

# Basic Photo Tips: Aperture, Shutter Speed, and ISO

by [Bryan F Peterson](#); created August 2008

Just as it was 100 years ago and just as it is today, every camera—be it film or digital—is nothing more than a lightproof box with a lens at one end and light sensitive film or a digital sensor at the other end. It is of course light that enters through a ‘hole’ in the lens (the aperture), and after a certain amount of time (determined by shutter speed) an image will be recorded (on film or digital media). This recorded image has been called—since day one—an exposure, and it still is.

Sometimes, the word exposure refers to a finished slide or print: “Wow, that’s a nice exposure!” At other times, it refers to the film or digital card: “I’ve only got a few exposures left.” But more often than not, the word exposure refers to the amount, and act, of light falling on photosensitive material (either the film or digital sensor). And in this context, it comes up most often as part of a question—a question I’ve heard more often than any other: “Hey Bryan, what should my exposure be?” And my answer is always the same: “Your exposure should be correct!”



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Although my answer appears to be flippant, it really is the answer. A correct exposure really is what every amateur and professional alike hopes to accomplish with either his or her [camera](#). Up until about 1975, before many auto exposure [cameras](#) arrived on the scene, every photographer had to choose both an aperture and shutter speed that, when correct, would record a correct exposure. The choices in aperture and shutter speed were directly influenced by the film’s ISO (speed or sensitivity to light). Most photographers’ exposures would be based on the available natural light. And when the available light wasn’t enough, they’d resort to using flash or a tripod.

## The Do-it-all Setting

Today, most cameras, either film or digital, are equipped with so much automation they promise to do it all for you, allowing photographers to concentrate solely on what they wish to capture. “Just keep this dial here set to P and fire away! The camera will do everything else,” says the enthusiastic salesman at the camera shop. Oh, if that were only true! Chances are that most—if not all—of you who are reading this article have a do-it-all-for-you camera, yet you still find yourself befuddled, confused, and frustrated by exposure. Why is that? It’s because your do-it-all-for-you camera is not living up to that promise, and/or you have finally reached the point at which you want to consistently record creatively correct exposures.

The do-it-all camera often falls short of its promise, yielding disappointing results. Use your camera's manual settings, or at the very least, know how light and shadow interact on film or digital media so that you can be assured of getting it right even when you are in auto exposure mode

## Setting and Using Your Camera on Manual Exposure



I know of no other way to consistently make correct exposures than to learn how to shoot a fully manual exposure. Once you've learned how to shoot in manual exposure mode (it's really terribly easy), you'll better understand the outcome of your exposures when you choose to shoot in semi- or full auto exposure mode.

With your camera and lens in front of you, set your camera dial to M for manual. (If you're unsure on how to set your camera to manual exposure mode, read the camera manual!) Grab your kid or a friend to use as your subject and go to a shady part of your yard or a neighborhood park, or if it's an overcast day, anywhere in the yard or park will do. Regardless of your camera, and regardless of what lens you're using, set your camera dial to M Mode and the lens opening to the number 5.6 (f/5.6). Place your subject up against the house or some six- to eight-foot shrubbery. Now, look through the viewfinder and focus on your subject. Adjust your shutter speed until the camera's light meter indicates a "correct" exposure in your viewfinder and take the photograph. You've just made a manual correct exposure!

Operating in manual exposure mode is empowering, so make a note of this memorable day.

### The Photographic Triangle

This does not mean that I want you to forever leave your camera's aperture at f/5.6 and simply adjust your shutter speed for the light falling on your subject until the viewfinder indicates a correct exposure. Before you forge ahead with your newfound ease in setting a manual exposure, you need to learn some basic concepts about exposure.

A correct exposure is a simple combination of three important factors: aperture, shutter speed, and ISO. Since the beginning of photography, these same three factors have always been at the heart of every exposure, whether that exposure was correct or not, and they still are today—even if you're using a [digital camera](#). I refer to them as the photographic triangle.



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Locate the button, wheel, or dial on your camera or lens that controls the aperture. If you're using an older camera and lens, the aperture control is a ring that you turn on the lens itself. Whether you push buttons, turn a wheel, or rotate a ring on the lens, you'll see a series of numbers coming up in the viewfinder or on the lens itself. Of all of the numbers you'll see, take note of 4, 5.6, 8, 11, 16, and maybe even a 22. (If you're shooting with a fixed-zoom-lens digital camera, you may find that your apertures don't go past 8 or maybe 11). Each one of these numbers corresponds to a specific opening in your lens and these openings are called f-stops. In photographic terms, the 4 is called  $f/4$ , the 5.6 is  $f/5.6$ , and so on. The primary function of these lens openings is to control the volume of light that reaches the film or digital media during an exposure. The smaller the f-stop number, the larger the lens opening; the larger the f-stop, the smaller the lens opening.

For the technical minded out there, an f-stop is a fraction that indicates the diameter of the aperture. The f stands for the focal length of the lens, the slash (/) means divided by, and the number represents the stop in use. For example, if you were shooting with a 50mm lens set at an aperture of  $f/1.4$ , the diameter of the actual lens opening would be 35.7mm. Here, 50 (lens focal length) divided by 1.4 (stop) equals 35.7 (diameter of lens opening). Whew! It makes my head spin just thinking about all that. Thank goodness this has very little, if anything, to do with achieving a correct exposure.

## Aperture

Interestingly enough, each time you descend from one aperture opening to the next, or stop down, such as from  $f/4$  to  $f/5.6$ , the amount of light passing through the lens is cut in half. Likewise, if you change from an aperture opening of  $f/11$  to  $f/8$ , the volume of light entering the lens doubles. Each halving or doubling of light is referred to as a full stop. This is important to note since many cameras today offer not only full stops, but also the ability to set the aperture to one-third stops, i.e.  $f/4$ ,  $f/4.5$ ,  $f/5$ ,  $f/5.6$ ,  $f/6.3$ ,  $f/7.1$ ,  $f/8$ ,  $f/9$ ,  $f/10$ ,  $f/11$ , and so on. (The underlined numbers represent the original, basic stops while the others are the newer one-third options sometimes available).

## Shutter Speed

Now let's turn to shutter speed. Depending on the make and model, your camera may offer shutter speeds from a blazingly fast  $1/8000$ s all the way down to 30 seconds. The shutter speed controls the amount of time that the volume of light coming through the lens (determined by the aperture) is allowed to stay on the film or digital media in the camera. The same halving and doubling principle that applies to aperture also applies to shutter speed.



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Let me explain. Set the shutter speed control on your camera to 500. This number denotes a fraction—500 represents  $1/500$  second. Now change from 500 to 250; again, this represents  $1/250$ s. From  $1/250$ s you go to  $1/125$ ,  $1/60$ ,  $1/30$ ,  $1/15$ , and so on. Whether you change from  $1/30$ s to  $1/60$ s (decreasing the time the light stays on the film/digital media) or from  $1/60$ s to  $1/30$ s (increasing the time the light stays on the film/digital media), you've shifted a full stop. Again this is important to note since many cameras today also offer the ability to set the shutter speed to one-third stops:  $1/500$ s,  $1/400$ s,  $1/320$ s,  $1/250$ s,  $1/200$ s,  $1/160$ s,  $1/125$ s,  $1/100$ s,  $1/80$ s,  $1/60$ s, and so on. (Again, the underlined numbers represent the original, basic stops while the others are the newer one-third options sometimes available). Cameras that offer one-third stops reflect the camera industry's attempts to make it easier for you to achieve "perfect" exposures. But as you'll learn later on, it's rare that one always wants a perfect exposure.

## ISO

The final leg of the triangle is ISO. Whether you shoot with film or use a digital camera, your choice of ISO has a direct impact on the combination of apertures and shutter speeds you can use.. To better understand the effect of ISO on exposure, think of the ISO as a worker bee. If my camera is set for ISO 100, I have, in effect, 100 worker bees; and if your camera is set for ISO 200, you have 200 worker bees. The job of these worker bees is to gather the light that comes through the lens and make an image. If both of us set our lenses at the same aperture of  $f/5.6$ —meaning that the same volume of light will be coming through our lenses—who will record the image the quickest, you or me? You will, since you have twice as many worker bees at ISO 200 than I do at ISO 100.

## ISO and Shutter Speed

How does this relate to shutter speed? Let's assume the photo in question is of a lone flower taken on an overcast day. Remember that your camera is set to ISO 200 and mine to ISO 100, both with an aperture of  $f/5.6$ . So, when you adjust your shutter speed for a correct exposure,  $1/250$ s is indicated as "correct," but when I adjust my shutter speed for a correct exposure,  $1/125$ s—a longer exposure—is indicated. This is because your 200 worker bees need only half as much time as my 100 worker bees to make the image.

## Understanding Exposure



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Since this is such an important part of understanding exposure, I want you to pause in your reading for a moment and get out your camera, as well as a pen and paper. Set the film speed dial to ISO 200; (If you are a film shooter, do this even if you have a roll of film in your film camera that is not ISO 200, but don't forget to set the ISO back to the correct number when we're done here.) Now, set your aperture opening to  $f/8$ , and with the camera pointed at something that's well illuminated, adjust your shutter speed until a correct exposure is indicated in the viewfinder. (If you want, you can leave the camera in the automatic aperture-priority mode for this exercise, too). Write down that shutter speed. Then, change your film speed again, this time to ISO 400, leaving the aperture at  $f/8$ , and once again point the camera at the same subject. Whether you're in manual mode or auto-aperture-priority mode, you'll see that your light meter is indicating a different shutter speed for a correct exposure. Once again, write down this shutter speed. And finally, change the ISO to 800, and repeat the steps above. What have you noticed? When you change from ISO 100 to ISO 200 your shutter speed changed: from  $1/125s$  to  $1/250s$  or perhaps something like from  $1/160s$  to  $1/320s$ . These shutter speeds are examples, of course, and not knowing what your subject was, it's difficult at best to determine your actual shutter speeds, but one thing is certain: each shutter speed is close to if not exactly half as much as the one before it.

When you increase the number of worker bees (the ISO) from 100 to 200, you cut the time necessary to get the job done in half. (If only the real world worked like that!) This is what your shutter speed was telling you: Going from  $1/125s$  to  $1/250s$  is half as long an exposure time. When you set the ISO to 400, you went from  $1/125s$ —passing by  $1/250s$ —and ended up at  $1/500s$ . Just as each halving of the shutter speed is called 1 stop, each change from ISO 100 to ISO 200 to ISO 400 is considered a 1-stop increase (an increase of worker bees).

You can do this same exercise just as easily by leaving the shutter speed constant, for instance at  $1/125s$ , and adjusting the aperture until a correct exposure is indicated in the viewfinder; or, if you choose to stay in auto exposure mode, select shutter-priority, set a shutter speed of  $1/125s$ , and the camera will set the correct aperture for you.

Now that you are armed with this simple yet invaluable information, let's put it towards some truly creative uses! The next article from Bryan will explain in detail how to correctly expose your photographs.