

**THE** *Complete*  
**DIGITAL**  
**PHOTOGRAPHY**  
**TOOLBOX COURSE**



# MODULE

# 1



# The Digital Photography Toolbox | Module 1

## **What will we learn?**

- 1) Terminology | Camera equipment and photography
- 2) Camera handling
- 3) Exposure | ISO, Aperture/F-Stop, Shutter-speed
- 4) White Balance
- 5) Exposure Modes

Terminology | Camera equipment and photography

See extra document

# Camera handling

## **Is there a correct way?**

- All cameras are designed for right handed use
- Which eye should I be photographing with?
- What about shooting vertical / portrait?
- Always support the camera and lens as best you can without letting the camera hang in your hand or without supporting the lens with your left hand.

# Camera handling

## **Taking care.**

- When placing your camera down, be sure to turn it to where the angle at which it rests is the least acute.
- Only remove caps or lenses if you have to, this will prevent excess dust entering.
- Secure your camera with a strap if possible.
- Always switch off your camera when changing batteries, swapping out memory cards or plugging in accessories.
- Never blow into your camera to try and clean off dust.

# Understanding Exposure

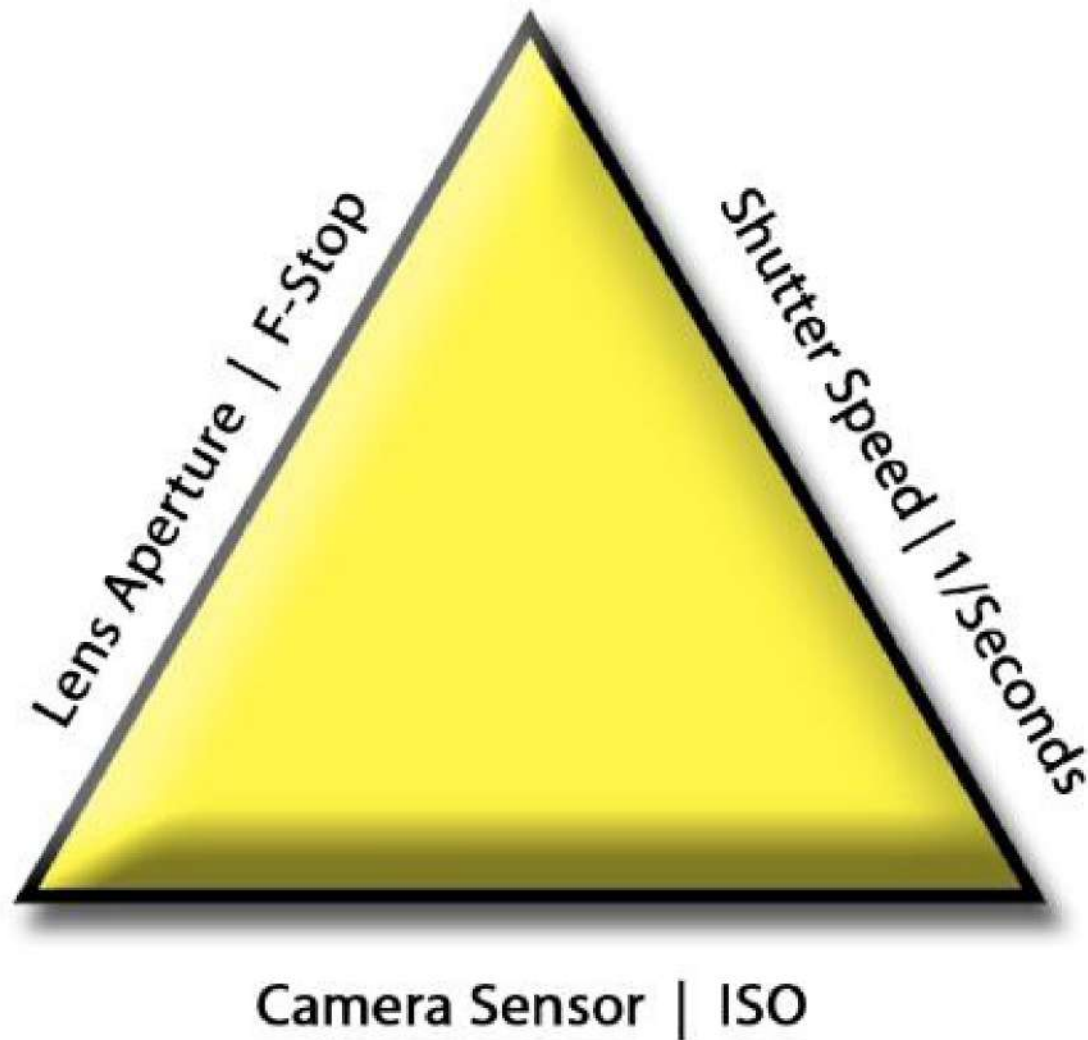
In basic technical terms, what is a photograph?

A Photograph is a **Recording** of **Light**.

What are the elements required to capture a photograph?

- 1) Something to **Record** light with.
- 2) **Light** to record.

# Understanding Exposure



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# Understanding Exposure

What is 18%Grey?

Also referred to as middle grey.

18% Grey refers to the target exposure of the camera.

Camera light meters measure light that reflects from a subject into the camera.

When looking at an 18% Grey card, the card reflects 18% of light falling onto the subject.

The brightness or Luminance of a scene reflected at 18%, appears to the human eye as in the middle between Black and White. We call this our Midtones.

# Understanding Exposure

Almost all cameras (By default setting only), will measure reflected light as an average of the total scene.

This way, the camera ensures that as much of my image as possible is exposed in such a way that it appears bright enough for us to see details in both light and dark areas.



# Understanding Exposure

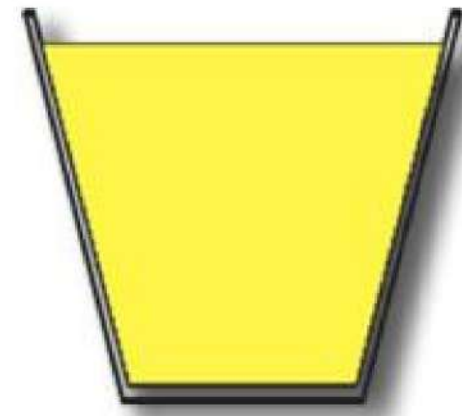
**Light** is **recorded** by the Camera's digital sensor.

- The sensor has a “sensitivity” rating indicated as the **ISO** of the sensor.
- **ISO** – International Standards Organization.
- DSLR Cameras have a wide range of **ISO** settings, depending on the camera model.
- Typically, an ISO range of at least 100-12800 can be expected
- Certain camera's allow for **ISO** values lower than the base/Native **ISO** of the camera, 32 **ISO** for example.
- On the high end, newer DSLR's will increase **ISO** up to 256000.

# Understanding Exposure

## Sensor **ISO**

- Think of your camera sensor as a bucket that catches and holds **light**.



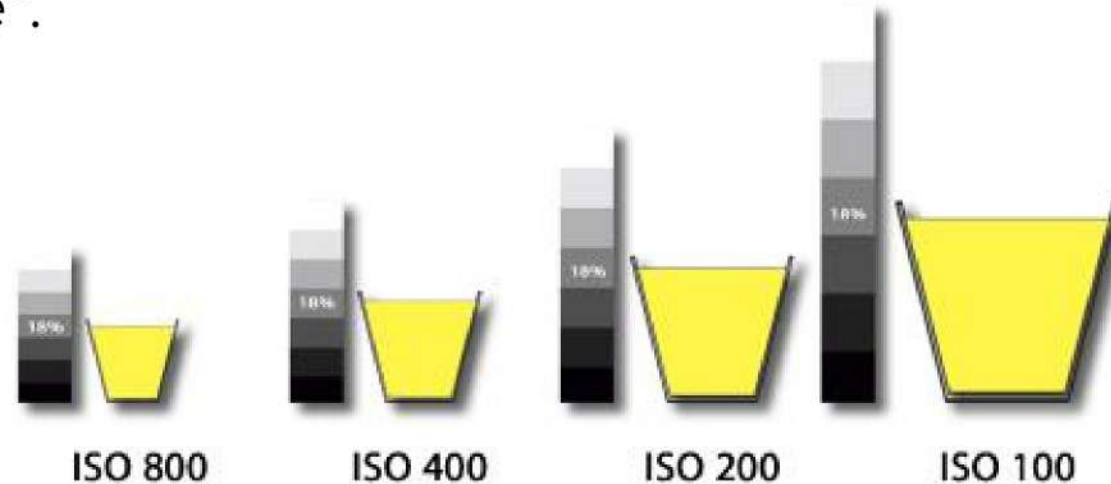
**100 ISO**

- The camera would like to fill the bucket with enough **light** to have a bright and clearly visible photograph.

# Understanding Exposure

## Sensor **ISO**

- The target is to fill the bucket with light to achieve “correct exposure”.

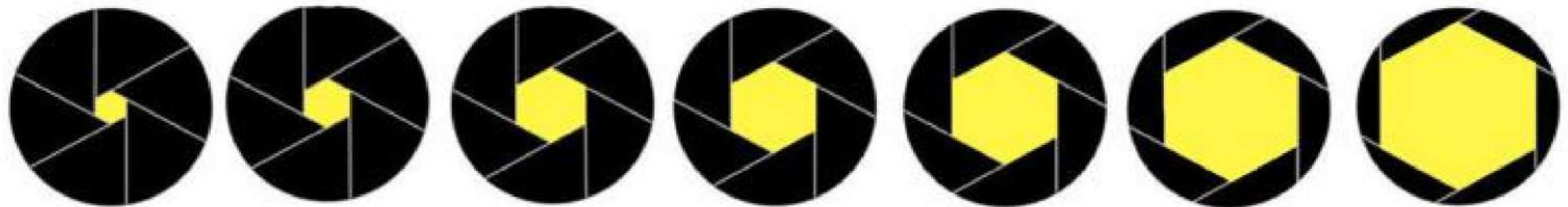


- The higher the **ISO** value, the smaller the bucket is, but we still need to fill the bucket!
- This means that the higher the **ISO** is set to, the less light we need to “expose correctly” the lower the **ISO** the more light we need to fill the bucket.

# Understanding Exposure

## Lens **Aperture | F-Stop**

- The Aperture of the lens is the mechanism that controls the amount of light that is allowed through the lens towards the camera sensor (Our Bucket)



f/22.0 | | f/16.0 | | f/11.0 | | f/8.0 | | f/5.6 | | f/4.0 | | f/2.8

- The size of the Aperture opening is called the **F-Stop** of the lens.

# Understanding Exposure

## Lens **Aperture** | **F-Stop**

- The **bigger or wider** the lens aperture, the **more light** is allowed through to hit the sensor (Fall in the bucket) at any given moment.
- With a **smaller or narrower** lens aperture, **less light** is allowed through to hit the sensor (Fall in the bucket) at any given moment.
- F-stop is typically displayed inside your cameras viewfinder and the top or rear LCD Screen, however, chances are that you will not see the letter “f” indicated everywhere on your camera.
- You should see a value indicated as 1,4 | 2,8 | 5,6 | 11 | 16 | 22 etc.
- So why is the **lower number indicating the bigger lens opening** and the **big number indicates the smaller lens opening**?

# Understanding Exposure

## Lens **Aperture | F-Stop**

F-Stop is calculated by dividing the focal (“f”) length of the lens by the diameter of the Aperture opening, also referred to as the fraction.

Example: 100mm lens set at f/4 appears as an aperture opening of 25mm when looking through the lens from the front.

The fraction:  $f/4 = 1/4$  of 100mm

Example: 100mm lens set at f/16 appears as an aperture opening of 6,25mm when looking through the lens from the front.

The fraction:  $f/16 = 1/16$  of 100mm; In other words, the displayed F-stop value is the fraction of the focal length.

In practical terms, when you refer to the size of the lens opening, you will refer to it as the **F-Stop**, even though the “f” in our formula refers to focal length.

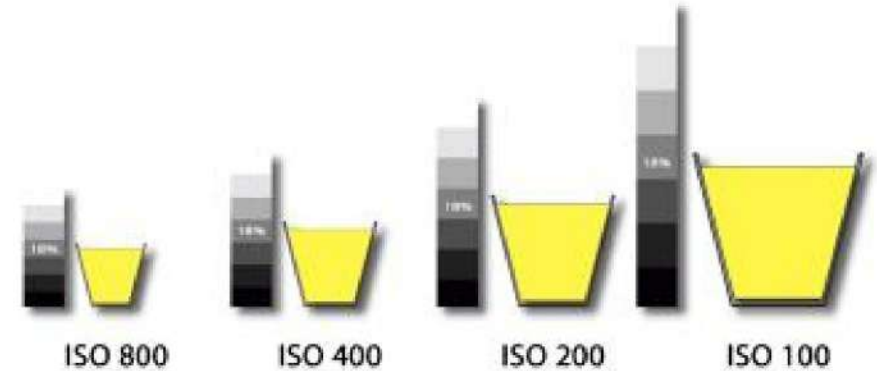
# Understanding Exposure

**ISO** and **F-Stop** so far

**ISO** refers to the sensitivity to light of the camera's sensor.

The higher the **ISO** value, the **more sensitive to light**.

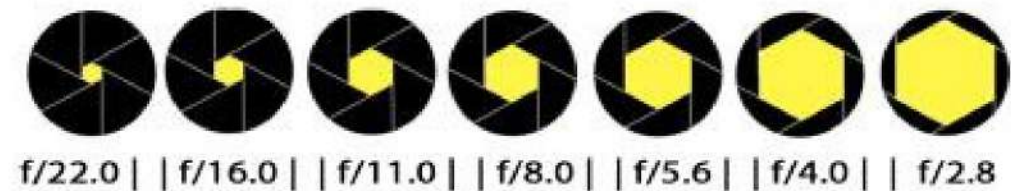
(The smaller the bucket we need to fill)



**F-Stop** refers to the size of the Aperture opening inside the lens.

The **lower** the **F-Stop** value, the **bigger the opening**.

The **higher** the **F-Stop** value, the **smaller the opening**.



# Understanding Exposure

## **Shutter-Speed**

So by now we have a recording material namely my camera sensor with a sensitivity rating measured and displayed in **ISO**

We also have a lens Aperture that allows light to travel to and fall on the camera sensor measured and displayed in **F-Stop**.

Now we need to control the **TIME** that light is allowed to fall on the sensor for recording, referred to as the **Shutter-Speed**.

The **Shutter** is the physical mechanism that controls the time allowance for light to hit the sensor. Think of the shutter as a curtain blind, that when opened, light falls onto the sensor and as soon as it closes there is no more light to record.

# Understanding Exposure

## **Shutter-Speed**

DSLR's typically has a **Shutter-Speed** range of 30" (Seconds) to 1/8000th of a second. (Some mid level camera's are restricted to 1/4000th)

Mirrorless camera bodies can in some cases increase **Shutter-Speed** up to 1/32000th of a second. (Although they might not have a physical shutter)

Speeds lower than 30" can normally be achieved using the "BULB" feature on a camera and/or with the use of a remote control device.

**Slower Shutter-Speeds** = More Time = More Light.

**Faster Shutter-Speeds** = Less Time = Less Light.

# Understanding Exposure

When would I use a fast **Shutter-Speed**?

- Moving subjects, sports, wildlife or action photography in general.
- Fast shutter-speeds are used to “freeze” motion.
- The faster the subject moves, the faster the shutter-speed required.

The **Shutter-speed** rule of thumb?

- A shutter speed value equivalent or greater than the focal length value of the lens.

Example: 500mm lens at 1/500th of a second shutter-speed.  
60mm lens at 1/60th of a second shutter-speed.

- The “rule of thumb” applies only to shooting out of hand to avoid camera shake and has no effect on the motion of the subject.

# Understanding Exposure

## Shutter-Speed



1/6400th of a second

# Understanding Exposure

## Shutter-Speed



1/8000th of a second

# Understanding Exposure

## Shutter-Speed



1/6400th of a second

# Understanding Exposure

## **Shutter-Speed**

When would I use a slow **Shutter-Speed**?

- Static subjects does not require a fast Shutter-speed, but the photographic situation should be considered carefully, ask yourself, can this subject move suddenly and quickly?
- To portray motion or creative blur.
- Panning or zooming blur.
- To allow more ambient light to be captured. (More when we talk artificial about lighting)
- Night time photography and star trails.

# Understanding Exposure

## Shutter-Speed



1/50th of a second

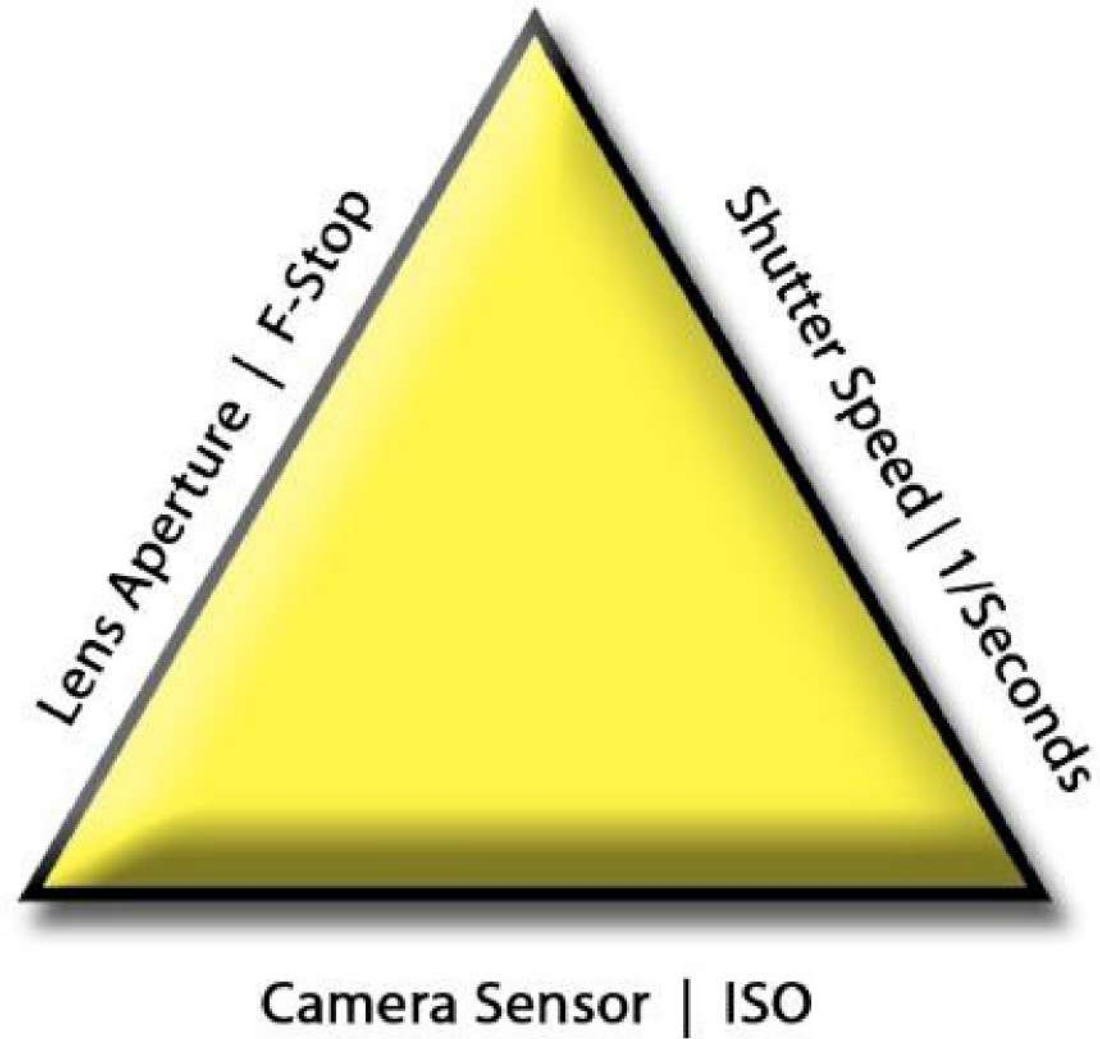
# Understanding Exposure

## Shutter-Speed



1/40th of a second

# Understanding Exposure



# Understanding Exposure

Bringing it all together for correct exposure – **The Target**

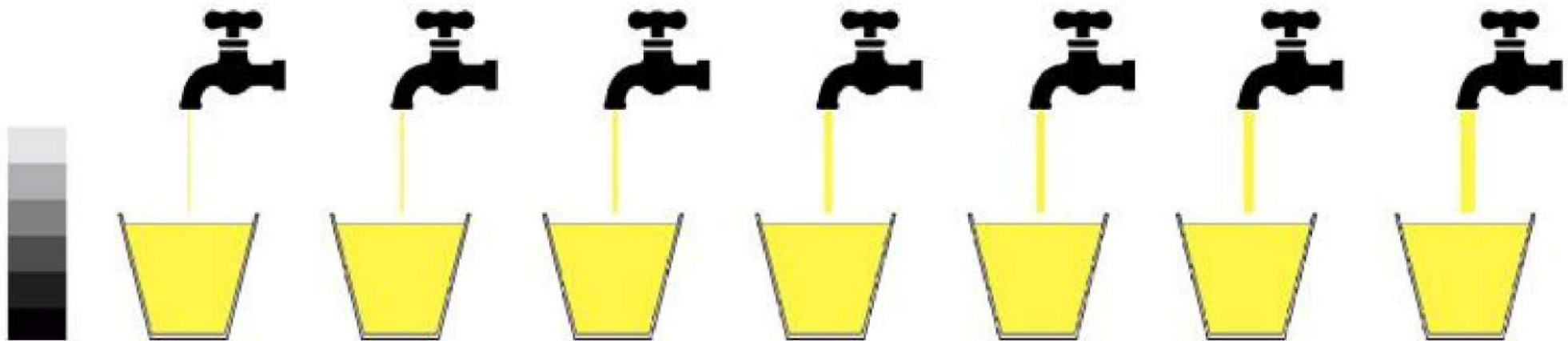


The camera wants to **fill the Bucket** - **ISO**  
with **Light** Supplied by the lens - **F-Stop**  
in a specific amount of time - **Shutter-Speed**

# Understanding Exposure



f/22.0 | | f/16.0 | | f/11.0 | | f/8.0 | | f/5.6 | | f/4.0 | | f/2.8



**ISO = 100**

**Shutter-Speeds? ? ? ? ? 1/1000 ?**

**1/30 1/60 1/125 1/250 1/500 1/1000 1/2000**

# Understanding Exposure

End results?

- In the previous example we have different settings applied with the same **ISO** setting.
- What is the difference in Exposure amongst these images?
- What can we learn from this example?

# Understanding Exposure

End results?

- It is important to note that when any of these settings (**ISO**, **F-stop** or **Shutter-Speed**) are changed, at least one of the other has to change accordingly to counter the effect of the changed setting to retain the same exposure or amount of light recorded.

**Remember, the camera wants to fill the bucket!.**

- If we do not compensate for any change in these settings, we will only fill the bucket partially or we will have an overflow.
- This means an **underexposed** or **overexposed** image in-camera.

**Remember, this is according to the camera**

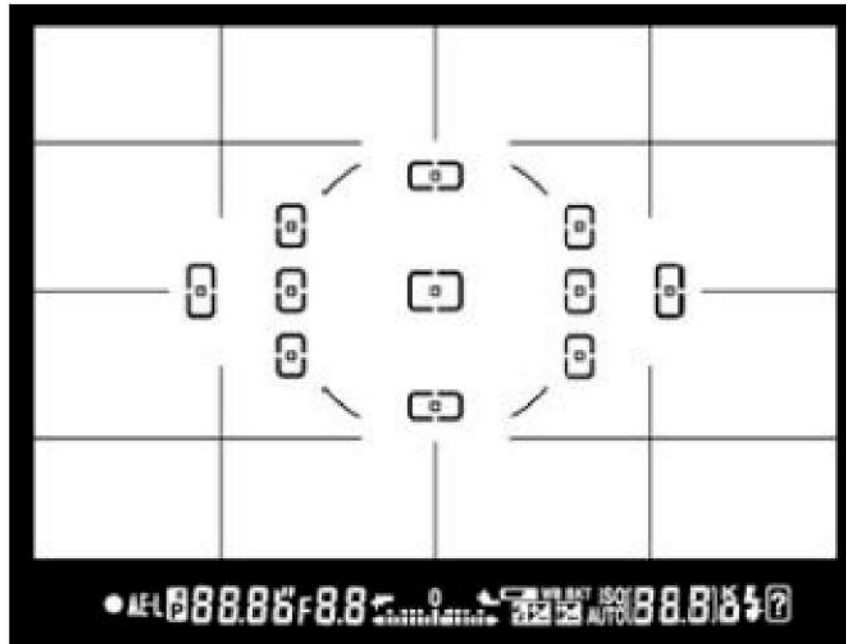
# Understanding Exposure

## **The good news!**

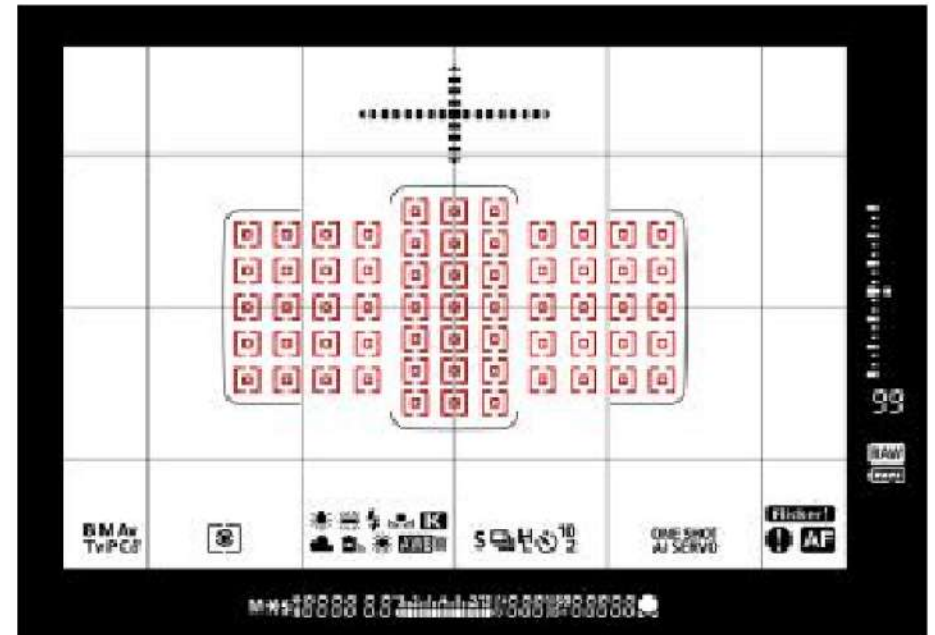
- In every single exposure mode available on your camera, the camera will automatically adjust the appropriate settings to achieve the exposure target of 18% Grey.
- When shooting full Manual mode, the camera will still do the light measurement for 18% Grey, but the camera will merely guide you instead of making the adjustments on its own. You will aim to adjust one or more of the available settings to reach the 18% exposure level.

# Understanding Exposure

Where to find the settings?



Inside the viewfinder.



# Understanding Exposure

Where to find the settings?



Top LCD Display

# Understanding Exposure

Where to find the settings?



Rear Display

# Understanding Exposure

The light equivalent of 1x F-stop

In photography, the term **F-stop** does not only refer directly to the aperture setting or the lens opening, but is also used to refer to an equivalent amount of light whether by means of allowing more or less **Shutter-Speed** for light to be recorded or a more or less sensitive sensor **ISO** value.

All of the mentioned settings are typically adjustable in **1/3rd increments** to allow for smaller, more accurate adjustments.

1x F-Stop is equal to exactly **2x more** or **2x less** “light”

**More or less light can be achieved by:**

- 1) A more or less sensitive Sensor **ISO**
- 2) More or less light through the lens at any moment **F-Stop**
- 3) More or less time to allow light to fall on the sensor **Shutter-Speed**

# Understanding Exposure

## **Examples of adjustable settings and values at 1x F-Stop:**

**ISO: 100 – 200 – 400 – 800 – 1600 – 3200 – 6400 – 12800 – 25600**

**F-Stop: f/1.2 - f/2.0 - f/2,8 – f/4 – f/5.6 – f/8 – f/11 – f/16 – f/22**

**Shutter-Speed: 1/60s – 1/125s – 1/250s – 1/500s – 1/1000s – 1/2000s – 1/4000s**

Let's look at adjusting in smaller increments.

# Understanding Exposure

## **Examples of adjustable settings and values at 1/3rd Increments:**

**ISO: 100 – 125 – 160 – 200 – 250 – 320 – 400 – 500 – 640 – 800**

**F-Stop: f/1.4 - f/1.8 – f/2.0 – f/2.2 – f/2.5 – f/2.8 – f/3.2 – f/3.5 – f/4**

**Shutter-Speed: 1/60s – 1/80s – 1/100s – 1/125s – 1/160 – 1/200 – 1/250**

Some modern camera bodies have the option of changing certain adjustment increments to  $\frac{1}{2}$  (Half Stops) or  $\frac{1}{1}$  (Full Stops) instead of the standard  $\frac{1}{3}$  incremental adjustments.

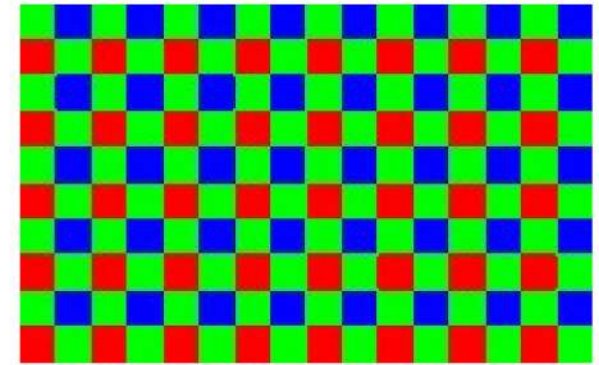
# White Balance - WB

## **Primary Colors | Red, Green and Blue**

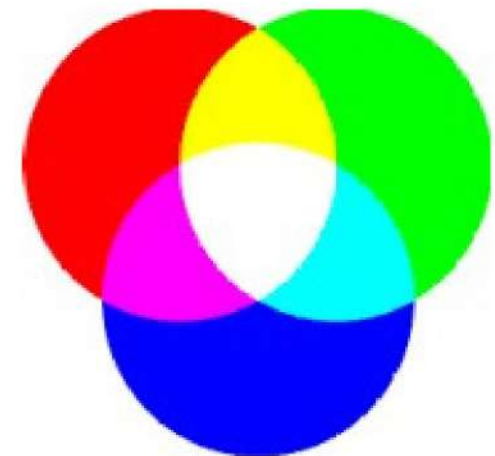
Camera sensors are made up by the 3x Primary colors, in other words the sensor consists of Red, Green and Blue Pixels

Our Primary colors combined at the maximum brightness results in white light.

This means that white light consists of all colors on the spectrum



Bayer Pattern (Sensor Pixel Layout)



RGB Color Wheel

# White Balance - WB

## **Color Temperature Balance – Measured in Kelvin**

White balance refers to the camera's process of balancing image color so that white objects in the image appears white.

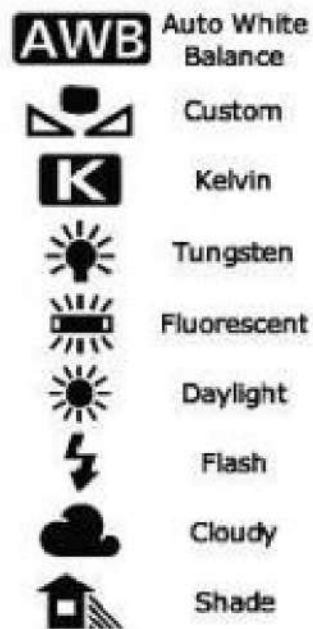
White light consists of all colors in the color spectrum, therefore if white is rendered as white, all other colors should be rendered correctly

White balance takes into account the color of the light source in the photograph.



# White Balance - WB

## Color Temperature Balance – Measured in Kelvin



## White Balance - WB

### **Color Temperature Balance – Measured in Kelvin**

Digital Cameras have a range of pre-set adjustments which can be selected to balance the color of light depending on the light source.

White balance correction is a RAW Adjustable setting, meaning you are able to change/correct the WB Setting after you have captured the photograph in any reputable RAW file converter application.

WB Corrections in any RGB file format (Non-RAW) can be extremely difficult, make sure to check your camera setting before commencing your photo shoot.

The safest option if you are unsure is to select the Auto WB setting, this will give you a very good, more neutral color to start from once you get to the editing phase of your photography.

# Camera Exposure Modes

## **Manual | A / AV | S / TV | P**

All cameras have various exposure modes they offer depending on the photographic situation you find yourself in and personal preference.

Entry level cameras will have more exposure modes on offer as the manufacturer believes that you might not be completely familiar with the workings of how a camera exposes an image.

These are typically the cameras Auto, Portrait, Landscape, Sport, Night Portrait, Night landscape or Macro modes.

Higher-end cameras will most likely display only 4x Exposure modes and this is what we will be focusing on. If you understand the camera exposure principles already covered, you have no need for all the “Automatically adjusted scene modes”

## Manual | A / AV | S / TV | P

- Manual Exposure (M)
- Program Mode (P)
- Aperture Priority / Value (A or AV)
- Shutter Priority / Time Value (S or TV)



# Camera Exposure Modes

## Manual Exposure Mode

This allows for total manual control, although many cameras will have an Auto-ISO setting independent from the selected exposure mode.

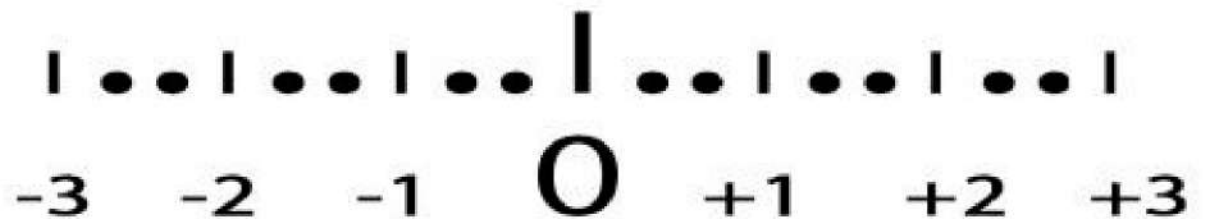
When shooting in Manual exposure, your camera will always guide you to achieve the correct exposure, though no settings will be adjusted automatically to achieve this exposure by default.

**You adjust:**

ISO

F-Stop

Shutter-speed



# Camera Exposure Modes

## Program Exposure Mode

This mode allows you to adjust the ISO of the camera, with limited direct control over F-stop and Shutter-speed values.

When shooting in Program mode, your camera will adjust F-stop and Shutter-speed automatically for the correct exposure. This is as close to the “Auto-mode” on an entry level camera as you will get on a higher-end camera body.

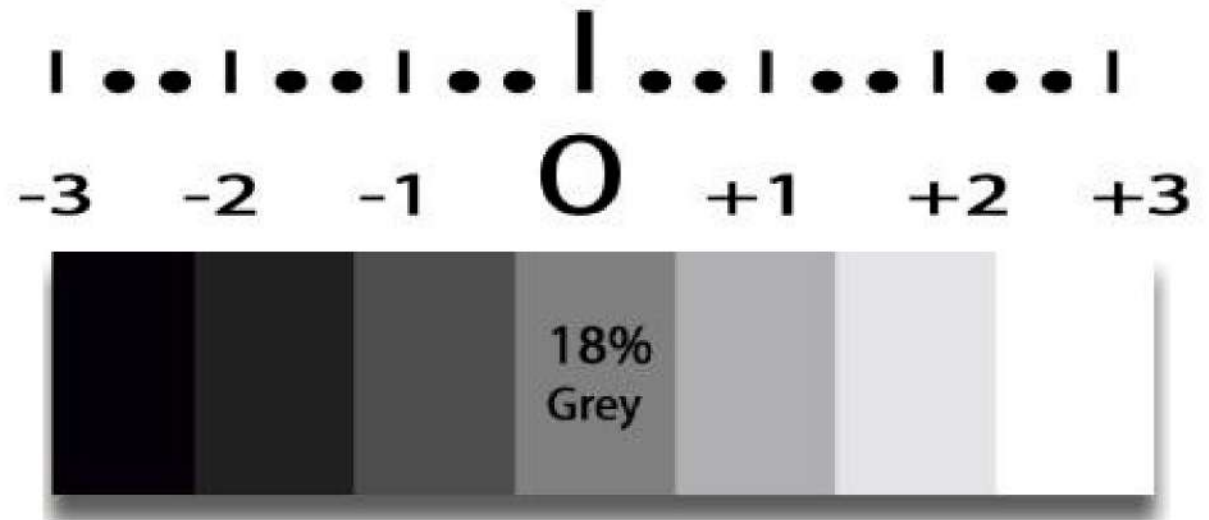
**You adjust:**

**ISO**

**Camera adjusts:**

**F-stop**

**Shutter-speed**



(You might still have limited control over above settings)

# Camera Exposure Modes

## **Aperture Priority (A) / Aperture Value (AV)**

This mode allows you to adjust the ISO and the F-Stop of the camera, with no direct adjustment of Shutter-speed values.

When shooting in Aperture Priority/Value mode, your camera will adjust only the Shutter-speed according to your ISO and F-Stop to achieve correct exposure.

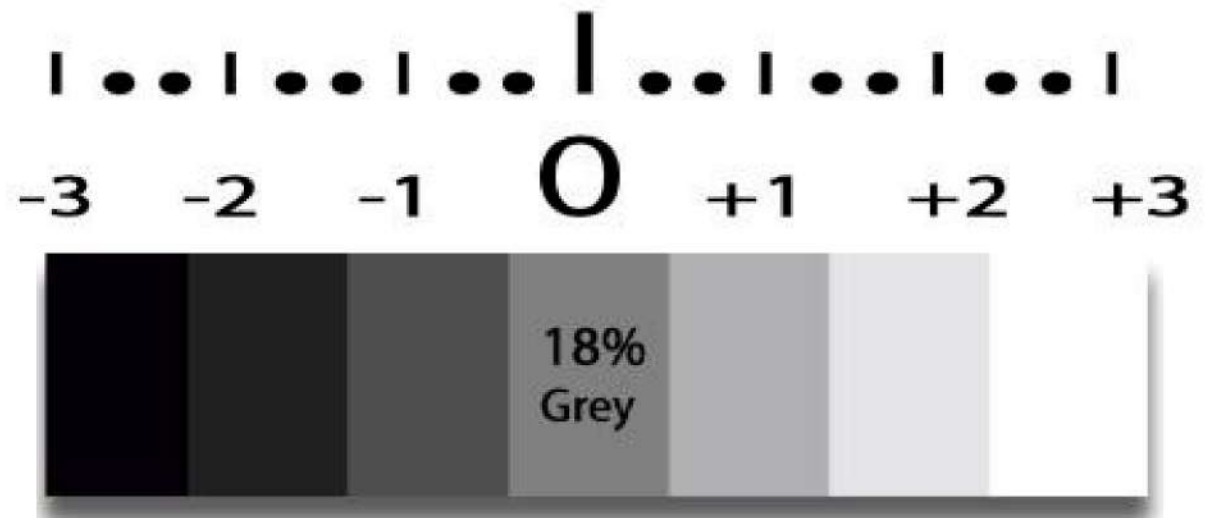
**You adjust:**

**ISO**

**F-Stop / Aperture**

**Camera adjusts:**

**Shutter-speed**



# Camera Exposure Modes

## **Shutter Priority (S) / Time Value (TV)**

This mode allows you to adjust the ISO and the Shutter-speed of the camera, with no direct adjustment of F-stop values.

When shooting in Shutter Priority/ Time Value mode, your camera will adjust only the F-stop according to your ISO and F-Stop to achieve correct exposure.

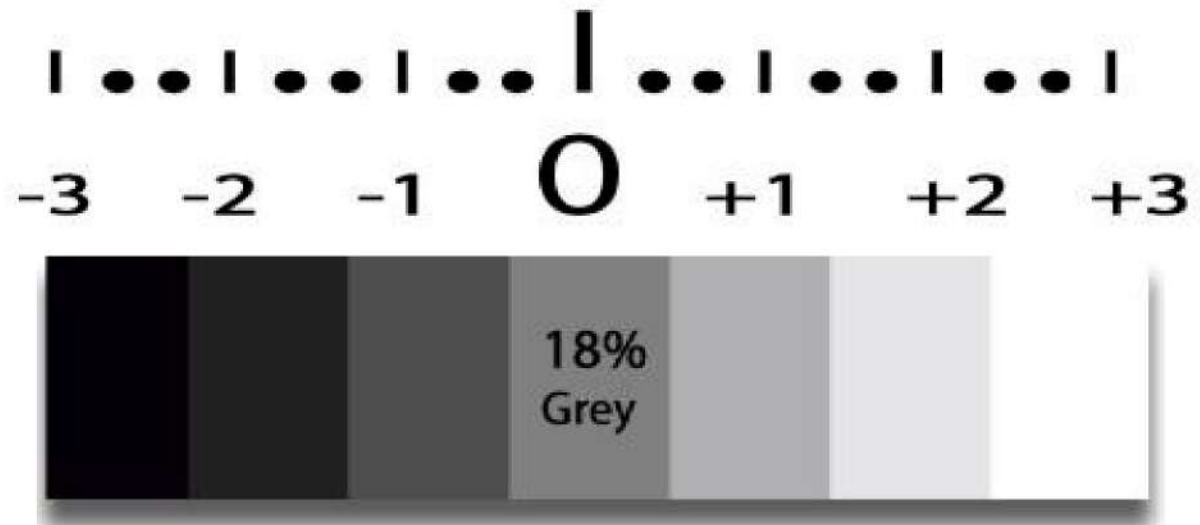
**You adjust:**

**ISO**

**Shutter-speed**

**Camera adjusts:**

**F-Stop / Aperture**



# Camera Exposure Modes

## **Setting the Exposure mode on your camera**

Most cameras on the market today will have one of two Mode-selector dials or buttons on the outside of the camera:

### **Mode-selector Dial**



### **Mode Selector Button + Dial**



**You have completed Module 1**



# Camera Exposure Modes

## **Module 1 Project**

Set up a basic scene to photograph: It can be a person or pet, a subject like a flower any other still life, even the view in your garden or from your balcony.

Take a photograph in each of the exposure modes mentioned, while also adjusting the settings available to you in the specific exposure modes. Take note of how different settings may or may not influence your photograph.

**Tip:** Use static subjects, avoid contrasting light conditions  
(Light and Dark, attempt exercise with even lighting, and for now,  
brighter is better)

**Goal:** Understand how each of the 4x Main Exposure modes work  
on your camera and be able to expose correctly.

Make a note of both The fastest and the Slowest Shutter-Speeds  
you are able to achieve with your camera set at 100 ISO while  
maintaining correct exposure according to the camera set at 100  
ISO while maintaining correct exposure according to the camera