows you to gather a lot of light into the lens which is directed through the aperture and onto the camera sensor for a photo.

I don't know the actual percentage but, when you zoom the lens to 55mm, you might only be using 25% of the surface area of the lens to gather light.

When zooming to magnify your view, you use smaller areas of the different glass elements in the lens to change and magnify the view.

Using less of the glass surface to gather light results in less light being gathered into the lens to pass through the aperture and be recorded for the photo. In this case, the total amount of light that is gathered is 1 and 1/3 stops less.

I'm simplifying this, but the main point is that when you have a zoom lens with a variable aperture like an 18-55mm lens, the focal length has an impact on the largest Aperture available for you to use.

That's why I had you zoom your lens to its widest angle when we were finding the Aperture range.

What you should do now is go back to your notes and change your largest Aperture to reflect the Aperture range of your lens. Again, you can find that printed somewhere on the lens. If it's not on the front of your lens, then it will be printed somewhere on the barrel of the lens.

Now your notes should read something like this.

Aperture: (3.5-5.6) - 22 (18-55mm lens)
“+” “-“

If you have a lens that does not zoom, also called a prime lens, then you will have just one setting for your largest aperture opening.

In the case of this 50mm Pentax lens, it's f1.8. The maximum Aperture doesn't change, because the lens doesn't zoom.

Now, one more thing about zoom lenses.

There are zoom lenses that maintain a constant maximum Aperture throughout the zoom range. These are generally more expensive and higher quality lenses.

An example is this Pentax 16-50mm lens.

It's printed on the barrel instead of the front, but you can see that the Aperture is listed as 2.8. That 2.8 indicates that the largest Aperture size available throughout the entire zoom range is f2.8. That means that whether I'm zoomed to 16mm or the full 50mm, I can still set my Aperture to f2.8.

If we look at the math quickly, we'll see some nice numbers.

At 16mm, the Aperture is 5.71mm in diameter to give us f2.8.

16 / 5.71 = 2.8

When zoomed to 50mm, the Aperture is 17.86mm which is much larger than the 9.82mm on the 18-55mm lens.

50 / 17.86mm = 2.8

If you look at the two lenses side by side, you can see that the 16-50mm lens is larger with larger glass pieces which allows for more surface area to be used at 50mm than the kit lens at 55mm.

Alright, let's recap what we know.

- The aperture is the opening in the lens that lets light into the camera.
- The size of the aperture determines how much light is able to enter the camera.
- The size of the aperture is indicated by the Aperture number and can be changed in 1/3 stop increments on all cameras.
- The smaller the number, the larger the size of the aperture, which allows for more light to be gathered for the photo.
- On most common zoom lenses, the size of the maximum Aperture varies depending on where the zoom is set, but there are zoom lenses available that maintain a constant maximum Aperture throughout the zoom range.

So what does all of this mean when it comes to shooting?

In the **UNDERSTANDING ISO** chapter, I mentioned that I always set my ISO first based on the lighting situation.

The second thing I set when I'm getting ready for a shot is my Aperture. I set it based on one of two things.

The first thing is the lighting condition, but I don't set my Aperture the same way that I set my ISO.

If I'm shooting in low light conditions, then I typically set my Aperture to the smallest Aperture number to let in as much light as possible.

So if I was using that 16-50mm lens we just looked at, I'd set it to f2.8 to let in as much light as possible for the photo.

But, when it's brighter out, I don't automatically set my Aperture to a smaller setting, such as f16.

That is because, along with controlling how much light comes into the camera, the size of the aperture also controls something called **Depth of Field**.

If you don't know what Depth of Field is, it looks like this:

Where the subject is in nice, sharp focus and the background is beautifully blurred out of focus.

Now we are going to learn all about Depth of Field and how to use it.

UNDERSTANDING DEPTH OF FIELD

Let's learn how to control Depth of Field.

Before we can learn to control it, we need to know exactly what Depth of Field is.

So what exactly is it?

Depth of Field is the distance between the nearest and farthest subjects in your photo that appear sharp or in focus.

That distance between the nearest and farthest things in focus is what we actually control.

When the distance is short, it looks like this:

When your photo looks like this, you have a very narrow area that is in focus which results in your main subject being nice and sharp while the background is beautifully out of focus.

This is called Shallow Depth of Field.

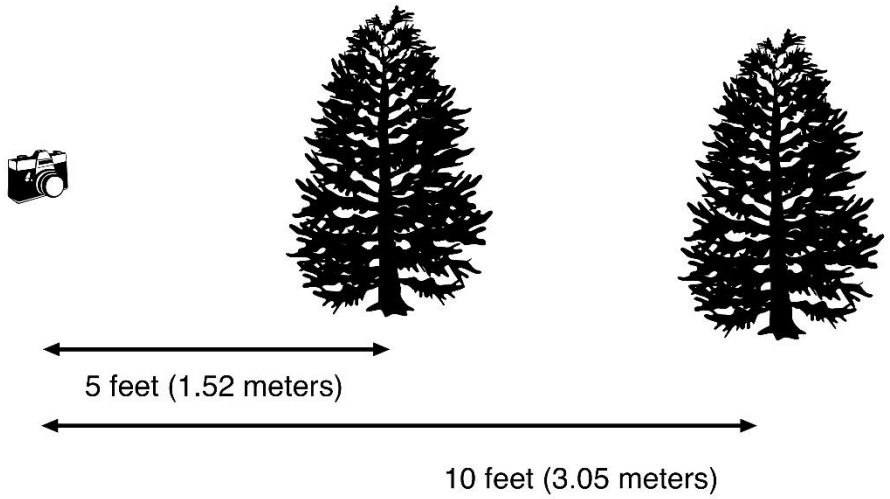
When that distance is greater, it looks like this:

When your photo looks like this, you have a very wide area that is in focus which results in your main subject and some or all of the background of the photo being sharp and in focus. In a shot like this, there is little or no background blurriness.

This is called Great Depth of Field.

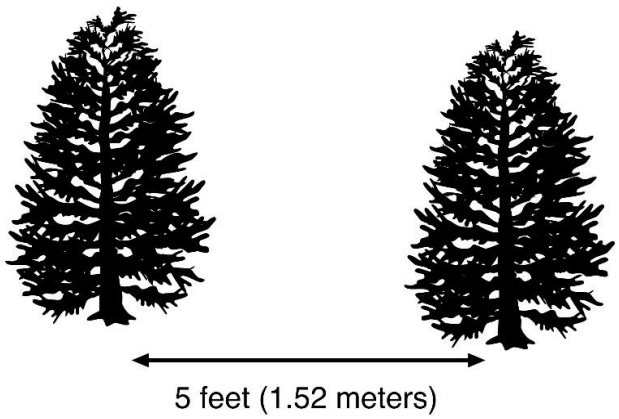
See, when we take a photograph, we're photographing a three dimensional scene that has depth and distance in it.

For example, let's say we have two trees that are five feet from each other.



Looking at the scene from the side, we can see the depth. The first tree is 5 feet (1.52 meters) from the camera, and the second tree is 10 feet (3.05 meters) from the camera. *(We're using made up numbers for these examples.)*

With both trees in focus, the Depth of Field is 5 feet (1.52 meters).

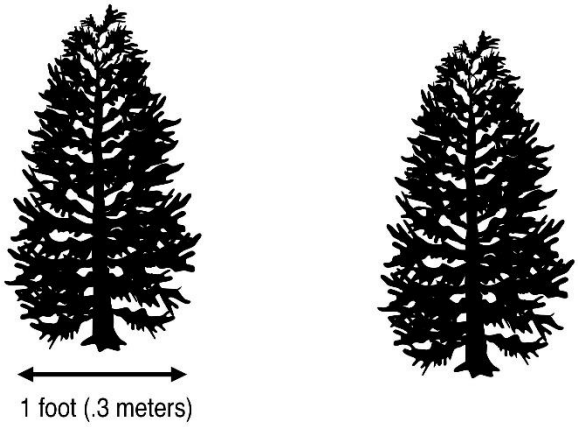


If you take a photo of this scene and both trees are in focus, the distance between the trees is the distance between the nearest and farthest objects that are in focus, so the Depth of Field for this photo is 5 feet (1.52 meters), giving this example photo Great Depth of Field.

On the other hand, if you were to take a photo with only the front tree in focus, we'd have a different Depth of Field.

Let's say in this case the front of the front tree is the nearest object in focus, and the back of the same tree is the farthest thing in focus. If the distance from the front to the back of the tree is 1 foot (.3 meters), then we have a Depth of Field of 1 foot (.3 meters), giving this example photo Shallow Depth of Field.

With the back tree out of focus, the Depth of Field is 1 foot (.3 meters).



So how do we control this?

I mentioned that we can control Depth of Field by changing the size of the Aperture used for the photo, but Aperture is not the only thing.

There are actually three things that allow us to control the Depth of Field.

Those things are:

1. ***The size of the camera Aperture***
2. ***The distances between the camera and the subject, and the subject and the background***
3. ***The focal length of the lens***

APERTURE AND DEPTH OF FIELD

We already know that we can use the Aperture to control how much light comes into the camera by varying the size of the opening.

We can also control the Depth of Field by varying the size of the opening.

Let's look at an example.

In this shot, the first three army guys are in focus. The settings for this shot are ISO 2000, f13, and 1/50.

Looking at it from above, we can see that the Depth of Field is 5 inches (12.7cm).

Now let's look at another shot.

In this shot, the first army guy is the only one in focus. The guys in the back are all out of focus. The settings for this shot are ISO 200, f4, and 1/50.

Both of these photos were shot with the 18-55mm lens zoomed to 35mm. At 35mm, f4 is the largest available Aperture for this lens.

This means that for the second shot the aperture was as large as I could make it, and the first army guy is both the nearest and the farthest subject in the photo that is in focus.

Looking at it from above, we can see that the Depth of Field is about 1 inch (2.54 cm).

What this shows us is that the size of the Aperture changes the Depth of Field.

The larger the size of the Aperture, the shallower your Depth of Field will be.

The smaller the size of the Aperture, the greater your Depth of Field will be.

This works because the size of the opening in the lens changes how the lens is able to focus the light coming through it for the photo.

With a larger opening, the lens is less able to focus the light from subjects that are farther away from the point the camera is focused on. As a result, subjects that are farther back are less focused, creating Shallow Depth of Field.

Logically, when the opening in the lens is smaller, the lens is more likely to be able to focus the light from subjects that are farther away from the point of focus, rendering objects in the scene behind your subject in focus, giving you Great Depth of Field.

Now before we move on, I want to point out that the ONLY things that changed in those two photos were the Aperture and the ISO settings. Everything else remained constant.

I changed the Aperture to demonstrate how it changes the Depth of Field. I changed the ISO because when I changed the Aperture that changed the exposure.

At ISO 2000, f13, and 1/50 my exposure indicator read 0.

When I changed my Aperture from f13 to f4, I turned up the Aperture volume to let in more light. The exposure indicator read +3 1/3 which means that my photo would be 3 1/3 stops too bright, and it would look like this:

In order to maintain a 0 exposure, I had to change my ISO from 2000 to 200 to record less light for the photo. This brought the exposure indicator back to 0.

From f13 to f4 was 10 clicks of the control dial. From ISO 2000 to ISO 200 was also 10 clicks of the control dial. That means that I compensated for the increase in Aperture volume by decreasing the ISO volume the exact same amount.

Okay, now I want to give you a way to remember how Aperture impacts your Depth of Field.

A larger Aperture, such as f2.8, gives us a shorter Depth of Field distance.

You can think of your Aperture number as your Depth of Field distance.

So in the case of f2.8, it can help to think that f2.8 gives you a Depth of Field of 2.8 inches (or centimeters, or whatever).

The unit of measurement doesn't matter, and the measurement WILL NOT be accurate. It's just a way to help remember where to set your Aperture when you want a shallow Depth of Field because then the logic of the numbers works out.

If f2.8 equals a Depth of Field area of 2.8 inches (or centimeters), and f16 equals a Depth of Field area of 16 inches (or centimeters), then it's perfectly logical to remember that a smaller Aperture number will give you shallower Depth of Field and a larger Aperture number will give you greater Depth of Field. 16 is greater than 2.8 so it makes sense.

Again, I want to be clear that f16 doesn't necessarily give you exactly 16 inches (or centimeters) of Depth of Field. It's just a way to help you remember.

So that's how Aperture impacts Depth of Field. Now let's look at the how the distance between the camera and the subject impacts it.

DISTANCE AND DEPTH OF FIELD

After Aperture, distance has the greatest impact on how great or how shallow your Depth of Field is.

With distance, we're considering two things. The first is the distance between the camera and the subject.

There's not much to explain about distance, just how it impacts the Depth of Field, and it works like this:

The closer the camera is to the subject, the shallower the Depth of Field will be.

The farther the camera is from the subject, the greater the Depth of Field will be.

Let's see this in action. Grab a couple of small objects, and set them up so one is in front of the other. Set the second object about 6 inches (15.24 cm) behind the first one and slightly to the side. Make sure that the first object isn't blocking the second one.

Make sure your camera is on and in Manual Mode. Make sure your lens cap is off and set your Aperture to 8. ***(We're using a smaller opening in the lens in this exercise to isolate the impact that distance has on Depth of Field).***

Since you're in Manual mode, you also need to set your ISO and Shutter Speed to get a 0 exposure, so go ahead and set your ISO to 1600.

Then set the camera (on the table/desk/floor) so that it's about 2 feet (.6 meters) from the front object. Set your Shutter Speed to give you a 0 EV exposure.

Finally, focus the camera on the front object and take a photo. It should look something like this:

Now move the camera so that it's 1 foot (.3 meters) away from the front subject. Again, focus on the front subject and take a photo.

It should look something like this:

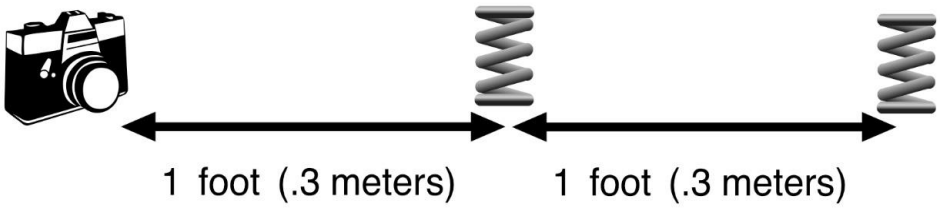
Notice how much more out of focus the rear army guy is in this shot as compared to the previous photo.

What you should see here is that where the camera is positioned in relation to the subject has a dramatic impact on Depth of Field. In fact, I find that the distance between the camera and the subject has a greater impact on Depth of Field than the size of the Aperture does.

So, to get the shallowest Depth of Field possible, position the camera as close to the subject as is possible for the photo.

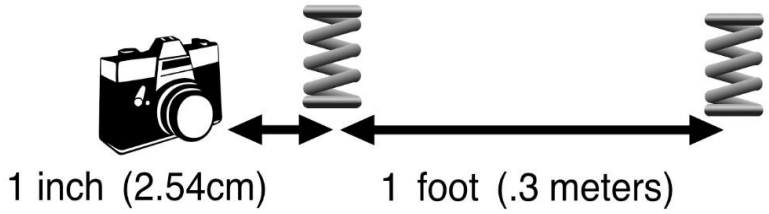
This works by changing the relative distances. The closer the camera is to the subject, the more extreme the distances between the subject and the background become.

For example, if the camera is 1 foot from the front subject and the second subject is 1 foot behind the front subject, the distance between the two subjects is not that great from the camera's perspective.



The camera is already 1 foot from the front subject, so one more foot isn't really that much farther away from the camera. As a result, the camera can focus the light from that back subject pretty easily.

Now, if the camera is 1 inch from the front subject and the back subject is still one foot from the front subject, the distance from the camera to the first subject is very short. That magnifies the distance between the front and the back subjects, making it much more difficult for the lens to focus both subjects.



Using distance to control Depth of Field is highly effective. As I mentioned above, it is sometimes more effective than changing the size of the Aperture. But what's even MORE effective is combining these things which brings me to an important point.

You can stack these control points to make the Depth of Field even shallower.

It works like this. If using the smallest Aperture number possible gives you Shallow Depth of Field, and positioning the camera closer to the subject gives you Shallow Depth of Field, then using the smallest Aperture possible AND positioning the camera closer to the subject will give you even shallower Depth of Field!

Now one other point about distance before moving on to Focal Length.

If you can change the position of your subject as it relates to the background, there's no reason not to.

Here's what I mean. Let's say you want to take a portrait of a person and you want a nice, Shallow Depth of Field background like we've been talking about.

You're shooting outdoors and there's a nice big line of green, leafy trees you're using as your backdrop, which you want nice and out of focus.

If you position the person you're photographing right in front of the trees (say a foot away), it's going to be challenging to get the trees out of focus for that super Shallow Depth of Field look.

If you bring the camera super close to your subject and use the smallest Aperture number possible, it's possible you'll get a nice out of focus look.

But if you move the subject forward 5, 10, 15, or even 20 feet from the trees, you've moved the background MUCH farther away from the subject. Doing that AND then positioning the camera in the same spot and using the smallest Aperture number will give you MUCH shallower Depth of Field.

The point is that, in addition to bringing the camera closer to the subject, you can move the subject farther away from the background to get shallower Depth of Field.

Want to see what I mean? Move the back object so that it's about a half inch or so away from the subject and take another photo.

The setup should look like this:

And the resulting photo should look something like this:

The settings haven't changed from the last photo we took when the rear guy was out of focus, but now because he's much closer, he's in the Depth of Field area so he's in focus.

As a photographer, you are creating the shot. If you can manipulate something within the environment to make the shot look the way you want it to, you should!

FOCAL LENGTH AND DEPTH OF FIELD

The last thing that allows us to control the Depth of Field is the focal length of the lens.

Zoom lenses allow us to change the composition of a photo by optically changing what the camera can see.

When you have a zoom lens set to a wider focal length, the camera's view is pulled back and you see more stuff in the entire scene. When you set the lens to a narrower focal length, the camera's view is tighter, bringing things that were farther away in the scene into closer view.

So when you zoom your lens out to a narrower focal length, you are optically bringing the camera closer to the subject.

We just learned that moving the camera physically closer to the subject makes the Depth of Field shallower, and the exact same thing happens when you bring the camera and subject closer optically by changing the focal length of your lens.

Note: If you have a prime (non zooming) lens, then obviously this will not work. However, if you have two prime lenses of different focal lengths, it will. If you keep the camera in the same position and change the lenses, you should see a difference in the Depth of Field.

Go ahead and try it. Put the rear subject back away from the front one again, and then zoom your lens (if you have a zoom lens) to the widest angle and take a picture.

Then, without moving the camera, zoom the lens all the way to the narrowest angle and take the picture and compare them. You'll get a result similar to the test we did when you actually moved the camera.

Zoomed wide

Zoomed narrow

And this is stackable too! So if using the smallest Aperture setting and putting the camera closer to the subject (and moving the subject away from the background if possible) all stack to make the Depth of Field shallower, then zooming your lens all the way to add that to the stack will make the Depth of Field even shallower!

So let's recap what we know.

- Depth of Field is the distance between the nearest and farthest subjects in our photo that are in focus.

- Shallow Depth of Field is when we have a short distance that is in focus which results in photos like this. The subject is in focus, and the background is out of focus.

- Great Depth of Field is when we have a longer or greater distance that is in focus which results in photos like this. The subject and some or all of the background will be in focus.

We have three ways to control Depth of Field.

- ***We can control it by changing the size of the aperture.***

    Larger sized apertures create shallower Depth of Field. Smaller sized apertures create greater Depth of Field.

- ***We can control it by changing the distance between the camera and the main subject and, if possible, by changing the distance between the subject and the background.***

    The closer the camera is to the subject, the shallower the Depth of Field is. The father away the camera is to the subject, the greater the Depth of Field is.

    Moving the main subject farther away from the background will result in shallower Depth of Field. Moving the main subject closer to the background will create greater Depth of Field.

- ***Finally, we can control it by changing the focal length of the lens.***

    The longer the focal length you use, the shallower the Depth of Field will be. The shorter the focal length, the greater the Depth of Field will be.

I know that was a lot to take in, but now you should have a better understanding of how Depth of Field works.

Next, we're going to take an in depth look at Shutter Speed.

UNDERSTANDING SHUTTER SPEED

We already know that Shutter Speed is the third piece that gives us control over how much light we capture when we take a photograph.

The Shutter Speed is how long the shutter is actually open, exposing the camera sensor to the light that is entering the camera through the lens.

We measure the Shutter Speed in seconds. Most of the time, we're using Shutter Speeds that are fractions of a second.

We already looked at the numbers back in the **CHANGING SHUTTER SPEED** section, and you should have your longest and shortest Shutter Speeds written down in your notes.

Now, let's take a moment and see how Shutter Speed impacts our photos.

First, I'd like you to grab your camera, and set your Shutter Speed to 30". Don't worry about the other settings. Just set it to 30 seconds and then take a picture.

Setting the Shutter Speed to 30" means the shutter will be open for the camera to record light for the photo for 30 seconds.

So when you press that shutter button to start the photo, you'll hear the shutter open and then nothing for 30 seconds. Then finally you'll hear the shutter close.

I want you to do this because, if you aren't paying attention to your Shutter Speed, you might think your camera is broken if you take a picture and it seems like nothing is happening. If that ever happens, check your Shutter Speed and make sure you didn't set it for 15, 20, or 30 seconds.

That's a long time to take a photo, isn't it? You might think you would never use a Shutter Speed that long but I'm going to show you a few examples that might change your mind.

But first, back to the numbers for a minute. I mentioned earlier that the double hash mark indicates seconds, but you won't see it only after the number like with 30 seconds.

You'll also see it like this: **0"6**

And like this: **1"6**

When you see this, the double hash still indicates seconds. In this case, it's acting like a decimal point.

So **0”6** means **.6** seconds, and **1”6** means **1.6** seconds.

Let’s look at all of the numbers.

SHUTTER SPEED SCALE

30"	25"	20"	**15"**	13"	10"	**8"**	6"	5"	**4"**	3"	2.5"
2"	1.6"	1.3"	**1"**	0"8	0"6	**0"5**	0"4	0"3	**1/4**	1/5	1/6
1/8	1/10	1/13	**1/15**	1/20	1/25	**1/30**	1/40	1/50	**1/60**	1/80	1/100
1/125	1/160	1/200	**1/250**	1/320	1/400	**1/500**	1/640	1/800	**1/1000**	1/1250	1/1600
1/2000	1/2500	1/3200	**1/4000**	1/5000	1/6400	**1/8000**					

Just as with ISO and Aperture, the bold numbers are full stops. The in between numbers are the 1/3 stop increments.

The 1/3 stop increments is the reason we have odd numbers like 0”3 or 1”6 seconds.

So the Shutter Speed controls how much light we capture through time.

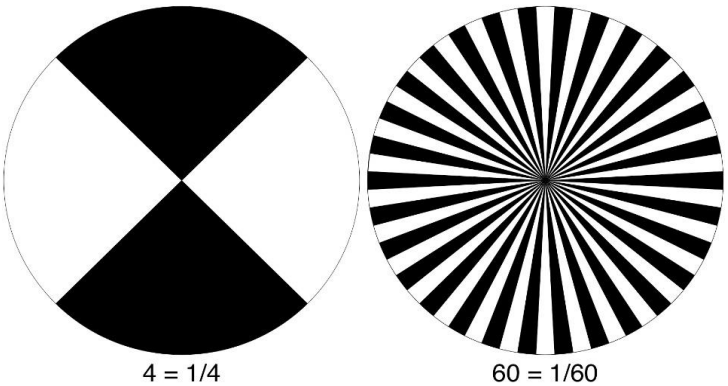
The longer the Shutter Speed is, the more light can be captured for a photo. The shorter the Shutter Speed is, the less light can be captured for a photo.

That's pretty easy to understand.

More time lets more light hit the camera sensor. When you look at a number like 4000 it can be deceiving, because if you forget that 4000 actually means 1/4000 you might start thinking that a bigger number means more light.

Sometimes it helps if you think of the number like a pie.

If a pie is one second, when you divide the pie up the difference is obvious.



4 = 1/4 60 = 1/60

4 is 1/4 of a second, and 60 is 1/60 of a second.

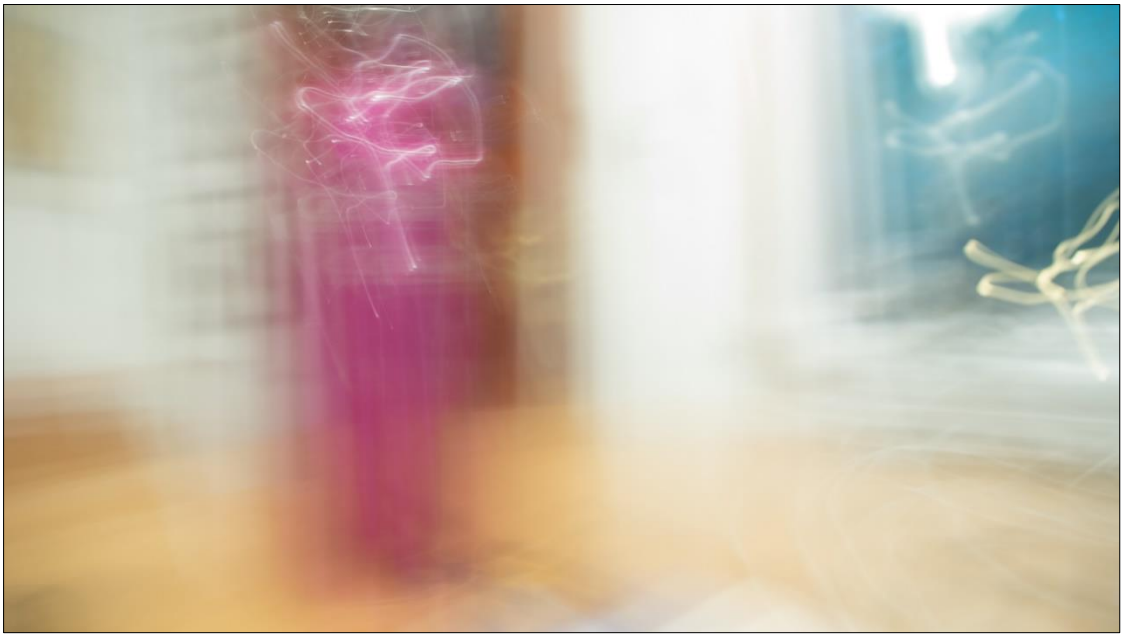
1/4 of a pie is a much larger piece than 1/60.

So it’s important to remember that the plain numbers are really fractions of a second.

In addition to controlling how much light you capture in your photos, the Shutter Speed also controls how motion appears in your photos.

This is something that we photographers constantly struggle with.

Most of the time, we want to get a sharp shot and we don't want motion blur to show up in our photos. However, if you have a camera, I guarantee that you've taken a photo that looks something like this:



It typically happens in low light situations, because the less light there is, the longer you need to leave the shutter open to get enough light for the exposure. The longer that shutter is open, the more likely you are to have motion blur.

There are two types of motion blur. There’s blur because the camera moves, and there’s blur because the subject moves. Let’s learn how to prevent both kinds of blur from happening, starting with camera shake.

PREVENTING BLUR FROM CAMERA SHAKE

The first type of motion is camera motion. This is the natural vibration and trembling of the body as you hold the camera while taking a photo. We all do it because we're human. It's difficult for us to hold perfectly still when taking a photo.

To deal with camera motion, there are a couple of guidelines that we can follow to help in choosing a Shutter Speed.

The first guideline is called the focal length rule. It's called a rule but it's really just a guideline, so don't take this as something that can never be violated.

The focal length rule tells us that, if we want to have a sharp photo with no blur from camera shake, the Shutter Speed needs to be at least 1/focal length of the lens.

This means that if you're using a 50mm lens, you want the Shutter Speed to be 1/50 of a second or faster to insure no motion from camera shake appears in the photo.

Let's take another example.

If you've got a longer zoom lens, like an 18-105mm or a 70-300mm, then sometimes you'll find yourself dealing with longer focal lengths.

So say you're shooting at a focal length of 100mm.

With a focal length of 100mm, you'll want the Shutter Speed to be at least 1/100 of a second to avoid blur from camera shake.

What's great about this is how simple it is to use this rule. If you're uncertain how fast your Shutter Speed should be, just look at what you've got your lens zoomed to. Then pretend it's a fraction and set your Shutter Speed to whatever that is.

Now in some cases, you might be using a focal length that doesn't match up with a Shutter Speed. For example, the 85mm prime lens is a very popular lens. If you're shooting with that lens, you want a Shutter Speed of at least 1/85. However, if we look at all the Shutter Speeds, you'll notice there is no Shutter Speed of 1/85.

SHUTTER SPEED SCALE

30"	25"	20"	**15"**	13"	10"	**8"**	6"	5"	**4"**	3"	2.5"
2"	1.6"	1.3"	**1"**	0"8	0"6	**0"5**	0"4	0"3	**1/4**	1/5	1/6
1/8	1/10	1/13	**1/15**	1/20	1/25	**1/30**	1/40	1/50	**1/60**	1/80	1/100
1/125	1/160	1/200	**1/250**	1/320	1/400	**1/500**	1/640	1/800	**1/1000**	1/1250	1/1600
1/2000	1/2500	1/3200	**1/4000**	1/5000	1/6400	**1/8000**					

When that happens, you just choose the closest Shutter Speed that fits your needs. So with an 85mm lens, you could use 1/80 or 1/100. Anything faster or close is fine.

On a zoom lens, the Shutter Speed you will want to use will vary based on where you have the lens zoomed, so this is something you'll need to pay attention to.

If you are using a 70-300mm zoom lens and the lens is zoomed to 150mm, then you would want to use a Shutter Speed of at least 1/160 since 1/150 isn't an available Shutter Speed.

If you are zoomed all the way out to 300mm, then you'd want to use at least 1/325 since 1/300 isn't available either.

And if you're zoomed back to 70mm, then you could use either 1/60 or 1/80. Both are close enough to 1/70 to get the job done.

The reason this rule exists is due to physics.

When you zoom a lens, the lens itself telescopes outward, becoming longer. When you extend the lens, the motion and vibration in the lens is magnified.

To combat that increased motion and avoid blur in your photo, a faster Shutter Speed is necessary.

The nice thing about this is that it's really easy to remember and implement when you're shooting. If you're out taking a photo and you're not sure if your Shutter Speed is fast enough to get a sharp photo, just look at where your lens is zoomed.

As long as your Shutter Speed is set to 1/focal length, you're good to go!

If the lens is zoomed to 85mm, make sure you're Shutter Speed is 1/85 (or whatever Shutter Speed is close to that!)

PREVENTING BLUR FROM SUBJECT MOTION

The second guideline is the motion threshold.

This is the minimum Shutter Speed for freezing everyday sort of motion. That Shutter Speed is 1/30.

1/30 is the Shutter Speed at which general motion will start to show up in your photos.

Knowing this threshold is important. You might think if you're shooting with an 18-55mm lens that, when you're zoomed out to 18mm, you can shoot at 1/20 or maybe 1/15 of a second and get a sharp shot.

That makes sense because of the focal length rule. You might get a sharp shot because it's not impossible. However, you're shooting under the general motion threshold which means that, even though you're following the focal length rule, you might get blur from camera shake because you're below the motion threshold.

In addition to motion from camera shake, blurring from subject motion can start to appear at 1/30. This includes motion like the slight shifting of a person posing, a person walking at normal speed, or flowers blowing in the breeze.

Dealing with subject motion is a little more difficult because different subjects move at different speeds. This means that the Shutter Speed you need to use to freeze that subject depends on how fast the subject is moving.

I have a general guide as to what Shutter Speeds you want to use when shooting motion or action to get sharp photos.

- For normal every day motion, Shutter Speeds from 1/30 of a second and up are generally going to freeze the action for a sharp photo.

- For fast moving action and sports, such as basketball, football, American football, baseball, and hockey, you'll want a much faster Shutter Speed. You're usually good using 1/500 of a second or faster.

- For very fast moving subjects, such as wildlife or fast cars, Shutter Speeds of 1/2000 of a second or faster should be used.

In any situation where you're trying to get a sharp shot, here's what I recommend you do.

1. Start with a Shutter Speed you think will work to freeze the motion you want to capture and take a test shot.

2. Then zoom in on the camera and check the photo. If it's sharp, then you should be good to go. If it's not sharp and you can see motion blur, then you need to use a faster Shutter Speed.

3. If you need a faster Shutter Speed, adjust your Shutter Speed (and to maintain your exposure adjust your ISO and/or Aperture as well) and then take another test shot

4. Repeat steps 2 & 3 until you get a sharp photo. Then you're ready to shoot.

For example, if I was shooting a basketball game, I'd start with a Shutter Speed of 1/500 of a second and take a test shot. If I see motion blur in that test shot, then I'd set the camera to a faster Shutter Speed, such as 1/1000 of a second, and take another test shot to see how it looks. If it's sharp, I'm good. If not, I'll go up to 1/2000 and try again, repeating the process (adjusting my ISO and/or Aperture to maintain exposure all along the way) until I get a sharp photo.

Okay, let's recap.

- We know that Shutter Speed controls how much light is captured by varying the length of time that the shutter is open.
- And that Shutter Speed is measured in seconds with fractions of a second (like 1/8000) being the shortest Shutter Speed and 30" as the longest Shutter Speed on most cameras.
- We know that the longer that shutter is open, the more light you get, but the longer the shutter is open, the more likely you are to have motion blur in your photos.
- We also know that in order to get sharp photos we have to consider both the focal length of the lens and how fast the subjects are moving when choosing a Shutter Speed.

What all this means when shooting is that choosing a Shutter Speed is often a balance between how much light you need and what Shutter Speed you can use and still get a sharp photo.

When I'm shooting, the Shutter Speed is always the last setting that I set. After choosing an ISO based on the lighting conditions and an Aperture based both on the lighting and on the Depth of Field, I set my Shutter Speed based on my motion threshold.

USING MOTION CREATIVELY

Now we have a good understanding of Shutter Speed and how to choose the right Shutter Speed to avoid motion blur and get a sharp shot.

Just as you can use the Aperture and Depth of Field to change the look and feel of a photo, you can also use motion to change the look and feel and do some really fun and creative things.

We spend much of our photographic lives just trying to get sharp photos. For many subjects that's a good thing to do, but there is so much more that you can do with motion in your photos if you're just willing to embrace it.

Let me show you a few examples and explain how I captured them. We'll start with fast Shutter Speeds. Not only does using an appropriate Shutter Speed get you a sharp photo, but you can also use fast Shutter Speeds to freeze motion as it is happening.

For example, I mentioned that when you're shooting sports you want to use a Shutter Speed of around 1/500 of a second or faster.

In this photo of my niece Kate, I used a Shutter Speed of 1/1000 of a second.

That Shutter Speed allowed me to capture and freeze the motion of her batting and capturing the ball as she hit it which makes for a great action shot. It's the fast Shutter Speed that allows me to capture this precise moment. That and a bit of timing.

So we can use our Shutter Speed to freeze all sorts of motion which is really fun, but we can also do some really cool stuff with long Shutter Speeds.

For example, here's a shot where I used a Shutter Speed of 10 seconds.

In this shot I used a Shutter Speed of 10 seconds because it was pitch black outside. I needed that extra-long Shutter Speed to capture what little light there was for this photo. In this case, the light came from the moon which is giving the sky the beautiful blue and a street light which gave the grass the nice, orangey glow.

Because this was such a long Shutter Speed, I used a tripod to make sure it would be as sharp as possible.

I want to encourage you to get out there and shoot some photos after dark. You can get some really beautiful lighting from the moon, stars, and street and house lights at night.

That is an example of a long Shutter Speed with stationary subjects. You can also get some really great photos with moving subjects.

In this photo, I used a Shutter Speed of 1/2 second. What I wanted to do was show the motion of the ride whirling around. To do that, I knew I'd want to show the lights streaking rather than frozen in place. Therefore, I chose 1/2 second for my Shutter Speed. This shot was hand-held. At 1/2 second, I should have used a tripod but I didn't have one with me. I made the best of it and did a pretty decent job.

It's not easy to handhold your camera and get good shots when shooting long Shutter Speeds but it is possible.

I did not choose 1/2 second for the Shutter Speed for my first shot of the ride. This is often a trial and error process using the same steps I described for getting a sharp shot. In this case, I tried a Shutter Speed of 1/8, took a test shot, and found it didn't show enough motion to give the photo the look I wanted. I then changed it to 1/4, which still wasn't enough, and finally ended with 1/2. All the while changing my ISO to maintain my exposure.

Another example of what you can do with motion is this shot:

I used a Shutter Speed of 1/8 of a second, and I used a technique called panning.

In all the photos I've shown you up to this point, the camera has remained stationary. However, in this case, I deliberately moved the camera to achieve this effect.

What I did here was move the camera to follow the carriage with the intent of keeping the carriage relatively sharp and having the background blur behind it.

As a result, it looks like the world is zipping by almost as if you were riding alongside the carriage. This really gives a strong feeling of motion and speed to your final photo and using this in your photos can be really fun.

In this next example, I had gone to the Fourth of July fireworks. I wanted to take some photos that were not your normal fireworks photos.

The photo below is what we normally expect when we think of fireworks photos and these can be really fun.

For this photo, I used a tripod and a Shutter Speed of 5 seconds.

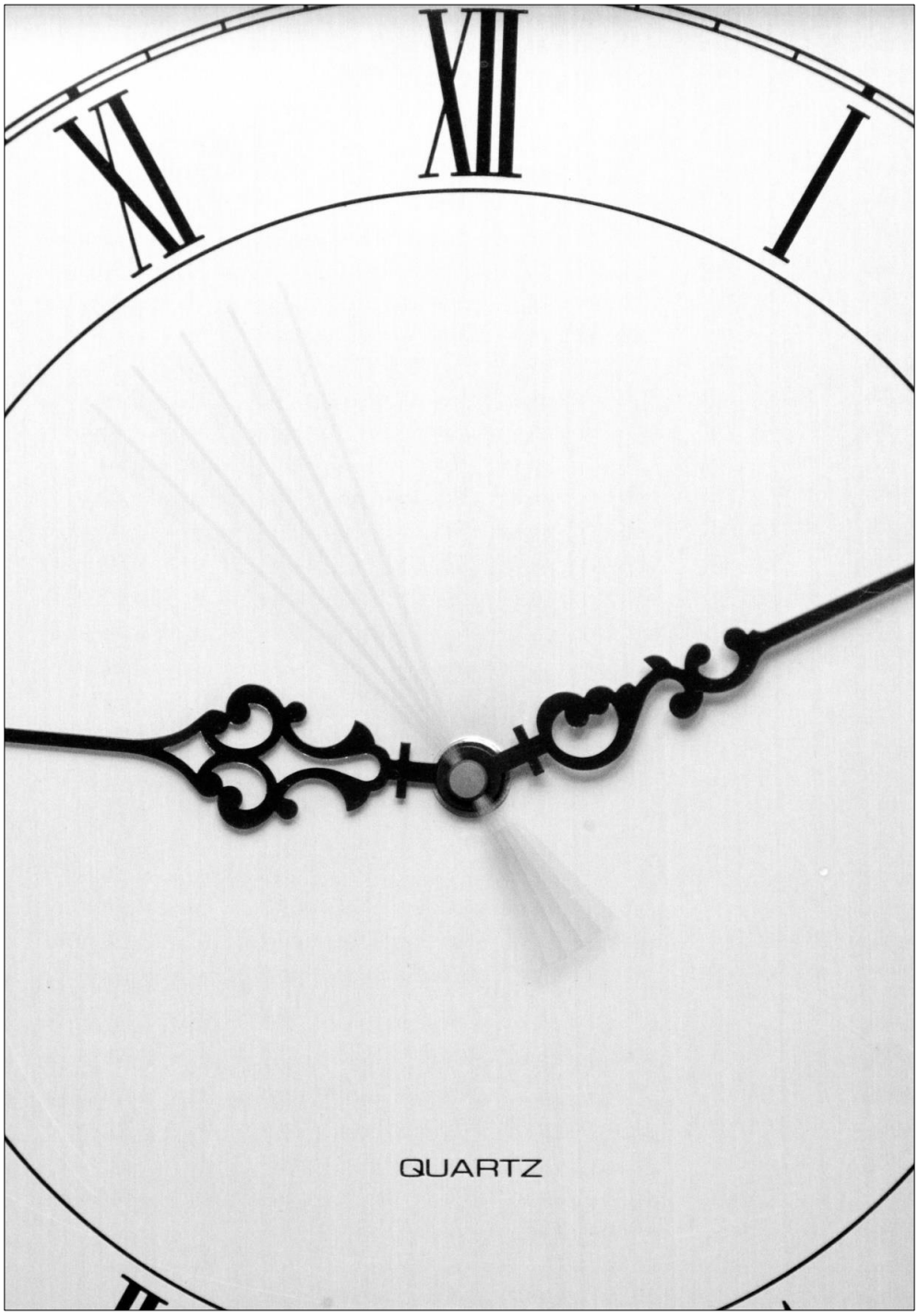
But I went to this fireworks show with the intent of trying something different and the following photo is what I came up with.

For this photo of fireworks, I used a three second Shutter Speed.

To achieve this effect, I had the camera focused on the sky where the fireworks were going off. When I took the photo, I moved the camera all around in order to make the lights streak in this abstract form.

So it pays off to not only shoot long Shutter Speeds with moving subjects but to experiment with moving the camera when using long Shutter Speeds as well. In the end, the possibilities are limited only by your imagination.

Here's another one. For this photo I used a four second Shutter Speed.



With this shot, I wanted to convey a very real and visceral feeling of time passing. I thought it would be perfect to use the ticking of the second hand and the clock we all live by to capture and show that in a photograph.

Now, up until this point, we've been talking about specific Shutter Speeds that you can choose based on your camera's range of Shutter Speeds. Whether it's 1/1000 of a second or ten seconds, these are specific Shutter Speeds that you choose, and every camera has a shortest and longest Shutter Speed limit. You should have this written down in your notes.

Now it's time to talk about that Bulb Mode that I mentioned the **CHANGING SHUTTER SPEED** section.

Pretty much every DSLR has Bulb Mode. If you're using a superzoom point and shoot or another type of camera, you may need to consult your user's manual to see if you have Bulb Mode.

Bulb Mode is really cool because it lets you take photos using Shutter Speeds longer than 30 seconds.

Here's how it works. When you put your camera into Bulb Mode, the Shutter Speed is as long as you hold down the shutter button.

You might be wondering why you would ever want to use a Shutter Speed longer than 30 seconds. Here is an example:

This is a photo that I took with a Shutter Speed of 15 minutes.

Let me just repeat that: ***the Shutter Speed was 15 minutes.***

That means that the shutter was open and stayed open for an entire 15 minutes. The camera was collecting light for a single photo for that entire 15 minutes.

One thing you'll notice right away is that this photo has a lot of noise in it. Particularly in the dark areas of the tree and in the sky. That's something that does occur with really long Shutter Speeds. However, really long Shutter Speeds like this also allow you to capture lots of light.

This was a really dark night. That ball of light in the sky is the moon. It's the moon that's lighting up this entire scene here. But that's not even the coolest thing about this photo.

Do you see all those streaks in the sky? Those are stars.

What I've captured here is called star trails.

The camera was collecting light for 15 minutes and, during that 15 minutes, the earth was rotating.

This means that the camera was moving while the stars were not. As a result, the light from the stars shows up as streaks in the sky.

With Bulb Mode, you can use Shutter Speeds of whatever length you'd like, from 31 seconds, to 15 minutes, to an hour, to three hours or right up until your battery dies!

Doing it is pretty simple. You may remember finding bulb mode when we were learning how to change the Shutter Speed on your camera.

On most cameras, you find the Bulb shutter option right after your longest Shutter Speed. If you want to check it out, grab your camera and change the Shutter Speed until it reads Bulb. Make sure you're going towards your longest Shutter Speed which is probably 30 seconds.

On some cameras, Bulb Mode is an option on the camera's mode dial. In that case, to put it in Bulb Mode you just switch the mode dial.

Now give it a try. Press and hold that shutter button for a few seconds and then let go.

The picture will suck but that's okay. I just wanted you to see how it works.

When using Bulb Mode, you'll get your best results using a tripod and a remote shutter release like this.

This is a cable that plugs into the camera. You press this button on the remote to trigger the shutter.

These releases typically have a lock switch on them so that you don't have to stand there and hold the button down the entire time you want the shutter to be open.

You can do some really cool stuff with long and short Shutter Speeds, and I definitely encourage you to get out there and experiment with long Shutter Speeds and Bulb Mode. You're limited only by your imagination, and I'd love to see what you come up with.

Once you've done some experimenting, make sure to share your photos in our Google+ Community [SHP] – Photography!

Click here to join if you haven't already.

Alright, so we've now learned all about how the ISO, Aperture, and Shutter Speed impact how our photos look, and we already know that they also impact how much light we capture.

Choosing the settings for any particular shot is always a balance between getting the amount of light you want with your exposure, and getting the photo to look the way you want it to look.

So what we're going to do next is go in depth into the process of choosing the best combination of ISO, Aperture, and Shutter Speed settings when you're taking a photo so that it looks the way you want it to look.

I AM SHOOTING

Now that we have a much better understanding of, ISO, Aperture, and Shutter Speed and how they impact our photos, it's time to pull back and look at how everything fits together.

When you're out shooting, you as the photographer need to decide exactly what ISO, Aperture, and Shutter Speed to use in order to create the photograph that you are trying to create. Even though it's just three settings, knowing how to decide which settings to use for a shot can be incredibly overwhelming.

The good thing is that I've got a way to think about this that makes it easy to choose the right settings in any situation.

As we went through each setting in depth, I mentioned that I always set my ISO first, followed by my Aperture, and ending with my Shutter Speed.

It's always the same. When you're just starting to shoot in Manual mode, and you're trying to think about all your settings and your Depth of Field and the focal length rule and noise, it's good to have a consistent way to choose your settings.

Right now, your brain is absorbing all of this new information. It's in there, but it's not instinctive knowledge like tying your shoe is. You've tied your shoes a million times. The circuits etched in your brain for tying your shoe are like the autobahn, a super-fast, wide open highway. You don't even have to think about tying your shoe. You just do it.

But as you go out to start shooting in Manual, you are going to be thinking a lot about each decision you make.

The circuits in your brain for this are like you hacking a path through the jungle. You'll get there, but it's going to be rough going, and it's going to be slow.

But if you set your settings the same way every time, that path in the jungle will become clearer and wider and faster every time you repeat the process. Pretty soon, that path will be more like a superhighway, and you'll be super-fast at choosing your settings because you're practicing it in a consistent way.

So I encourage you to set your settings in this order, for every shot, every time.

Start with your ISO.
Then set your Aperture.
Finish with your Shutter Speed.

What's great is that it works out into a cute little acronym.

***I**SO*
***A**perture*
***S**hutter Speed*

I
***A**m*
***S**hooting*

Here's how it works.

Set the ISO first because it has the least impact on how the final photo will actually look. Other than noise at extremely high ISO settings, whether you use ISO 100 or 800 makes no real difference to the final photo.

So set your ISO first and set it based on how bright it is. If it's really bright, set the ISO low, like 100 or 200. If it's really dim, set the ISO high like 1600 or 3200.

By practicing this consistently, after a while you'll find yourself instinctively choosing an ISO when you walk into different lighting situations.

You'll walk into a restaurant and think, *"I'd shoot this at ISO 3200"*.

You'll wake up with the sun streaming in through your windows and you'll think, *"ISO 100"*.

Your assessment of the situation will become automatic and your jungle path will turn into a dirt road, speeding up your shooting process.

Once your ISO is set, move on to Aperture.

Aperture is second, because for almost every photographer out there the primary concern for how the shot looks is the Depth of Field. So set your Aperture based on the Depth of Field that you want.

If you want Shallow Depth of Field, set it to a large sized Aperture, such as f2.8 or the lowest Aperture number available for your lens. If you want Great Depth of Field, then set it to a smaller sized Aperture, such as f16.

The exception to this is when you're shooting in very low light.

If it's a low light situation, it’s likely that you’re going to struggle to get a good Shutter Speed for sharp photos. Therefore, just set the Aperture as large as you can, choosing an Aperture like f2.8 or whatever the lowest Aperture number is for the lens you’re using.

If you use the process of always setting Aperture after ISO, once you set your ISO you will automatically start thinking about the Aperture you'll need to get the shot you see in your head.

Now your dirt road has some paving on it and things are moving even faster.

Finally, set your Shutter Speed.

Once the ISO is set and you’ve got your Aperture where you want it, set your Shutter Speed to obtain a reading of 0 on the exposure indicator. Then look at that Shutter Speed and determine if it's a Shutter Speed you can use.

For example:

- ISO: It’s bright out so you decide set your ISO to 100.
- APERTURE: You’re shooting a portrait and you want shallow Depth of Field for a nice out of focus background. Your kit lens is zoomed to 55mm so you choose f5.6, because f5.6 is the smallest Aperture number available at that focal length, giving you the largest aperture opening.
- SHUTTER SPEED: You set it so that the exposure indicator reads zero, and when you do that the Shutter Speed is 1/200 of a second.

With the lens zoomed to 55mm, you know you want at least 1/50 of a second for a sharp photo so you know that, with 1/200 of a second, you’re good to go and you can start shooting.

So it’s always ISO, followed by Aperture, and then Shutter Speed.

I Am Shooting

Now grab your camera, take off the lens cap, and make sure it’s turned on and in Manual mode. Take a look around you for a moment and find something to take a photo of.

Set your ISO first.

1. Choose an ISO based on the lighting you are in. If it's bright where you are, set your ISO volume to low, something like 100 or 200.

2. If it's dim where you are, set the ISO volume high, such as 1600 or 3200.

These are just suggestions. What I want you to do is choose what you think is best based on the lighting you are in right now.

After ISO comes Aperture.

3. For this exercise, let's say you want Shallow Depth of Field. To achieve that, set the Aperture to the smallest Aperture number which will give you the largest size aperture you can get for your lens.

Now set the Shutter Speed.

4. Point the camera at the subject you intend to photograph.

5. Press the shutter button halfway down to wake up the camera.

6. Look at your exposure indicator to see what it's telling you.

7. Change your Shutter Speed so that your exposure indicator reads zero.

If the exposure indicator is reading negative, then you have to let in more light with the Shutter Speed, so you have to choose a longer Shutter Speed

If the exposure indicator is reading positive, then you have to let in less light with the Shutter Speed, so you have to choose a shorter Shutter Speed.

Now check to see if the Shutter Speed is fast enough for a sharp photo.

8. Compare the focal length of your lens to your Shutter Speed.

If your Shutter Speed is good, (for instance, focal length is 55mm and Shutter Speed is 1/50 or shorter), go ahead and take your photo! Congratulations, you did it! You can skip to the end of this list!

If your Shutter Speed is not good, (for instance focal length is 55mm and Shutter Speed is 1/20 or slower), then you need to make an adjustment.

9. To make an adjustment, start by setting your Shutter Speed to the minimum speed you need.

10. Take a look at your exposure indicator.

    If the exposure indicator is reading negative, you need to turn the volume up somewhere.

    If the exposure indicator is reading positive, you need to turn the volume down somewhere.

11. Adjust your ISO up or down based on what your exposure indicator was reading.

    We started with ISO, then we set Aperture, and then Shutter Speed. When you need to make an adjustment to maintain your exposure, just go back to the top of the sequence!

12. Now your exposure indicator should be back at (or pretty close to) 0 and you're ready to shoot, so go ahead and take the shot!

Congratulations, you just used the I Am Shooting Method!

Don't worry if your photo sucks. Getting started with the process is what's important here.

Now I know this is probably a bit overwhelming, but it really boils down to just remembering the phrase ***I Am Shooting***.

If you always set your settings in that order - ISO, Aperture, and Shutter Speed - this process will speed up. Before you know it, choosing your settings will take seconds instead of the minutes it probably took you to go through these steps. The more you shoot, practice, and use this method, the better and faster you will get.

Now to make this easy for you to reference, I put a step by step breakdown of the ***I Am Shooting*** method on the next page so it's easy to print out and keep in your camera bag.

I Am Shooting

1. **Set your ISO**
    a. Choose an ISO based on the lighting you are in. If it's bright where you are, set your ISO volume to low, something like 100 or 200.
    b. If it's dim where you are, set the ISO volume high, such as 1600 or 3200.

2. **Set your Aperture**
    a. If you want Shallow Depth of Field set your Aperture to the smaller Aperture Number.
    b. If you want Great Depth of Field set your Aperture to a larger Aperture Number.
    c. If it's a dim lighting situation, set the Aperture to the smallest possible number for the lens.

3. **Set your Shutter Speed.**
    a. Point the camera at the subject you intend to photograph.
    b. Press the shutter button halfway down to wake up the camera.
    c. Look at your exposure indicator to see what it's telling you.
    d. Change your Shutter Speed so that your exposure indicator reads zero.

4. **Check to see if the Shutter Speed is fast enough for a sharp photo.**
    a. Compare the focal length of your lens to your Shutter Speed. If it's good, go ahead and shoot.
    b. If the Shutter Speed is not fast enough, make an adjustment. Start by setting your Shutter Speed to the minimum speed you need.
    c. Take a look at your exposure indicator.
    d. Adjust your ISO up or down so that the exposure indicator reads at or near 0.

5. **Shoot!**

CONCLUSION

What we've just covered is the foundation of all photography.

With a strong understanding of how to use ISO, Aperture, and Shutter Speed and the knowledge to control your camera, you are ready to start creating fantastic photos that will inspire you and capture your unique vision of the world.

So what's next?

The most important thing you can do is to ***get out there and take some damn photos.***

Get out there and shoot on a regular basis. If you don't practice and shoot regularly, you'll start to forget what you've learned.

The good thing is that you can come back to this Guide and read it any time so feel free to do that as often as you need to.

When it comes to your shooting, I encourage you to give yourself regular free time to practice and shoot in Manual mode. I say regular free time because there will be plenty of times when you're out shooting but it will be a pressure situation where you need to get the shot. Maybe it's your child's sporting event, a graduation, or a once in a lifetime trip to a beautiful place. Whatever it is, you'll be trying to set your settings, and you're going to feel frustrated because you need to get this shot but you can't quite get the settings right.

When this happens, I want you to put the camera back in Auto.

Yes, I just told you to put the camera in Auto.

Here's the thing: In critical situations, I don't want you to miss the shot because you feel like you have to shoot in Manual. I'd rather you put the camera in Auto to get the shot instead of fumbling with it in Manual mode.

Now let me be clear that I want you to shoot in Manual as much as possible, because then you will have the control you need to create the photos you want to create. But until you've practiced enough to turn that hacked-up jungle path in your brain into a four lane superhighway, put the camera in Auto to get your important shots.

Once you've gotten the shot in Auto, then go back to Manual mode.

You'll be more relaxed and able to think about setting your settings because you won't feel the pressure of having to get the shot.

And here's the best part. That shot you take in Auto can help you shoot in Manual.

When you view your images on the camera, it will show you the ISO, Aperture, and Shutter Speed that the camera chose for the shot that you took in Auto.

That means that if you're struggling to figure out which settings to choose in Manual mode, you can take a shot in Auto and then see what settings the camera chose. Then use those settings as your starting point in Manual mode.

Again, it's important to regularly give yourself pressure-free time to practice shooting in Manual. When there is no pressure, it doesn't matter if you get the shot, so you can just practice and shoot and be creative and have fun. Doing this will help improve your photography by leaps and bounds.

Be aware that you'll take a lot of shitty photos when you practice but that's okay. It is part of the learning process so don't beat yourself up.

The more you practice, learn, and experiment, the better your photos will get.

Now, the most important thing here is what you do next. This will be the difference between seeing dramatic improvement in your photos, or this being another thing that you've taken some interest in and learned about but never really mastered.

So if you want to cement in this knowledge, speed up your process, and see dramatic improvement in the quality and content of your photos, what you need to do next is to…

A Note From Spyros

I want to thank you for purchasing and taking the time to read this book.

My goal is always to help other photographers experience the joy and growth that photography has brought to my life. This book has been a labor of love, and I am proud to be able to share my knowledge with you through this book.

I would be remiss if I didn't thank two hugely important people in the creation of this book. The first person is my wife, who is a constant source of love and support for me and my work. I truly couldn't do this without her.

The second is my friend and business partner Angela Hill. Without her, this book wouldn't exist. It would still be an idea waiting to happen. Angela, you are amazing.

Finally, if you enjoyed this book and are looking for more, I have a video course based on this book called The Guide to Shooting in Manual Mode Video Course.

The video course covers this same material, with live demonstrations of the different concepts, along with a TON of bonus material, exercises to help you practice and learn, and much, much more. If you're interested in the video course, you can click here to learn all about it.

If you decide the video course is for you, as a thank you for purchasing and reading this book, I'd like to offer you a discount. You can save 22% off the regular price of $69 and get the video course for only $54 with coupon code **SHPVIDEO**.

Click here to purchase The Guide to Shooting in Manual Mode Video Course.

And, if you're at all interested in flash photography *(you absolutely should be!)*, I also have my Understanding Flash Photography video course that will take you from knowing nothing about flash to being able to shoot amazing photos using flash photography.

Click here to learn about the Understanding Flash Photography Video Course.

Now get out there and take some damn photos! :)