Photzy

QUICK GUIDE TO EXPOSURE

Quick Guide

Written by Jason D. Little

Rinou Bao
https://www.flickr.com/photos/tinou/334842339/

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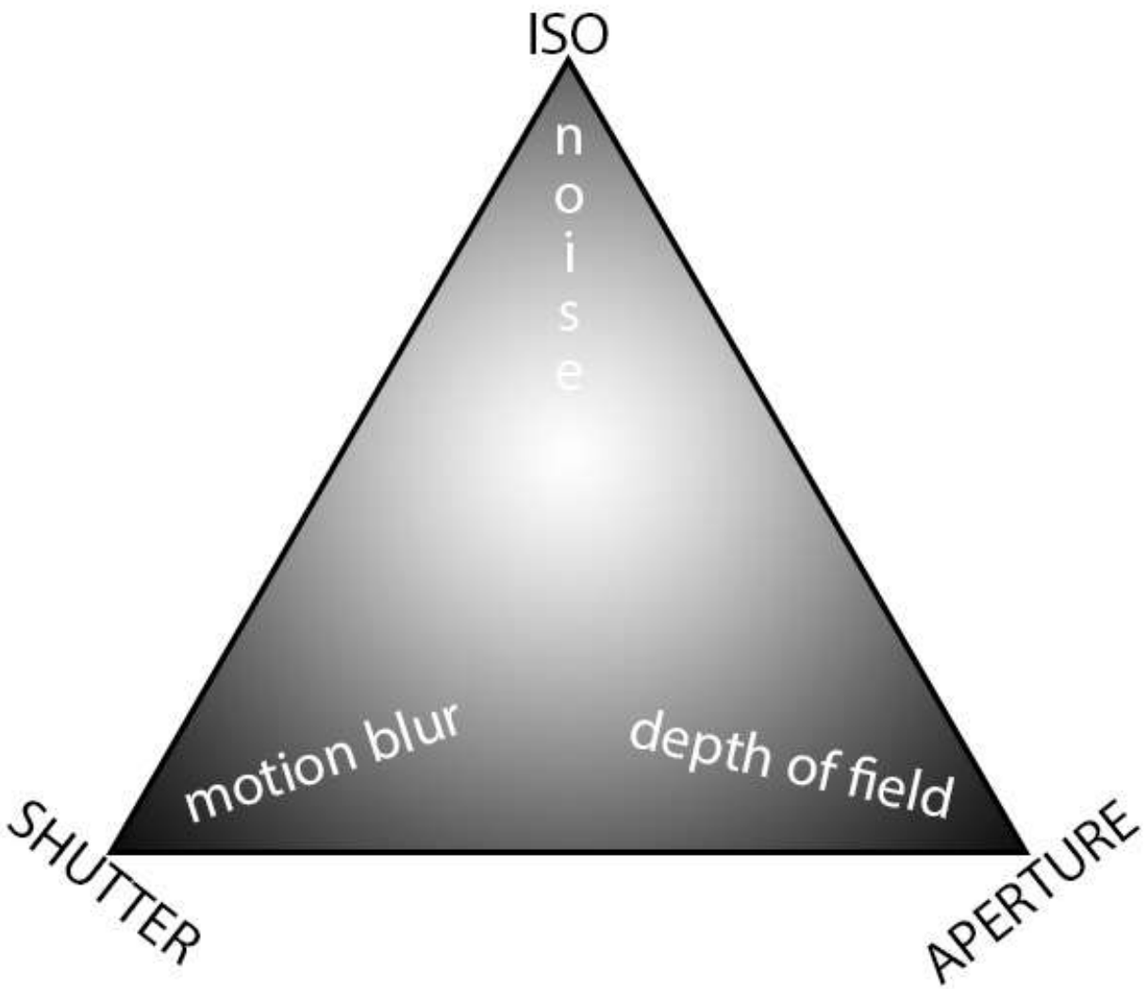
Photography is an art form, one occupied by creative individuals who desire to share their inner vision with the rest of the world. A good photographer doesn't need to be a scientist or a technology expert, despite the fact that in the modern world, our cameras are bursting at the seams with technological innovation.

Similarly, one does not need to be a mathematics genius in order to succeed at photography, but there are plenty of aspects of photography where mathematical principles apply.

One such area is the fundamental concept of exposure. Taking the time to understand a few number-based ideas can go a long way in making you a more proficient and efficient photographer.

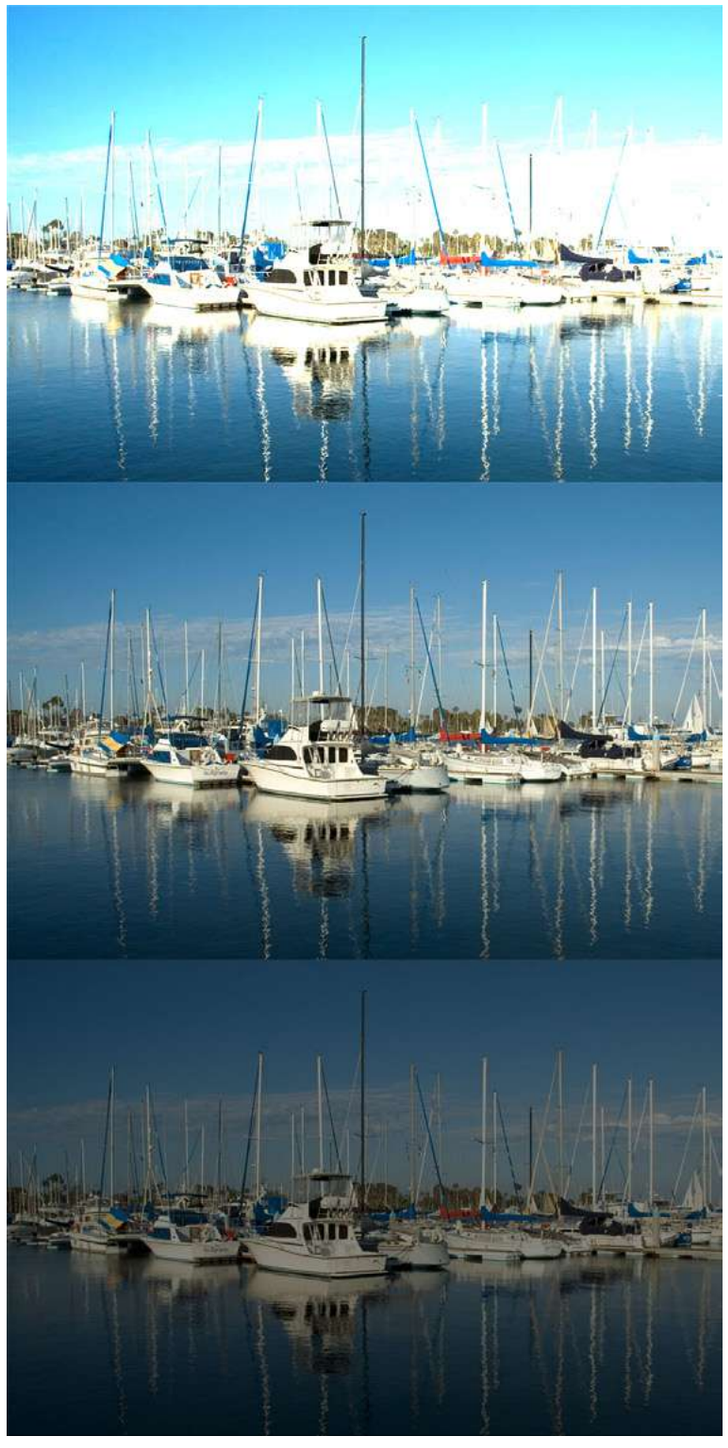


The three elements of the exposure triangle and what each controls.

THE EXPOSURE TRIANGLE

Depending on how long and how deeply involved in photography you've been, there's a good chance you have heard of or read about something called "the exposure triangle". Referring to aperture, shutter speed, and ISO, there is indeed a triangular relationship among these three elements.

Here, we'll take a look at each component of this triangle and then consider how they all work together to control the photographic outcome of any given scene.



Michael Miller
https://www.flickr.com/photos/12150723@N06/1863578835/

The top image is overexposed, the bottom image is underexposed, and the center image is correctly exposed.

EXPOSURE

In short, an exposure is the final result of any given amount of light that is collected by a camera's imaging sensor. A shot that is exposed for too long (overexposed) will be overly bright and washed out.

A shot that is not exposed long enough (underexposed) will be dark and contain no discernible details. A "correct" exposure is one that achieves the right balance of shadows, highlights, and details — it is an accurate reproduction of a scene's dynamic range (the difference between the brightest and darkest parts of a scene).

APERTURE

Aperture is the quasi-circular opening of a lens. This opening can be adjusted from the size of a pencil point (or smaller) to nearly as large as the lens itself. The size of the opening is adjusted to allow variable amounts of light to reach the camera's sensor. The larger the opening, the more light gets into the camera, the smaller the opening, the less light is allowed in.

You might think of aperture as the window blinds in your home; opening them just a bit lets a small amount of light into the room, whereas opening them fully lets a lot of light in. It's a relatively straightforward idea in that regard.

Where the confusion lies for some people is in how we designate specific apertures in photography. Just remember that larger aperture openings have smaller numbers (f/1.4, f/2.0, etc.) and smaller apertures have larger numbers (f/16, f/22, etc.).

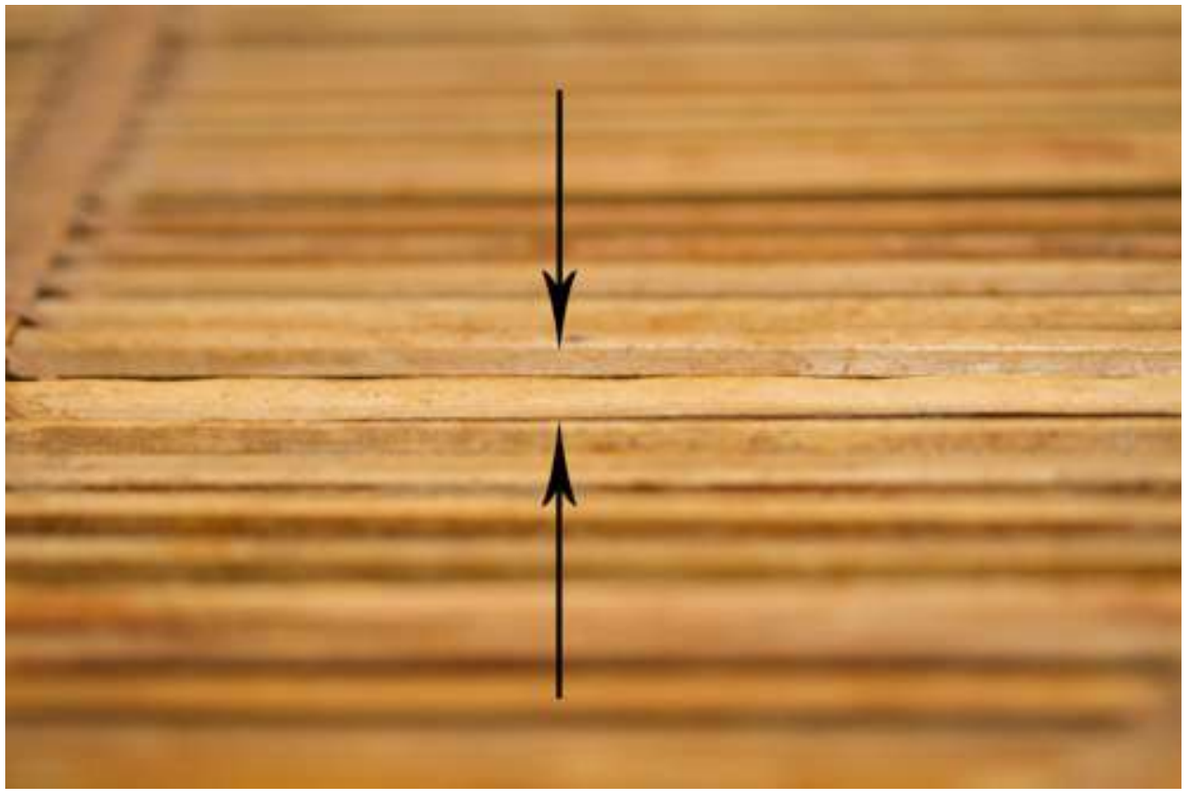
That seems rather counterintuitive at first, but it does make more sense if you think of the f-numbers in terms of fractions. For example, think of f/2 as being 1/2 and think of f/4 as being 1/4; 1/2 is a greater value (bigger aperture opening) than 1/4.

Lens aperture openings.

Some standard aperture numbers include: f/1.4, f/2, f/2.8, f/4, f/5.6, f/8, f/11, f/16, and f/22. These numbers represent whole “stops”. A stop is simply the halving or doubling of light that the aperture allows to pass through the lens. Thus, f/1.4 lets in twice the light as f/2. Or, conversely, f/2 transmits half the light as f/1.4.

Your camera’s LCD or the markings on the barrel of your lens may display f-numbers of 1.2, 1.8, 2.2 and so on; these one-third stops simply allow you more precise control over the amount of light entering the lens.

In practical terms, aperture (f-stop) plays a significant role in determining how much of a scene is in focus. Larger apertures cause a small portion of a scene to be in focus, while smaller apertures lead to more of a scene being in focus. This effect is known as depth of field and is illustrated below.



Shot at f/2.8. Notice the small area of the image that is in focus while the rest is out of focus. This is known as shallow depth of field.

Shot at f/16. In contrast to the example above, much more of this image is in focus. It exhibits deep depth of field.

SHUTTER SPEED

While aperture is tasked with controlling the amount of light that reaches a camera's sensor, shutter speed enters the equation by determining how long the sensor is exposed to that light. The longer the shutter is open, the more light that reaches the sensor.

Shutter speed is technically expressed in fractions of a second, such as 1/4 (a slow shutter speed) or 1/1000 (a fast shutter speed), but your camera's LCD might display these values without the numerator, so you will instead simply see 4 or 1000. For shutter speeds of 1 second and slower, the "second" symbol will be displayed along with the shutter speed; thus 1" is 1 second, 4" is 4 seconds, etc.

Just like with apertures, shutter speeds are designated whole stops in which each duration either doubles or cuts in half the amount of light entering the camera. Shutter speeds are also available in one-third stops on most cameras.

Moving away from the technical considerations of shutter speed, its practical use for photography is to control how motion is captured. If you have ever seen photos of birds in flight or splashes of water and wondered how the photographer went about freezing such rapid motion, you will be relieved to know that there is no great mystery behind it.

It's the result of using a very fast shutter speed.

Rachel Samanyi
https://www.flickr.com/photos/sarairachel/7876010420/

A fast shutter speed of 1/1000 sec. is needed to freeze the splashing action.

Rinou Bao
https://www.flickr.com/photos/tinou/334842339/

A slow shutter speed of 1/5 sec. creates motion blur in the passing train.

On the other hand, if you want to convey motion, then you have to slow down your shutter speed; this will introduce a certain amount of blur to the image and show that the subject is moving.

Once camera shake is counted out as a factor, how much blur, if any, is present in an image comes down to artistic choice.

As part of the exposure triangle, ISO helps us find balance with the other two components of the triangle.

ISO

ISO is a measure of how sensitive the camera's sensor is to light. A low ISO number correlates to lower sensitivity, meaning that more light is required to produce the same exposure that a more sensitive (higher ISO) setting would produce. In essence, the lower the ISO, the greater the amount of light needed (aperture) or the more time the light needs (shutter speed) to contact the sensor for a technically proper exposure.

Most cameras offer ISO levels ranging from as low as 50 up to well over 6400; many high-end cameras commonly reach levels of 12,800 and higher.

As part of the exposure triangle, ISO helps us find balance with the other two components of the triangle — aperture and shutter speed. It may be tempting — or even sound completely reasonable — to set ISO to one level and just leave it. The problem is that with too little sensitivity you'll end up with dark images; with too high a sensitivity you introduce noise into your photos. Noise is essentially the digital equivalent of film grain (though there are some differences in aesthetic quality between the two); some people like a bit of grain/noise, while others find it undesirable.

Shooting outdoors on a sunny day, even with the presence of some cloud cover, will generally facilitate the use of a low ISO such as 100 or 200. Shooting indoors without the use of flash may require you to boost the ISO to 800 or 1600, or 3200 depending on the quantity of light. It is important to check your images when shooting at increasingly higher ISO levels to make sure the amount of noise hasn't exceeded what you are comfortable with. The good thing is that most modern digital camera sensors are quite capable of handling low light/high ISO shooting with good results.

The shots below illustrate how noise affects photos.

Michael Glasgow
https://www.flickr.com/photos/glasgows/2099423639/

ISO 100: No significant noise.

Michael Glasgow
https://www.flickr.com/photos/glasgows/2099481959/

ISO 2000: Noise is clearly noticeable

Michael Glasgow
https://www.flickr.com/photos/glasgows/2099483405/

ISO 6400: A significant amount of noise.

WHAT DOES IT ALL MEAN?

To maintain the same exposure, a change in one element of the triangle requires an opposing change in at least one of the other elements.

- For each full stop increase in aperture (double the light), increase shutter speed one full stop or decrease ISO one full stop (both halve the light).
- For each full stop decrease in aperture (half the light), decrease shutter speed one full stop or increase ISO one full stop (both double the light).
- For each full stop increase in shutter speed (half the light), increase aperture one full stop or increase ISO one full stop (both double the light).
- For each full stop decrease in shutter speed (double the light), decrease aperture one full stop or decrease ISO one full stop (both half the light).
- For each full stop increase in ISO (double the light), increase shutter speed one full stop or decrease aperture one full stop (both half the light).
- For each full stop decrease in ISO (half the light), decrease shutter speed one full stop or increase aperture one full stop (both double light).

Shutter Speeds	
Whole	Thirds
1/8000	
	1/6400
	1/5000
1/4000	
	1/3200
	1/2500
1/2000	
	1/1600
	1/1250
1/1000	
	1/800
	1/640
1/500	
	1/400
	1/320
1/250	
	1/200
	1/160
1/125	
	1/100
	1/80
1/60	
	1/50
	1/40
1/30	
	1/25
	1/20
1/15	
	1/13
	1/10
1/8	

Shutter speeds continued	
Whole	Thirds
	1/6
	1/5
1/4	
	1/3
	1/2.5
1/2	
	1/.6
	1/.3
1 sec.	
	1.3″
	1.6″
2 sec.	
	2.5″
	3″
4 sec.	
	5″
	6″
8 sec.	
	10″
	13″
15 sec.	
	20″
	25″
30 sec.	

F Stops	
Whole	Thirds
	1.2
1.4	
	1.6
	1.8
2.0	
	2.2
	2.4
2.8	
	3.2
	3.5
4.0	
	4.5
	5.0
5.6	
	6.3
	7.1
8	
	9
	10
11	
	13
	14
16	
	18
	20
22	
	25
	29
32	

ISO	
Whole	Thirds
100	
	125
	160
200	
	250
	320
400	
	500
	640
800	
	1000
	1250
1600	
	2000
	2500
3200	

Nikon D200 f-stop chart. Thanks to Ken Storch
PhotographyUncapped.com

Craig
https://www.flickr.com/photos/41681212@N02/5888533829/

This chart illustrates whole stops and third stops for shutter speed, aperture (f-stop), and ISO.

From a purely creative standpoint, there is no such thing as a “correct” exposure.

As the term “exposure triangle” implies, achieving a technically correct photographic exposure requires a symbiotic relationship among each element that impacts exposure. To get a faithful reproduction of a scene’s dynamic range, aperture, shutter speed, and ISO must work together. One element is going to exert some degree of influence over the others.

From a purely creative standpoint, there is no such thing as a “correct” exposure.

Once you’ve gotten comfortable with the basics of photography and have begun to establish your own personal style, you will know how to set your camera to produce photos that meet your criteria for what a correct exposure looks like.

Hey there!

Let's get real for a minute... Learning photography can be super challenging! But we're here to help you every step of the way! Here are 3 of our most useful *(and FREE!)* photography resources:

3 Free Photography Cheat Sheets

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About the Author

Jason D. Little is a photographer (shooting macros, portraits, candids, and the occasional landscape), part time writer, and full time lover of music.
You can see Jason's photography on his *Photography Blog* or on *Flickr.*

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