

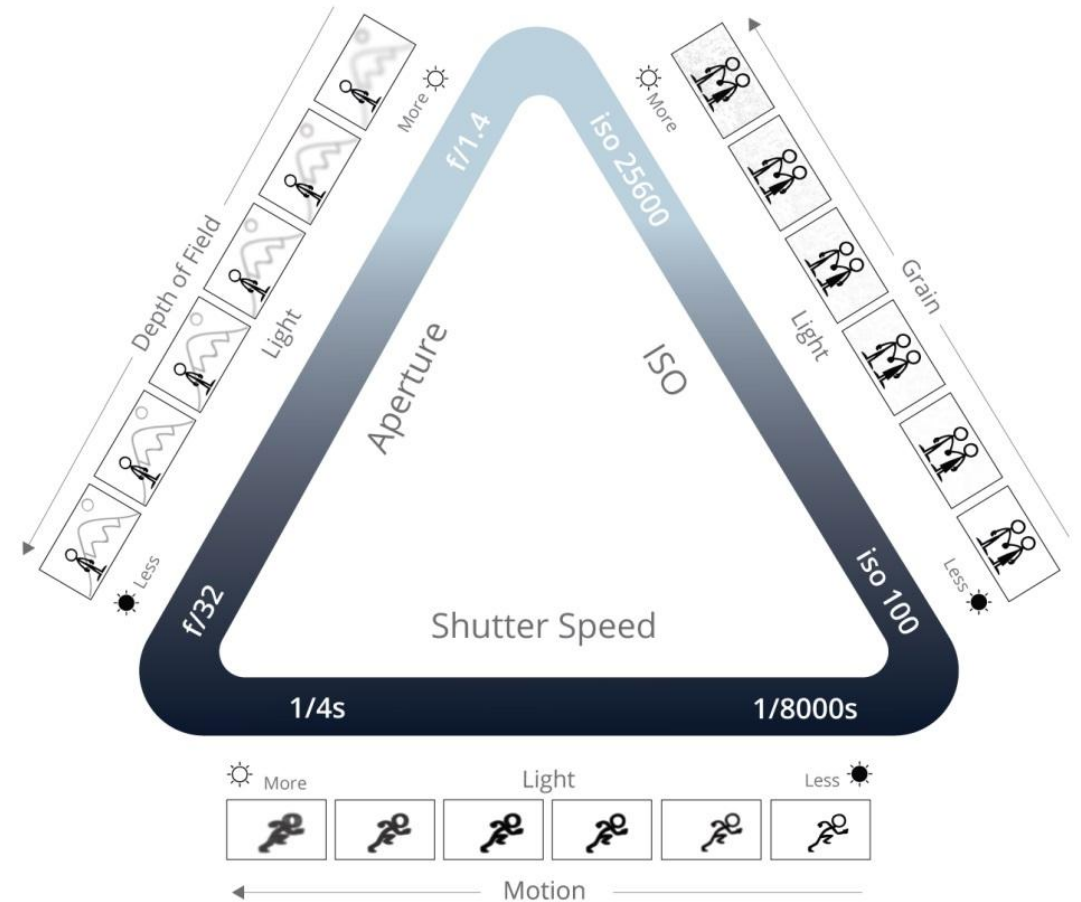
Focus on Fundamentals

Exposure
Triangle

The Exposure Triangle

- How the Camera controls the amount of light the Sensor is exposed to

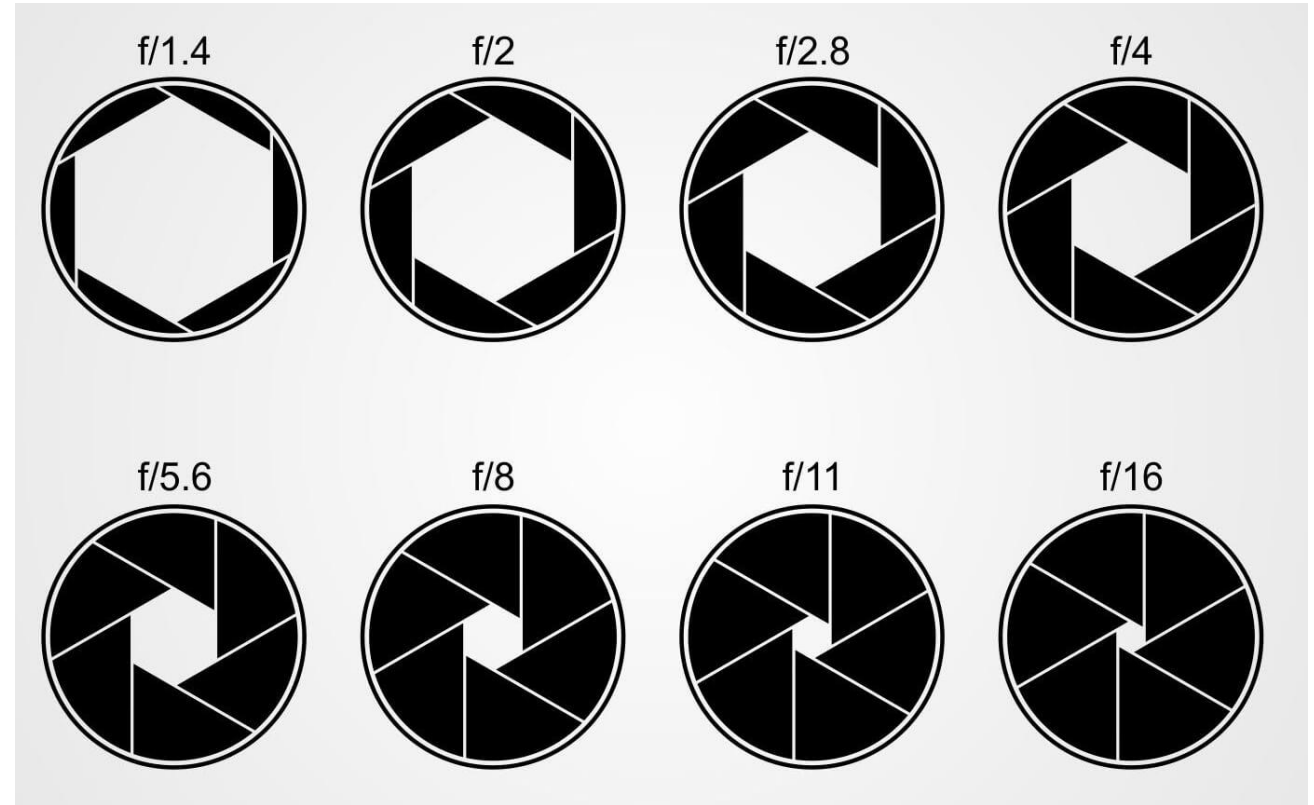
Aperture
Shutter Speed
ISO



How to control the amount of light the Sensor is exposed to? (Part 1)

1. Aperture

- The (variable) opening in the lens which light passes through.
- The larger the opening, the more light that passes thru
- Your eyes do the same - As you move between bright and dark environments, the iris in your eyes either expands or shrinks, controlling the size of your pupil



Aperture vs F-Stop

- The terms F-Stop and Aperture are often used interchangeably, this is incorrect.
- Aperture is the (variable) opening in the front of the lens where light enters the camera.
- F-Stop is how we define (assign a numeric value) to the size of the aperture
 - $\text{F-Stop} = \text{Lens Focal Length (mm)} / \text{Aperture Diameter (mm)}$
- The photographer controls the f-stop, which determines the depth of field and how much light enters the lens.

$$\text{F-Stop} = \frac{\text{Lens Focal Length (mm)}}{\text{Aperture Diameter (mm)}}$$

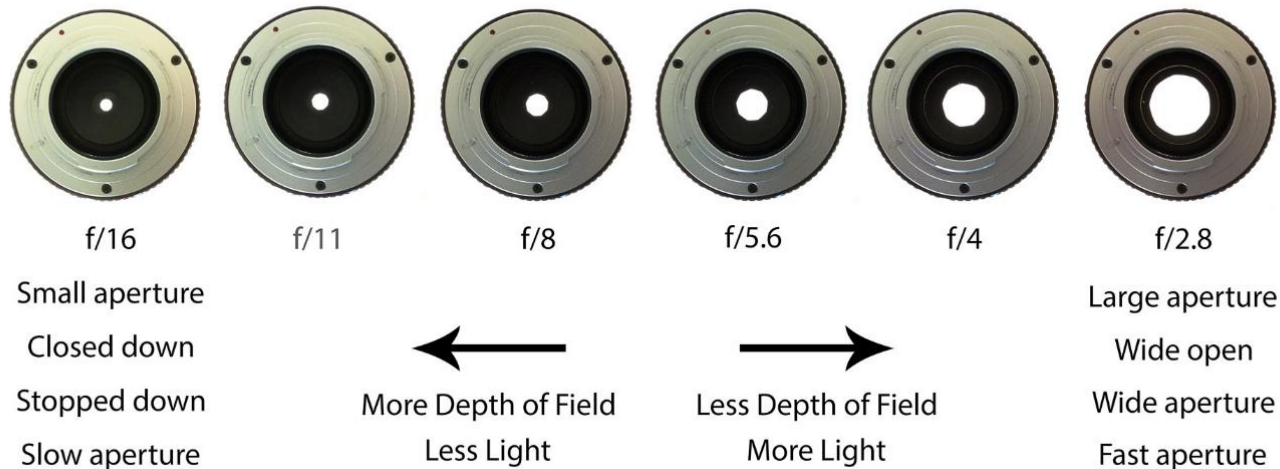
Focal Length $\rightarrow$

Aperture Diameter $\rightarrow$

$$\frac{50\text{mm}}{12.5\text{mm}} = f/4$$

Relative Aperture

Aperture Scale - Some Common Terminology



What Aperture Controls

- Depth of Field - How much of the photo is in focus
- The Smaller the F-Number, the less of the photo is in focus
 - Think of a row of “F”s
 - F2 has a 2 “F”s in focus = Shallow Depth of Field = blurry background = dreamy portraits
 - F16 has 16 “F”s in focus = Deep Depth of Field = everything in focus = great for landscapes
- But...Changing the Aperture also changes 2 additional things:
 - The of amount light hitting the sensor
 - Sharpness of the Image

What Aperture Controls – Part 2

But...Changing the Aperture also changes 2 additional things:

- The amount of Light hitting the Sensor
 - A wide aperture (low f-stop like f/1.4) lets in more light, so it's perfect for low-light situations. A narrow aperture (high f-stop like f/22) restricts light — useful in bright conditions.
- Sharpness of the Image
 - Most lenses are sharpest around f/5.6-8. At very low f-stops, the edges of the photo may be softer. At very high f-stops like f/22, light diffraction can reduce sharpness again.

How to control the amount of light the Sensor is exposed to? (Part 2)

Shutter

- The door to the camera, (which is always closed)
- When you press the shutter release button, the shutter opens for a specified length of time, allowing light to hit the sensor and create an image.

Shutter Speed

- The duration for which the shutter remains open
 - Usually expressed in sec's - 1/60, 1, 1/1000, 1/30
 - Bulb -The camera's shutter stays open for as long as you hold down the shutter release button
 - Time – program in time

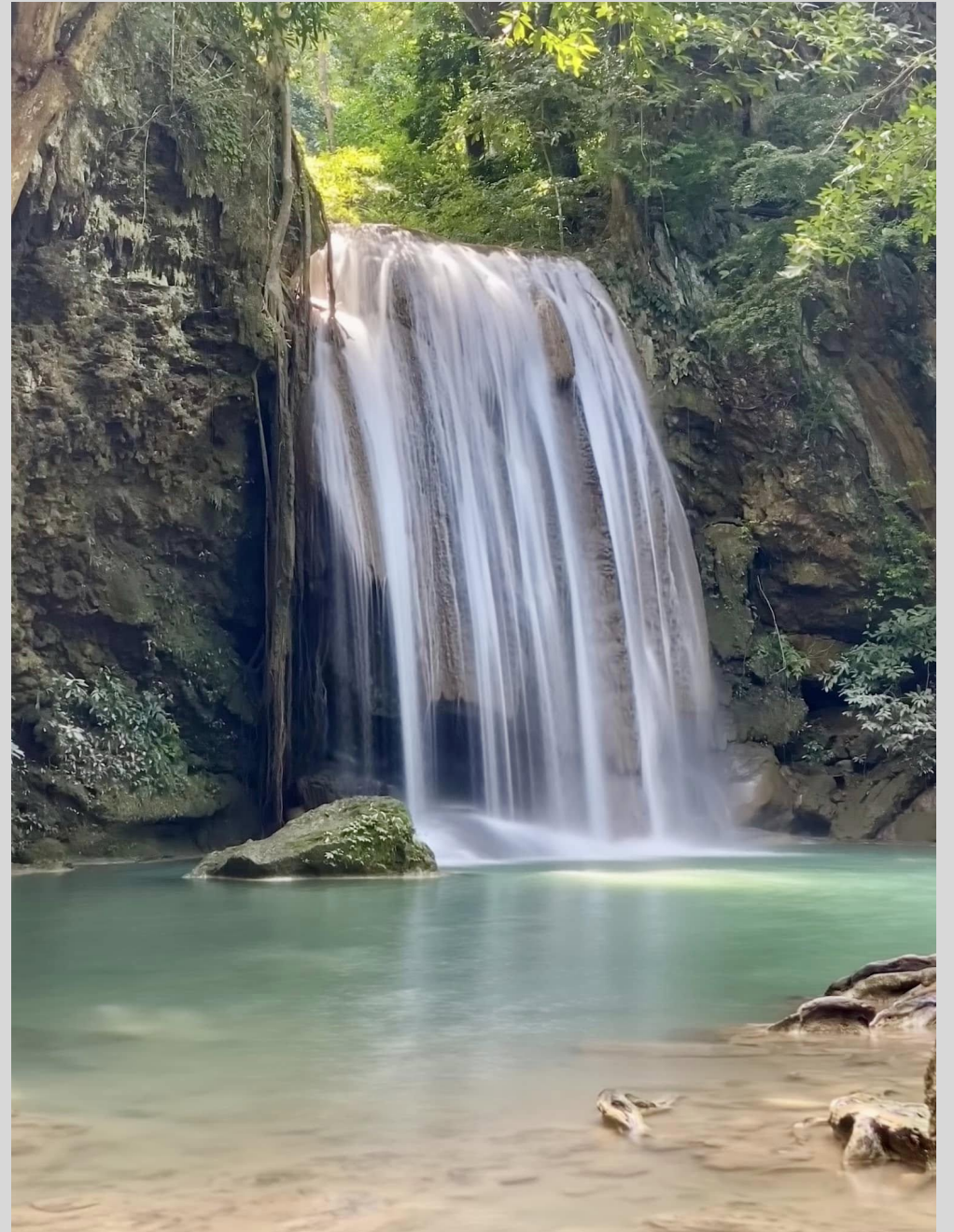
Shutter speed directly impacts how motion is captured in a photograph.

A fast shutter speed freezes motion, making it ideal for photographing fast-moving subjects



Shutter speed directly impacts how motion is captured in a photograph.

- A slower shutter speed can create a sense of motion blur, which can be used artistically.



Now that we can control the size of the opening to the shutter and the amount of time the shutter is open... Can we control the ambient light?

Nope..
But the camera can Amplify the light that hits the sensor!

Let's call this **ISO**

ISO
Controls the camera's ability to amplify or suppress the electronic signal the sensor creates from the absorbed light.



Think of ISO as the volume level on a radio

If the volume is weak (low light), you crank it up. The signal is "Amplified" – High ISO

If the volume level is too strong, you "suppress the signal" – Low ISO

the radio signal delivered to the radio does not change

How to control the amount of light the Sensor is exposed to? (Part 3)

ISO

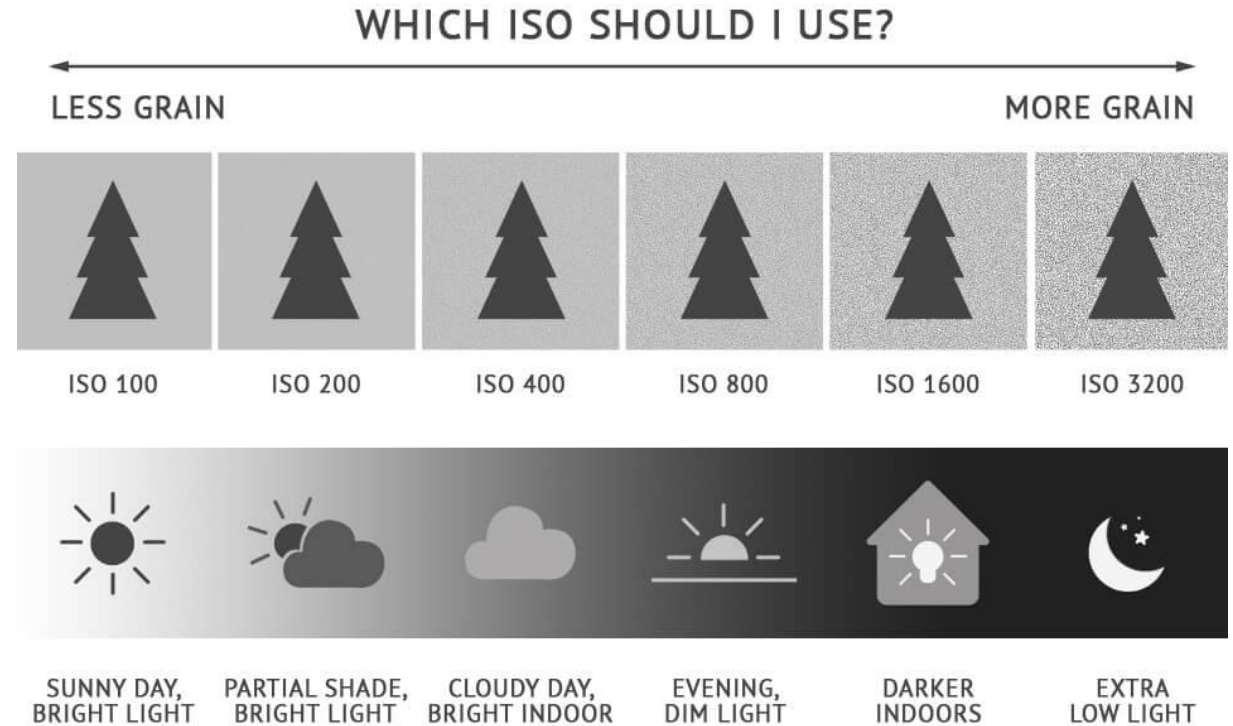
Controls the camera's ability to amplify or suppress the electronic signal the sensor creates from the absorbed light.

Starting at ISO 100...

Moving from left to right, each step in the diagram doubles the amplification of the light

Think of ISO as the volume level on a radio

- i. If the volume is weak (low light), you crank it up. The signal is "Amplified" – High ISO
- ii. The radio signal delivered to the radio does not change



Adjusting the ISO does not



Change sensor sensitivity



Control how much light comes into the sensor



Increase the “Noise” (just amplifies the existing “Noise” already present)