

Aperture

Aperture controls the brightness of the image that passes through the lens and falls on the image sensor. It is expressed as an f-number (written as "f/" followed by a number), such as f/1.4, f/2, f/2.8, /f4, f/5.6, f/8, f/11, f/16, f/22, or f/32.

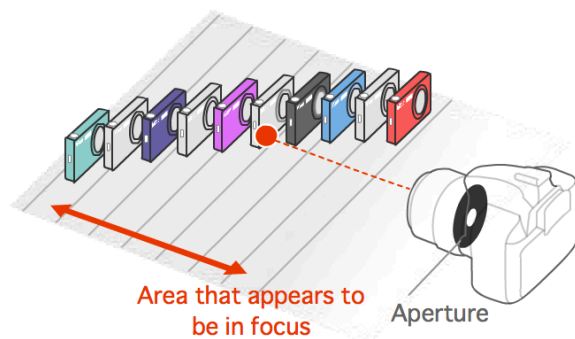
Changing the f-number changes the size of the aperture, changing the amount of light that passes through the lens. The higher the f-number, the smaller the aperture and the less light that passes through the lens; the lower the f-number, the larger the aperture and the more light that passes through the lens. For example, changing the aperture from f/4 to f/5.6 halves the amount of light passing through the lens and halves the brightness of the image that falls on the image sensor.

Changing the f-number also changes the distance in front of or behind the focus point that appears to be in focus. The higher the f-number, the greater the distance in front of and behind the focus point that appears to be in focus; on the other hand, the lower the f-number, the shorter the distance in front of and behind the focus point that appears to be in focus. The distance in front of and behind the focus point that appears to be in focus is referred to as "depth of field."

Photographing the Same Scene at Different Apertures


Changing the aperture changes depth of field.

High f-number (increased depth of field)

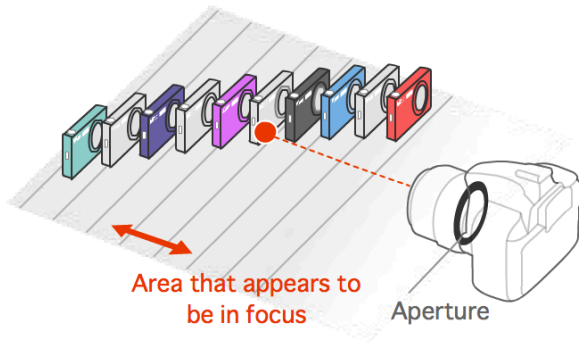


* The illustration is an artist's conception.



> [Depth of field: long](#) 
Click image to enlarge.

Low f-number (decreased depth of field)



* The illustration is an artist's conception

> Depth of field: short
 Click image to enlarge.

f-numbers

f-numbers change as shown below.

Low		←		f-number				→		High
F 1.4	F 2	F 2.8	F 4	F 5.6	F 8	F 11	F 16	F 22	F 32	
				← 1 step →						

Raising the f-number one step is referred to as "stopping aperture down a step " or "stepping aperture down an f-stop." This halves the area of the aperture (or opening), halving the brightness of the image that falls on the image sensor. Lowering the f-number by one step is referring to as "stopping aperture up a step " or "stepping aperture up an f-stop." This doubles the area of the aperture (or opening), doubling the brightness of the image that falls on the image sensor.

If you are using a Nikon digital SLR camera, f-number changes in 1/3 steps; some models also support increments of 1 step and 1/2 step.

Sample Camera Displays



f-number:

Shown as f/4, f/4.5, f/5, f/5.6, etc.

camera information display

Shutter Speed

Shutter speed is a measurement of the time the shutter is open, shown in seconds or fractions of a second: 1 s, 1/2 s, 1/4 s ... 1/250 s, 1/500 s, etc. The faster the shutter speed, the shorter the time the image sensor is exposed to light; the slower the shutter speed, the longer the time the image sensor is exposed to light.

If you are photographing a subject that is in motion, you will get different effects at different shutter speeds. Fast shutter speeds will “freeze” motion, while slow shutter speeds introduce blur from two sources: camera movement (camera shake) and subject movement. In other words, the faster the shutter speed the easier it is to photograph the subject without blur and “freeze” motion and the smaller the effects of camera shake. In contrast, slower shutter speeds are suited to suggesting the motion, such as that of flowing water or other moving subjects. Changing the shutter speed gives you control over whether to “freeze” or suggest motion.

In the photograph taken at a fast shutter speed, the walker appears “frozen” in mid step. This is because only a brief instant of the walker’s motion was recorded because the shutter was only open for a short time. In the photograph taken at a slow shutter speed, the walker is blurred. This is because the walker moved while the shutter was open.



Fast shutter speed



Slow shutter speed

Expressing Subject Movement



Fast shutter speeds freeze motion.



Slow shutter speeds suggest motion.

Shutter Speed Values

Shutter speeds change as shown below.



Choosing a shutter speed one step faster than the current shutter speed (by, for example, changing shutter speed from 1/60 s to 1/125 s) is referred to as "increasing shutter speed by one step" and halves the amount of time the shutter is open. Choosing a shutter speed one step slower than the current shutter speed (for example, by changing shutter speed from 1/125 s to 1/60 s) is referred to as "slowing shutter speed by one step" and doubles the amount of time the shutter is open.

If you are using a Nikon digital SLR camera, shutter speed changes in 1/3 steps; some models also support increments of 1 step and 1/2 step.

Camera Blur and Motion Blur

If the camera or subject moves while the shutter is open, the picture will be blurred. Blur caused by subject movement is referred to as "subject blur" or "motion blur"; blur caused by camera movement ("camera shake") is referred to as "camera blur." The results in both cases are similar, but whereas blur caused by subject movement is generally regarded as a legitimate way of expressing motion in photographs, blur caused by camera shake is frequently seen as a flaw. While camera blur does not necessarily render a photograph a failure, caution should be observed to avoid unintentional camera blur. The main subject is in both cases blurred, but the results are distinct from blur caused by the subject being out of focus (focus blur).

Camera blur



The camera moved while the shutter was open, producing blur.

Motion blur



The main subject moved in the wind while the shutter was open and is blurred; the surrounding flowers and leaves, which were at rest while the shutter was open, are not.

Out-of-focus shot (focus blur)



The camera is focused not on the flower in the center but on a flower further back.

Intended result



The central flower is in focus.

Sample Camera Displays



Shutter speed:

Speeds faster than one second are shown as fractions (e.g.: ...1/125, 1/160, 1/200, 1/250...). Some cameras may omit the numerator so that "1/125" becomes "125," "1/250" becomes "250," etc. Speeds slower than one second are shown by a double prime symbol following the value (e.g.: 1").

QUESTIONS:

Use the Aperture chart & Shutter Speed Chart to help you answer the following questions.

1. What number f stop does a large aperture hole have?
2. What type of aperture hole does F 5.6 have?
3. F in "F-Stop" also refers to:
4. If you want to change the aperture to let in the least amount of light what would you set the aperture at?
5. If you want to change the aperture to let in the most amount of light, what would you set the aperture at?
6. The F-stop also determines the "depth of field" or how much depth of the picture will be in focus. Using the picture in the note explain how much of an image will be in focus if you use F 32?
7. How much of the image will be in focus if you use the aperture of F 1.4?
8. If you want to adjust the shutter speed to capture or freeze something in motion, what would you set the shutter speed at?
9. If you want adjust the shutter speed to create an image blur, what might you set the shutter speed at?
10. If you have your shutter speed at 1/25 you might consider using a tripod. Why is this?