**The Aperture & Shutter Relationship**

3 Factors affect exposure:

* Aperture
* Shutter speed
* ISO setting

**Aperture**: Controls the **amount** of light passing through the lens.

 A set of adjustable blades in the lens varies the size of the opening

 the light can pass through.

 Expressed as f-numbers e.g. f/4, f/5.6 etc.

 This means the focal length (f) of the lens divided by that number.



As you can see, a small number refers to a wide aperture and a large number to a small aperture. Each aperture value allows in the same amount of light no matter what the focal length of the lens is – e.g. f4 on a 24mm lens is the same as on a 200mm lens.

Each of the apertures above allows twice as much light through as the one that follows it and half as much light as the one before it:

**e.g. f4 = half f2.8 and twice f5.6**

The difference from each to the next is referred to as **one full f-stop**

**Shutter Speed**: Is the **Length of time** the shutter is open allowing the light to

 ­ reach the sensor.

 Usually expressed as a fraction of a second e.g. 1/500th

Relationship - Aperture & Shutter Speed

To produce a well-exposed picture, an aperture and shutter speed combination is used. Because of the reciprocal relationship between the two, you can use different combinations to give exactly the same exposure - If you select the next smallest aperture, half as much light is admitted so the shutter speed must be doubled to ensure correct exposure.

If your camera suggests an exposure of 1/60sec at f8, any of the combinations shown below may be used to give the same exposure. Your choice depends on the subject you are photographing and the effect you require in the final image.

Aperture

 f/2 f/2.8 f/4 f/5.6 f/8 f/11 f/16 f/22

Total

Light

 1/1000 1/500 1/250 1/125 1/60 1/30 1/15 1/8

Shutter Speed in Fractions of a Second

In the diagram above the overall light level (exposure) is the same throughout. On the left, a large aperture (f2) allowing in a lot of light, requires only a very short (fast) shutter speed (1/1000th/sec). Correspondingly a very small aperture (f22) allowing in a small amount of light requires a longer (slower) shutter speed to record the same exposure.

Apertures also control the depth of field in an image i.e. how much of the image is in sharp focus. Large apertures give shallow D-O-F (good for portraits) while small apertures give great D-O-F (good for landscapes).

Fast shutter speeds can be used to freeze action while slow shutter speeds are used to show movement or artistic effects.

**ISO Setting**

(ISO stands for International Standards Organisation).

This is the rate at which the sensor absorbs light, which can be varied. It was originally applied to rolls of film. It was also known as ASA (American Standards Association) in the early days.

ISO settings are also calibrated in “stops”, to correlate them with aperture and shutter speed settings. The scale (in full “stop” settings) is as follows:

ISO 50 – 100 – 200 – 400 – 800 – 1600 – 3200 etc.

So a 1 stop increase in ISO allows for a further 1 stop adjustment in aperture or shutter speed.

e.g. An ISO 100 combination of 1/30th sec @ f 5.6 can be adjusted as follows at ISO 200:

(a) 1/60th sec @ f5.6 OR (b) 1/30th sec @ f 8

i.e one extra stop on either the shutter speed or the aperture.

Increasing your ISO setting allows for higher shutter speeds in low light but the higher settings result in degraded image quality. This is referred to as digital “noise” where the pixels have colour artefacts visible at normal resolution. Try taking the same image at 100 ISO and at the highest ISO setting on your camera and compare them. The difference will be obvious.

For this reason, most images will be shot at ISO settings of 100 – 400. Low ISO settings provide the finest detail and image quality. Above ISO 400 the image may start to show signs of degradation.