

The 'Big 3'



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Aperture, Shutter Speed, ISO

Understanding their relationship, and instinctively knowing how they interact, is fundamental to good photography.

1. **Aperture (Av)**- this controls the amount of light the lens allows to fall on the camera's sensor.
2. **Shutter Speed (Tv)** - this controls the length of time for which the shutter is open.
3. **ISO** - this is a measure of how sensitive the sensor is to the light coming through the lens.

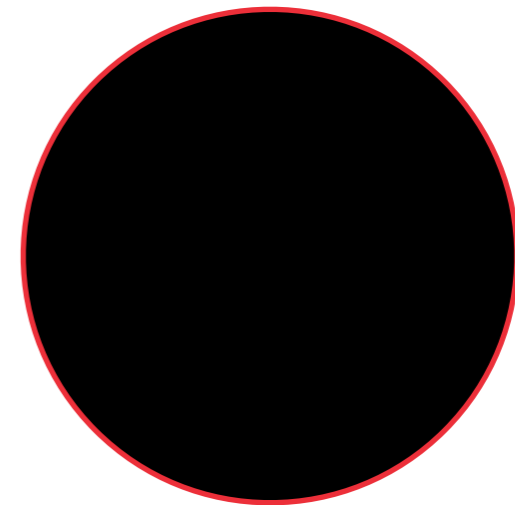
Av - Aperture value or priority

The Av or Aperture setting controls the area over which light can pass through the camera lens.

It is specified in terms of an ***f-stop*** value, which can at times be confusing, because the area of the opening *increases* as the f-stop value *decreases*.

So:

Large Aperture = Small f-Stop number e.g. f2.8



Small Aperture = Large f-Stop number e.g. f22



- The smaller the f-stop number (f2.8), the more light will enter the lens, but in general, the depth of field (how much of the image is in focus) will be small. This is ideal for macro and portrait shots, or those where you require a blurred background.
- The larger the f-stop number (f22), the less amount of light enters the lens, but the depth of field will be large. This is ideal for landscape shots or those where you require as much as possible to be in focus.
- In photographer slang, when someone says they are "*stopping down*" or "*opening up*" their lens, they are referring to *increasing* or *decreasing* the *f-stop* value, respectively.
- Every time the f-stop value halves (say from f5.6 to f2.8), the light-collecting area quadruples, as shown in the following table:

Aperture Setting	Relative Light	Example Shutter Speed
f/22	1X	16 seconds
f/16	2X	8 seconds
f/11	4X	4 seconds
f/8.0	8X	2 seconds
f/5.6	16X	1 second
f/4.0	32X	1/2 second
f/2.8	64X	1/4 second
f/2.0	128X	1/8 second
f/1.4	256X	1/15 second

The above aperture and shutter speed combinations all result in the same exposure.

The above f-stop numbers are all standard options in any camera, although most also allow finer adjustments, such as f/3.2 and f/6.3.

The range of values may also vary from camera to camera (or lens to lens). For example, a compact camera might have an available range of f/2.8 to f/8.0, whereas a DSLR camera might have a range of f/1.2 to f/32 with a portrait lens.

Tv - Time value or Shutter priority

Tv or Shutter priority determines how long the camera sensor will be open to incoming light through the camera lens.

Its influence on exposure is perhaps the simplest of the main camera settings as it correlates exactly 1:1 with the amount of light entering the camera:

When the exposure time doubles the amount of light entering the camera doubles, and vice versa.

It's also the setting with a wide range of possibilities:

Shutter Speed	Typical Examples
1 - 30+ seconds	Specialty night and low-light photos on a tripod
2 - 1/2 second	To add a silky look to flowing water Landscape photos on a tripod for enhanced depth of field
1/2 to 1/30 second	To add motion blur to the background of a moving subject Carefully taken hand-held photos with stabilization
1/50 - 1/100 second	Typical hand-held photos without substantial zoom
1/250 - 1/500 second	To freeze everyday sports/action subject movement Hand-held photos with substantial zoom (telephoto lens)
1/1000 - 1/4000 second	To freeze extremely fast, up-close subject motion

It's important to set the Tv (shutter speed) high enough to prevent camera shake and blurring.

A good rule of thumb is:

$$Tv \text{ (seconds)} = 1 / \text{Focal Length of the Lens (mm)}$$

- So if you have a 100mm focal length lens, then you should ideally set the Tv to **1/100th** second.
- You may need to adjust the aperture and/or ISO settings to achieve this.
- Many DSLR lenses have Image Stabilisers or Vibration Reduction (IS and VR) that give as much as 4 extra f-stops, allowing reduced Tv. This is especially useful in low light or where flash isn't possible or allowed. However, be careful when using image stabilisers at shutter speeds of **1/60th** or less, as objects or people will also move, which may result in movement blur.
- Some people can hand hold as low as **1/30th** second on a 50mm lens without producing camera shake.

ISO

- This is the 'speed' or 'sensitivity' of the digital sensor and *generally* range in values from 100 to 6400 (from 50 to 248,000 for pro DSLRs).
- The lower the ISO number, the longer the exposure and/or wider Aperture value will be needed, and vice versa.
- At very high ISO values there is a high risk of 'noise' appearing on the image, so use the minimum value possible. Remember, you cannot recover information that isn't captured at the start!

Summary

