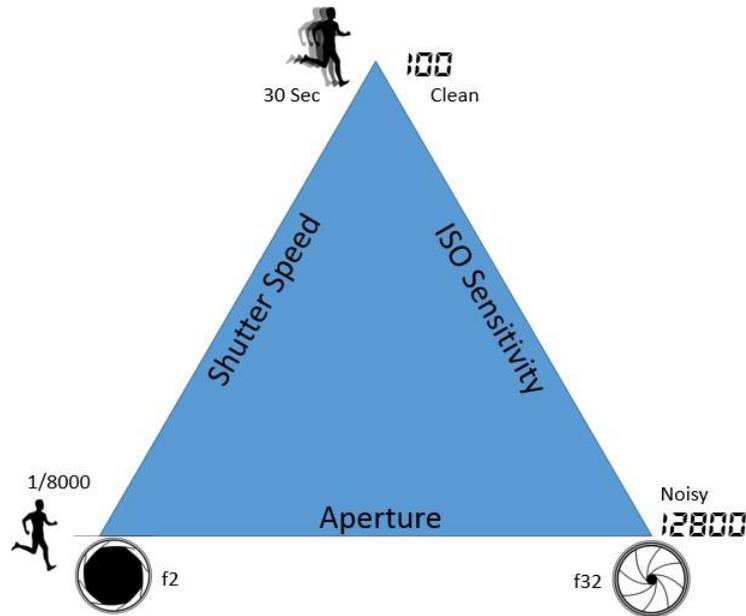


A Basic Guide to Exposure

Exposure is all about controlling how much light strikes the sensor. There are three things that affect exposure, how long you expose the sensor to the light (Shutter speed), how big the hole is that lets the light in (aperture), and how sensitive the sensor is (the ISO rating).



All cameras have an AUTO setting which controls all this for you. If you are happy to leave your camera set on automatic exposure and let the camera decide then it's less to worry about. AUTO mode is fine for many - or perhaps even most shots. The problem with "AUTO" mode is that the camera makes its own decisions based on average settings that the people in the factory dictated. In most situations AUTO will get you a photo, but there is no creative control whatsoever.



Our eyes are actually quite sophisticated and will compensate for light and dark and can handle a wide range of light and dark areas in the same scene, they have what is technically called a wide "dynamic range".

If too little exposure is given then the photo can be dark and "underexposed" and shadows become black and lack detail, if you err the other way then highlights become white and washed out.



Under Exposed



About Right



Over Exposed

Of course you can correct exposure to a degree by processing the digital image in your favourite image editing software – but there is only so much that can be done, if your highlights are totally washed out and/or shadows black, then no amount of “photoshopping” is going to get the detail back.

If you want more control over how your camera controls exposure you need to know a bit more about the three factors that affect exposure. Appropriate exposure for a given amount of light depends on three factors:

- the aperture,
- the shutter speed, and
- the ISO (sensitivity)

Let's look briefly at each.

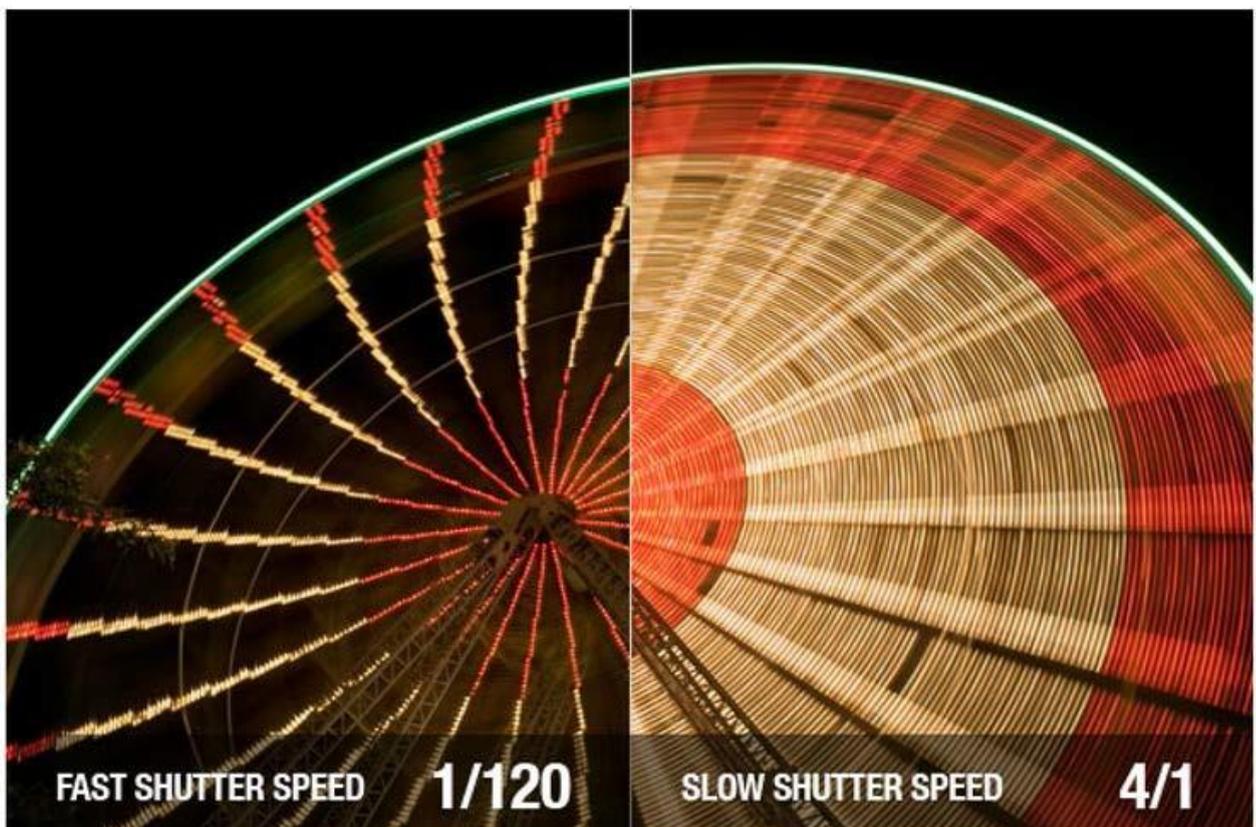
Shutter Speed

Shutter speed is how long the shutter exposes the sensor to the light. Now if you're wondering why in this age of digital electronics modern DSLR cameras depend on a clumsy electro-mechanical shutter to control the exposure (something that has not changed much in 50 years, then join the club – it seems a bit archaic and many digital compact cameras have long ago ditched mechanical shutters in favour of solid state electronics).

The faster the shutter travels then the less time light has to hit the sensor, the higher the speed, the less the light, so a speed of 1/1000 of a second lets in half as much light as a speed of 1/500th. Typically, speeds are quoted in a scale as follows

1/2000	1/0000	1/500	1/250	1/125	1/60	1/30	1/15	1/8	1/4	1/2	1
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With each one, right to left, allowing half as much light to strike the sensor as the previous one. The range of shutter speeds available will vary from camera to camera.



Basic considerations

- A fast shutter speed will be better to freeze action, and a slow shutter speed may blur anything that's not absolutely still. The creative use of shutter speed can be effective.



Same shot first on at 1/60th and second at 1/15th second

- If hand holding a camera, for sharp pictures without 'camera shake' it is generally advised that the shutter speed should not be slower than the focal length of the lens. So for a 200mm lens the shutter speed should not be slower than 1/200 of a second, or for a 50mm not slower than 1/50 of a second, and so on.
- If your shutter speed is slow then to avoid camera shake you should try and support it: lean against a wall, place on a surface, or fix it on a tripod. Consider using a remote release or the self-timer function so that you're not touching the camera during the exposure.
- Many digital cameras have an "anti-shake" compensation built in, small gyros detect and compensate for camera shake, in the case of Canon and Nikon cameras it's built into the lens, while Panasonic, Pentax, Samsung, Olympus and Sony build it into the camera itself. This anti-shake can reduce the effect of camera shake at low shutter speeds allowing you to take blur-free photos at quite slow speeds.

Aperture

This is the adjustable hole within a camera's lens controlled by a series of overlapping leaves called the iris. The size of the hole is indicated by a number called the f stop. The larger the hole, the smaller the number, the numbers also form a bit more of an obscure sequence as well, but as with shutter speeds each major aperture number lets in twice as much light as its predecessor

f32	f22	f16	f11	f8	f5.6	f4	f2.8	f2	f1.4
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So the f22 lets in twice as much light as f32 – the actual range of f numbers you have available will depend on the lens you use "fast lenses" with low aperture numbers tend to be very expensive. Wide narrow apertures also give a greater 'Depth of Field' and wide apertures give a more limited depth of field and this can be used creatively.

LARGE APERTURE = SHALLOW DOF **F/2**

SMALL APERTURE = DEEP DOF **F/16**

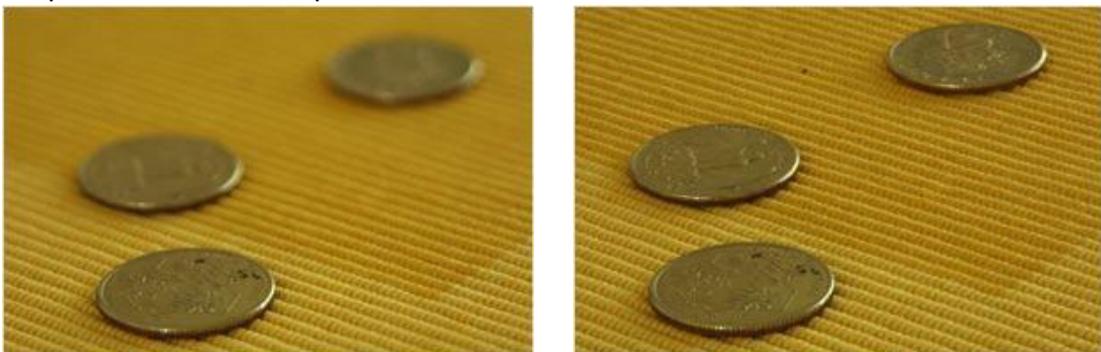


By combining aperture and shutter speed you can control the amount of light hitting the sensor, if a correct exposure would be made at for example f4 at 1/30th, then you could have the same amount of light hitting the sensor if instead you used f5.6 at 1/60th (bigger hole faster shutter) or f11 at 1/15th (smaller hole slower shutter)

F32	F22	F16	F11	F8	F5.6	F4	F2.8	F2	F1.4
1/2	1/4	1/8	1/15	1/30	1/60	1/125	1/250	1/500	1/1000

Basic Considerations

- The smaller the aperture (larger number), the greater 'depth of field', i.e. the more of the picture that is in sharp focus from front to back.



Same shot: first at f4 second at f32

- So when taking landscape shots which includes near foreground objects that you also want in sharp focus you would want to use a smaller aperture (larger number)
- But when taking portraits and you may want the person to be in focus but the background to be blurred so you would use a larger aperture (smaller number).

ISO

The ISO is a measure of sensitivity of the sensor. All sensors have a native ISO, normally 100 or 200 ISO, other levels of sensitivity are achieved by using some clever electronics to amplify the sensor data. The problem that this creates is that the more the signal is amplified, the more the signal to noise ratio degrades and the image becomes noisy.



Basic Considerations

- Use low ISOs in preference to avoid excessive noise



Sample image taken at f2.8 and 1/200 second.

Notice how the water has been 'frozen' by the fast shutter speed and how the far river bank is blurred due to the shallow Depth of Field.



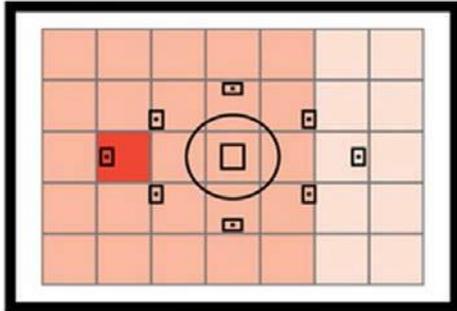
The same image taken at f22 and at 1/2 second.

The long shutter speed has caused the water to blur because of its movement during the exposure. The small aperture however has increased the Depth of field and the far bank of the river is much less blurred.

Metering Modes

Cameras contain a sophisticated light meter that is used to determine exposure. This can be set in a number of ways and by understanding these you can take control of how your camera exposes a scene.

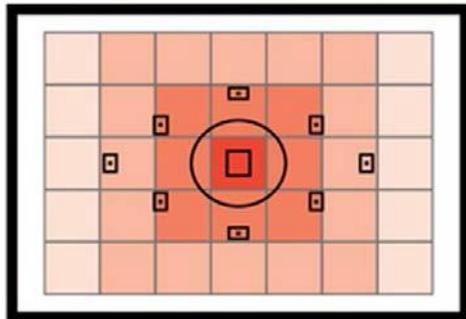
Multi-Zone/Evaluative/Matrix



In this mode the scene is divided into a number of zones. Exposure is calculated by taking into account where the focus of the image is and giving this priority, other zones are taken into account but the importance of each is weighted according to distance from the focus.

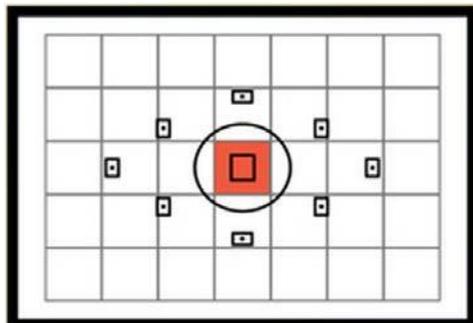
This is normally the default metering mode and works well for most common subjects.

Centre Weighted



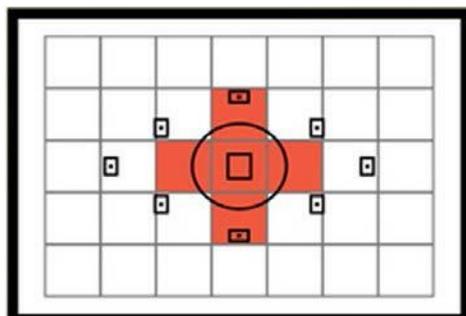
With centre weighted metering more emphasis is placed on the centre of the frame than at the edges. Note that the emphasis is always in the centre of the frame regardless of where the point of focus happens to be.

Spot



With spot metering only a very small area under the point of focus is taken into account when calculating exposure. Typically 3-5% of the frame. This makes sure that the focus of the image is correctly exposed no matter how much lighter or darker the surroundings are. This makes it ideal where a subject is against a lighter or darker background, a dark coloured bird in a light sky for example.

Partial



Partial metering can be likened to a cross between spot and centre-weighted metering, the exposure is calculated from the point of focus but the area is normally 10-15% of the frame area centred on the point of focus.

Different Exposure Modes

Most Cameras other than simple compact cameras have variety of exposure modes, these are:

	Auto Exposure This is essentially the camera's "point and shoot" mode. When you select this mode various settings return to their defaults and the camera decides all the settings based on the manufacturers data.
P	Program Exposure Program exposure sets the shutter speed and aperture but these can be shifted, this means that you can select one of a variety of equal exposures by turning the dial.
A Av	Aperture Priority In this mode you select the aperture and the camera will calculate the correct shutter speed for the exposure based on its meter reading.
S Tv	Shutter Priority In this mode you select the shutter speed and the camera will calculate the correct aperture for the exposure based on the meter reading.
M	Full Manual Exposure In this mode you select the aperture and the shutter speed. As you adjust the shutter speed/aperture the exposure scale indicates how close the selected exposure is to the metered exposure.
	Flash off mode Suppressed flash mode is a variant of 'Auto' mode but, as the name suggests, one that will not resort to using flash. Instead it will just keep trying to use longer exposures in low light. Useful for situations in which flashes are forbidden.

Scene Modes

In addition many cameras have "scene modes" with sets of settings optimised for certain common situations typically these might include:-

Position	Mode
	Portrait Selects large apertures (small F numbers) to reduce the depth of field and make the portrait subject stand out from the background.
	Landscape Selects small apertures (large F numbers) to enlarge the depth of field and ensure more of the image appears to be sharp and 'in focus'.
	Macro Tends to select faster shutter speeds to avoid shake at high macro magnifications but normally tries to try to maintain an aperture of around F5.6 for reasonable depth of field
	Sports Selects faster shutter speeds to capture moving action. It may also engage continuous drive mode and/or Continuous Auto Focus
	Sunset Selects small apertures (large F numbers) to enlarge the depth of field and sets the white balance to preserve (or enhance) the warm colours.
	Night view / portrait Uses slow shutter speed and exposure / colour settings suited to night photography. The difference (between night view and night portrait) is that one is without and the other with the flash.