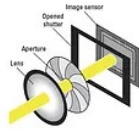


# Basic Photography

## HOW THE CAMERA MAKES THE IMAGE (EXPOSURE)



The camera acts like your eye but instead of seeing moving pictures it captures one moment in time. When your eye catches an image it uses its lens to focus the image onto the retina to be recorded by your brain. Your retina is like the film or the sensor in your camera. Your eye is very similar to the lens in a camera. The camera lens allows light through and focuses that light to make a sharp image. Like your eye's pupil, the camera lens can control how much light passes through it by opening and closing its aperture. If it is wide open, it lets a lot of light through. When it is smaller it reduces the amount of light passing through. The aperture opening is measured in f-stops. (i.e. f8)



Along with the lens, the camera uses a shutter to control light. The shutter is just that, a shutter. It opens and closes. When closed, it stops all light from passing through. When opened, all light passes through. The amount of light allowed through the shutter is controlled by changing the amount of time it is left open. The shutter time is measured in fractions of a second. (i.e. 1/125th second)



The third and last thing that controls the amount of light in a photo is the film speed or ISO. The higher the ISO, the more sensitive the camera is to light.

This trio of options to control light in a camera is called The Exposure Triangle. The best way to understand how these three options work together to make a properly exposed image is to use a reference point. Our reference point will be outdoors in daylight. On our camera we have the film speed set at ISO 100 which is our base. Our shutter speed is set at 1/250th second which is a mid-range speed and our lens aperture is set to f8 which is halfway open. Let's assume if we take a photo at these settings it will have the right amount of brightness or exposure.



The light changes. The sun has gone behind the clouds. If you use the same settings again the picture will be too dark. It is now necessary to let more light into the camera. You have a choice of what to adjust. You can choose a larger aperture, you can choose a slower shutter speed, or you can choose a higher ISO.

We choose 1/125th sec. and the shutter stays open twice as long than 1/250th sec. which allows twice as much light onto the film or digital sensor. Let's choose to make the shutter slower. Another choice is to change the f-stop or aperture setting. What should we do? F-stops represent the size of the aperture opening. Let's say that your lens' aperture range is from f2.8 to f22. f2.8 is the setting where the aperture is most wide open. f22 is the setting where the aperture opening is the smallest. We are at f8. So, since we want to let more light in, we choose to open the aperture to f5.6. F5.6 allows twice as much light onto the film or digital sensor.

Your third choice is a higher ISO. ISO settings are listed as 100, 200, 400, 800, 1600, etc. You will notice that the number doubles as you go up. Each setting is twice as sensitive as the previous setting. ISO 200 is twice as sensitive to light as ISO 100. ISO 400 is twice as sensitive as ISO 200, and so on. So, if we want to make the picture brighter we choose a higher ISO. We are at ISO 100 so we change to ISO 200. (You should only raise your ISO setting from ISO 100 if it is absolutely necessary.)

You may have noticed that all three camera settings have adjustments which double the amount of light exposing the film or sensor. This is important. If you make one setting brighter you can make one of the other two settings darker to compensate. These combinations of settings all give the same exposure.

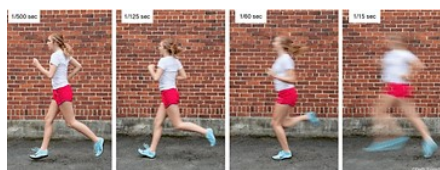
- 1/250th sec at f8 ISO 100
- 1/125th sec. at f11 ISO 100
- 1/60th sec. at f16 ISO 100
- 1/30th sec. at f22 ISO 100
- 1/500th sec. at f8 ISO 200

All of these settings produce the same exposure. Why is this important? Keep reading.

## THE SETTINGS YOU CHOOSE AFFECT HOW THE IMAGE LOOKS

If you can choose different combinations (as shown above) of shutter speed and aperture and get the same exposure then why does it matter what you choose?

Let's start with your shutter speed. 1/60th sec. is reasonably fast. It is actually faster than the eye sees (1/30th sec.). So why would I use a faster speed? 1/60th sec. is fast enough to capture an subject that isn't moving but it's not fast enough to capture something like a moving car, a child playing or a bird flying. We need to use faster shutter speeds when the subject is moving. If you are shooting a subject that requires a fast shutter speed, you adjust the aperture accordingly. It is important to note that shutter speeds slower than 1/60th sec. will usually result in blurred photos because our hands shake when we take pictures.



Aperture has an effect on photos, too. Let's do the 'eye' comparison again. When you need to pinpoint focus on something you squint and your pupil closes. Closing the pupil makes things a little more in focus. The aperture of a lens operates the same way. If you use an aperture like f22, which is like squinting, everything tends to be in focus from up close to far away. If you use an aperture like f2.8, which is like having dilated pupils, very little is in focus. In fact, only the subject is in focus. Everything closer and farther away than the subject is blurry. This focus area is called 'depth of field'.



Sometimes there just isn't enough light to make the adjustments you want to make with your shutter speed and aperture. What is your next option? You can choose a higher ISO speed. Yes, I advised you not to change it from ISO 100 but sometimes you don't have a choice. Raising your ISO speed lets you choose higher shutter speeds and smaller apertures. So why don't we want to raise it and leave it raised? NOISE. High ISO settings make noise and noise lowers image quality. Luckily, there is another option for adding light to a photo. You can use lights.



When you need more light you can add light. Flash units are an excellent source of light. Please see [Flash](#).