# Camera Tools and Functions

# Camera Obscura

Camera = Room

Obscura = Dark

Physics and Optics behind it = Inverse Square Law

# How the camera works



Viewfinder

Mirror or Pentaprism

Translucent Screen

Film

Shutter

Mirror

Light Path

Lens

**Top View**
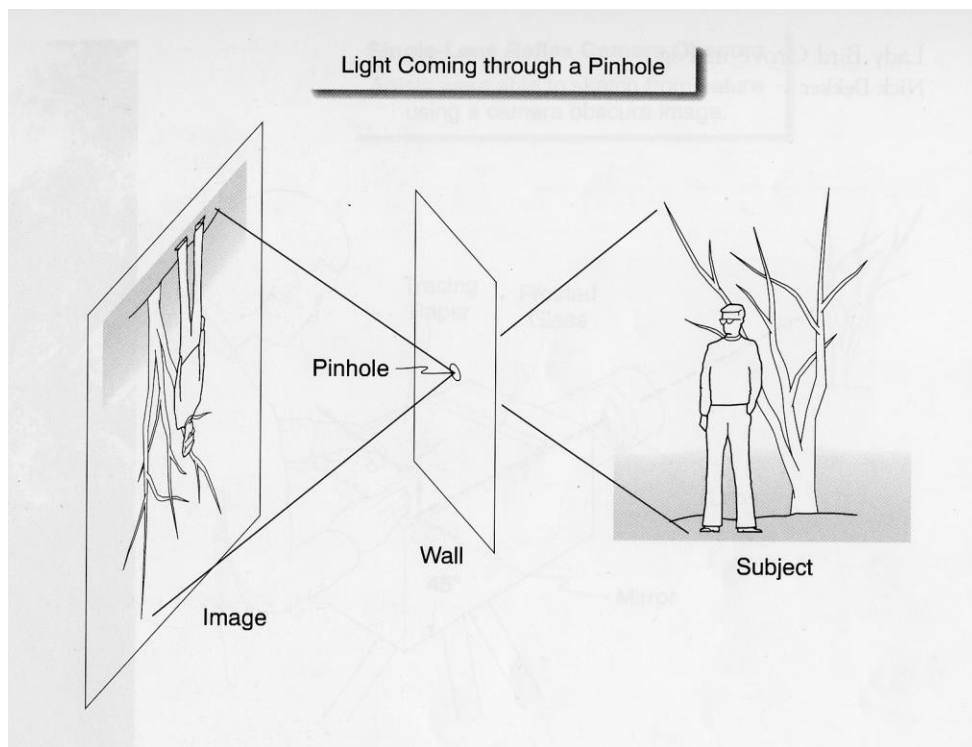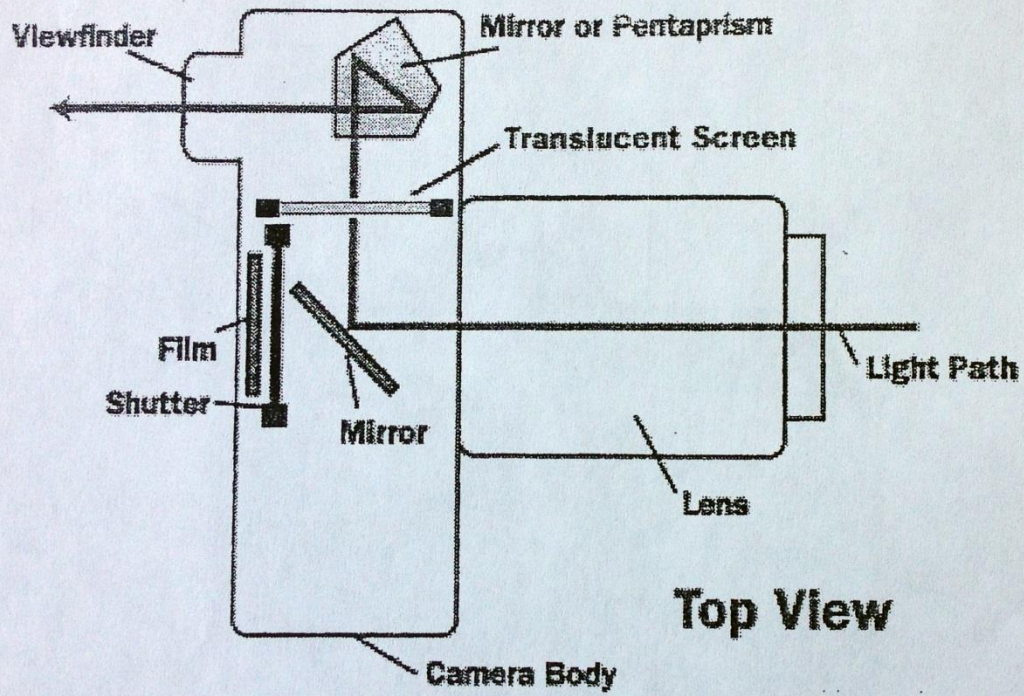
Camera Body

1.
2.
3.

# The Camera/Eye Comparison

Aperture =
Pupil

Shutter =
Eyelashes

Camera body =
Eyeball

Eye

Camera

b

a

c

f

d

e

a′

b′

c′

f′

d′

e′

Iris diaphragm =
Iris

Lens

Film =
Light sensitive
retina

Less light
100 ISO
More detail

More light
f/1.4
Shallow DOF

Controls the sensitivity of your camera's sensor to light

Controls the area over which light can enter your camera
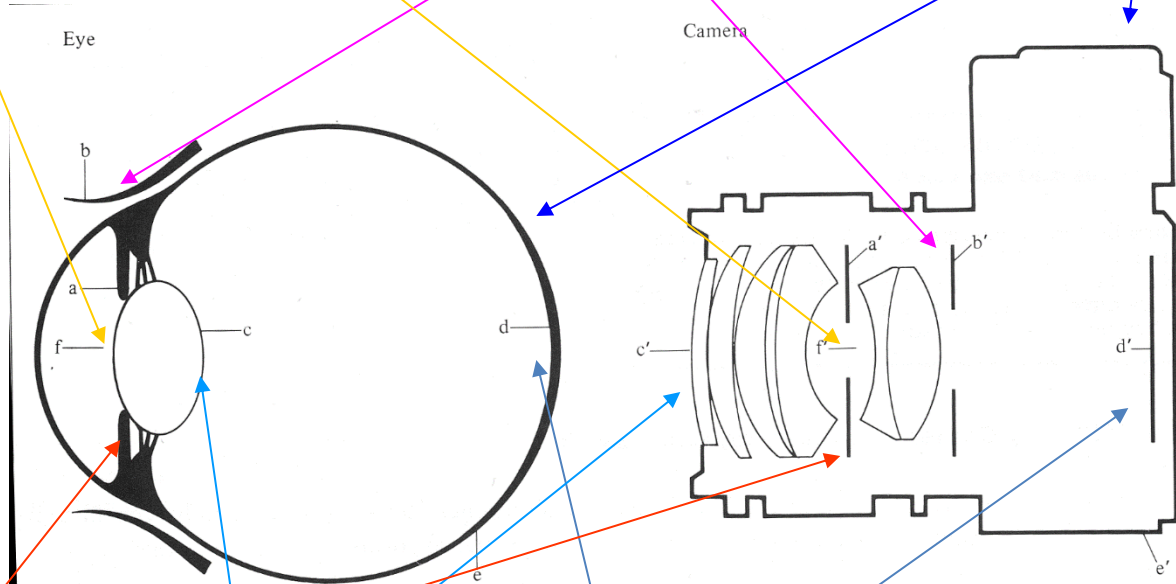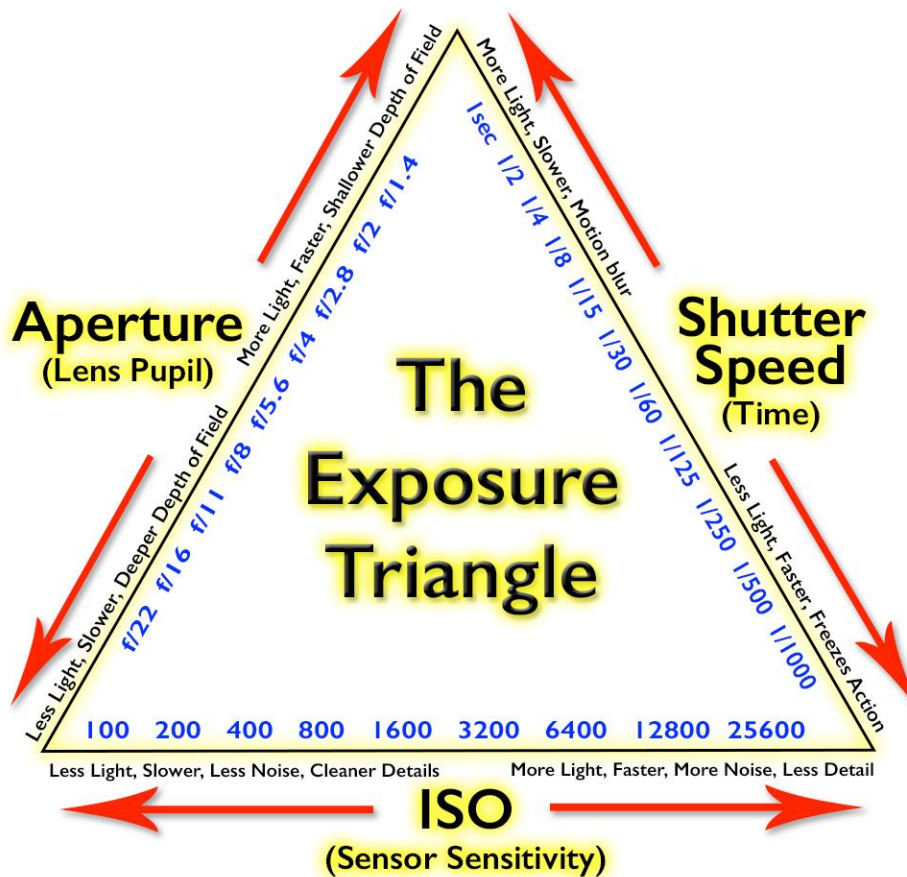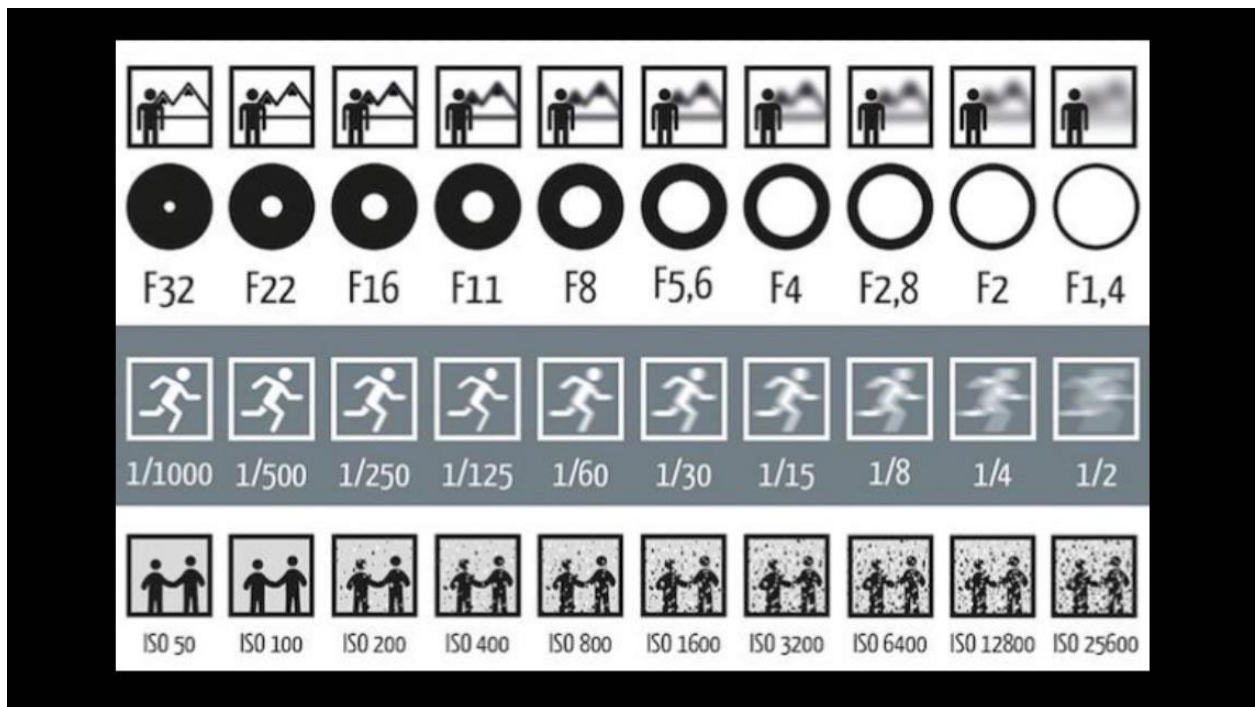
ISO

Aperture

More light
12 800 ISO
Less detail

Less light
f/22
Greater DOF

Shutter Speed

Less light
1/1000 sec
Freeze action

Controls the duration of the exposure (how much light is allowed to reach the sensor)

More light
1 sec
Artistic blurs

Aperture
(Lens Pupil)

Shutter Speed
(Time)

The Exposure Triangle

More Light, Faster, Shallower Depth of Field
f/2.8  f/2  f/1.4
f/5.6  f/4
f/8
f/16  f/11
f/22
Less Light, Slower, Deeper Depth of Field

More Light, Slower, Motion blur
1sec  1/2  1/4
1/8  1/15  1/30
1/60  1/125
1/250  1/500  1/1000
Less Light, Faster, Freezes Action

100  200  400  800  1600  3200  6400  12800  25600

Less Light, Slower, Less Noise, Cleaner Details

More Light, Faster, More Noise, Less Detail

ISO
(Sensor Sensitivity)

Exposure

Aperture — Depth of Field — f/2.8 (More Light) — f/22 (Less Light)

ISO — Grain — 6400 (More Light) — 100 (Less Light)

Shutter Speed — Motion/Shake Blur — 1/1000 (Less Light) — 1/60 (More Light)



| F32 | F22 | F16 | F11 | F8 | F5,6 | F4 | F2,8 | F2 | F1,4 |

| 1/1000 | 1/500 | 1/250 | 1/125 | 1/60 | 1/30 | 1/15 | 1/8 | 1/4 | 1/2 |

| ISO 50 | ISO 100 | ISO 200 | ISO 400 | ISO 800 | ISO 1600 | ISO 3200 | ISO 6400 | ISO 12800 | ISO 25600 |

# File Types on a Digital Camera

## RAW vs. JPEG

- RAW files are massive and hold the most information
- Cannot set White Balance on RAW – White Balance is adjusted in post production
- Files cannot be opened without certain software
- Professionals use RAW all the time – files are better quality and white balance is not an issue

- JPEGs (Joint Photographic Experts Group) are compressed Files – take up less space
- White Balance must be monitored and adjusted as necessary
- Files can be opened anywhere
- You can use JPEG or RAW in this class
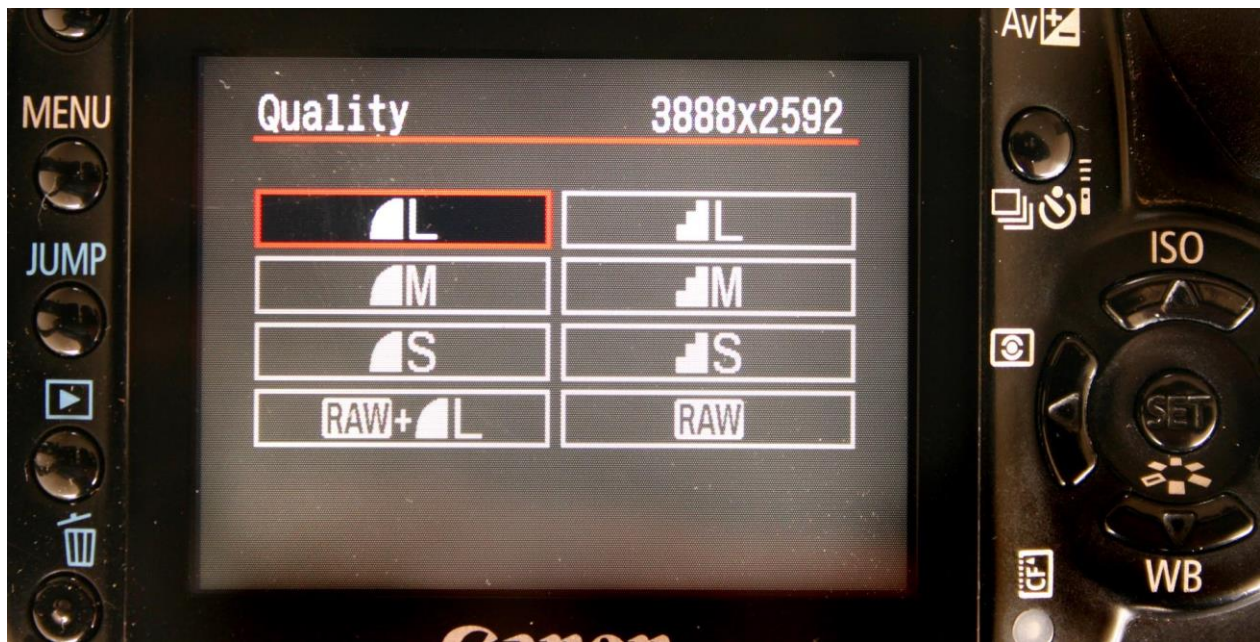
# ISO

**ISO stands for International Standards Organization**
**(ASA is used on older cameras – American Standards Association)**

- **ISO designates the film's degree of sensitivity to light**

- **Higher number ISOs means more sensitive to light – can be used in lower light settings (generally)**

- **Lower number ISOs means it is less sensitive to light and is used for brighter settings (generally)**

**The sensitivity of film to light has to do with the density of the silver halides on the film or how sensitive the CCD (Charged Coupled Device) on the digital camera is based on its current ISO setting**
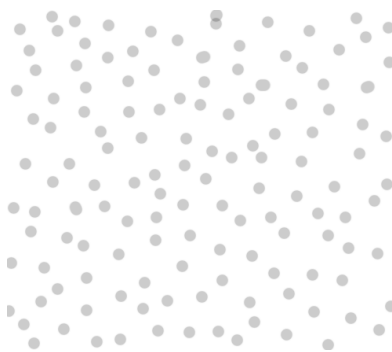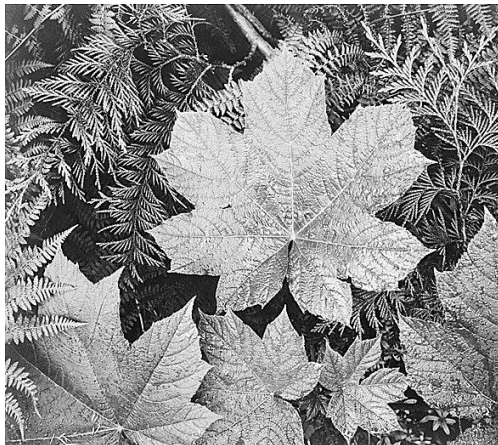

800 ISO


100 ISO
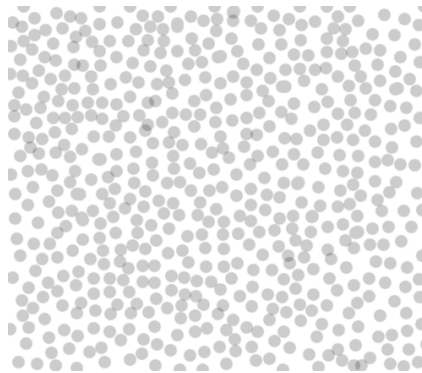
**LESS DENSITY**                    **MORE DENSITY**


**High ISO**


**Low ISO**

**The higher the ISO, the more grainy the final image will appear in film prints and more noise appears in digital images with higher ISOs**



ISO 80          ISO 800          ISO 1600

**This is how to adjust ISO on a Canon DSLR:**



**Each time you double the ISO (for example, from 200 to 400), the camera needs only half as much light for the same exposure. So if you had a shutter speed of 1/250 at 200 ISO, going to 400 ISO would let you get the same exposure at 1/500 second (providing the aperture remains unchanged). This is why high ISOs are so often used indoors, especially at sporting events. Needing a fast shutter speed to stop action, photographers regularly choose ISO 1600 or above.**
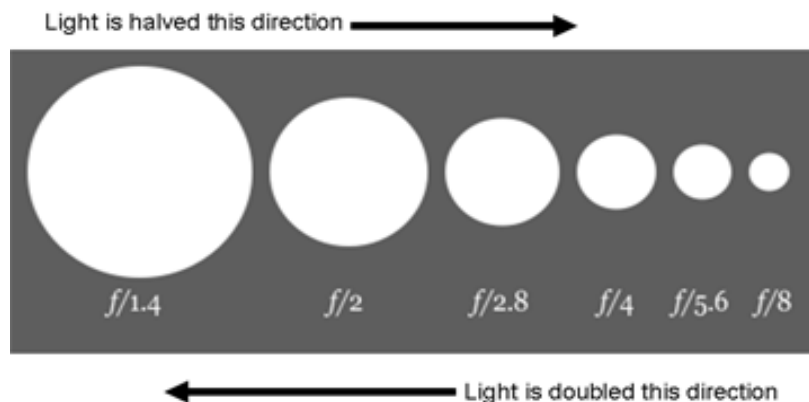
# Light Meter

- Purpose = tells you how much light is being allowed into the camera based on the current APERTURE, SHUTTER SPEED, and ISO settings

- Averages all light in scene to 18% gray which is ZONE V on Zone system scale

- Is correct most of the time

The tone to which all light meters average the light given off by the scene which is being photographed
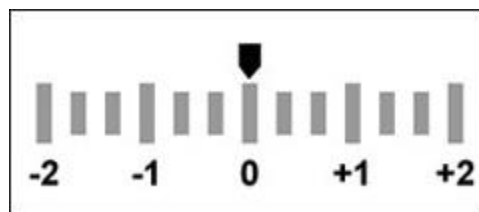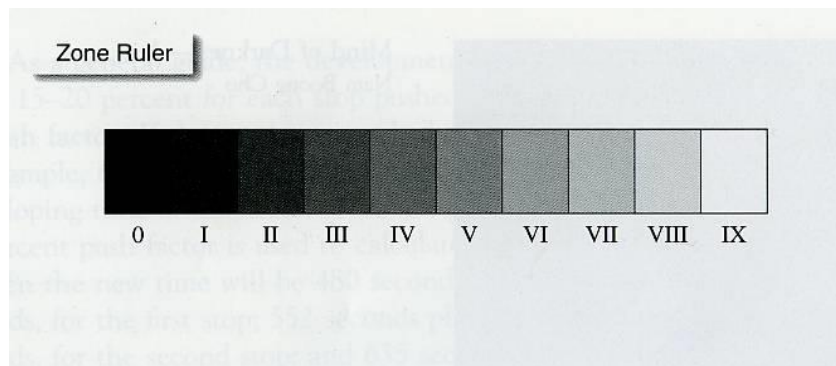
# The Stop

- A change in an exposure setting, either aperture or shutter speed, that either doubles or halves exposure

- f-stop numbers represent fractions
- The number represents the denominator
- For example f-22 = 1/22, f-5.6 = 1/5.6
- One full f-stop adjustment will either double or halve the amount of light coming into the camera

Light is halved this direction ➡

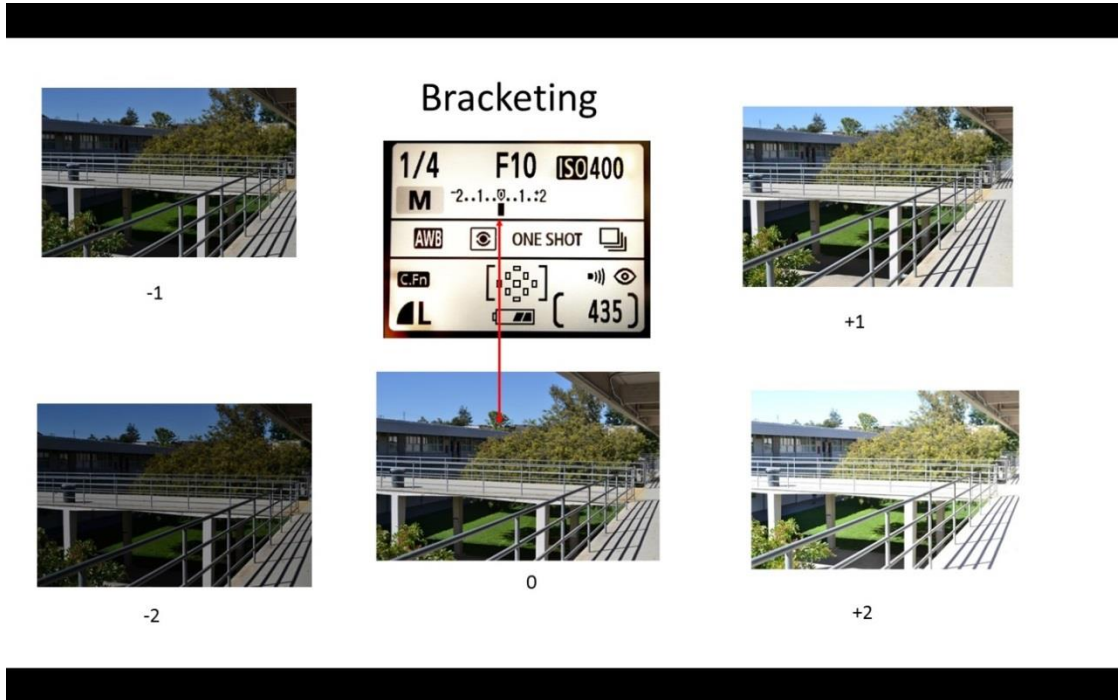f/1.4    f/2    f/2.8    f/4    f/5.6    f/8

⬅ Light is doubled this direction

- Shutter speed numbers represent fractions as well
- The shutter speed number on your camera is the denominator
- For example, 125 = 1/125 of a second, 1000 = 1/1000 of a second
- One full shutter speed adjustment will either double or halve the amount of light coming into the camera
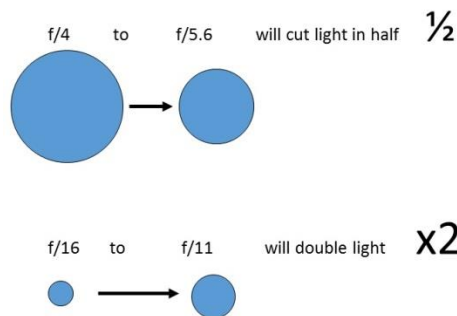
# Doubling Comparison for Shutter Speeds

- Doubling Sequence
- 1
- 2
- 4
- 8
- 16
- 32
- 64
- 128
- 256
- 512
- 1024

- Camera Shutter Speeds
- 1
- 2
- 4
- 8
- 15
- 30
- 60
- 125
- 250
- 500
- 1000

# Bracketing

**Shooting the same scene at different stop settings to get different amounts of exposure**



## Bracketing

| 1/4 | F10 | ISO 400 |
| M | -2..1..0..1.:2 | |
| AWB | ☉ ONE SHOT | ▭ |
| C.Fn | | ▬)) ◉ |
| ◢L | | ( 435 ) |

-1     +1

-2     0     +2

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**How Stops Work with the Aperture (f-stop)**

f/4     to     f/5.6     will cut light in half     ½

f/16     to     f/11     will double light     x2

**How the stop works with shutter speeds (for example)**

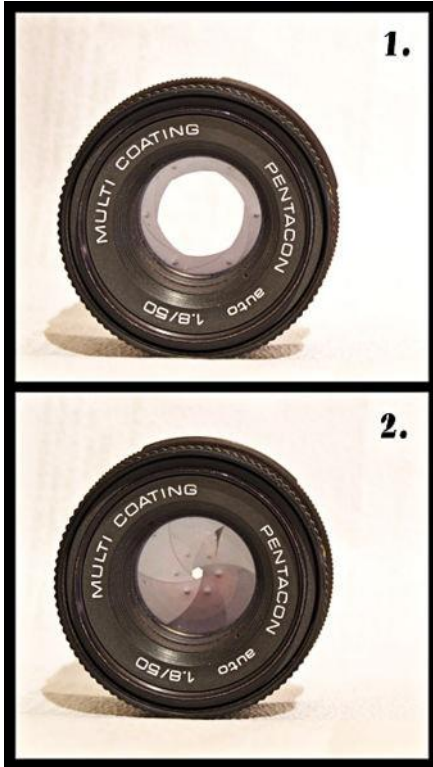Adjusting from **125 to 250** will cut the light in half **½**

Adjusting from **2000 to 1000** will double the light **x2**

# Aperture

**Controls opening's size during exposure**
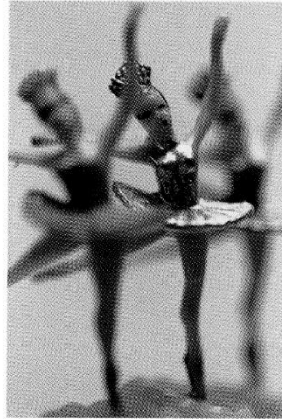
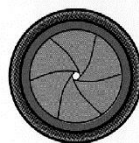**Another term for aperture: f-stop**

**Controls Depth of Field**

# Depth of Field

**The zone of sharpness variable by aperture, focal length, or subject distance**
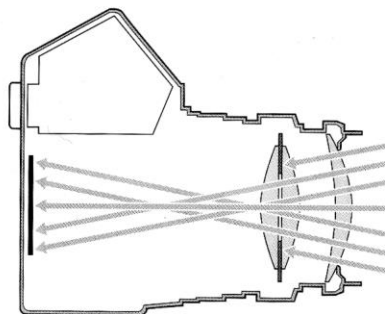
**Depth-of-Field Factors**

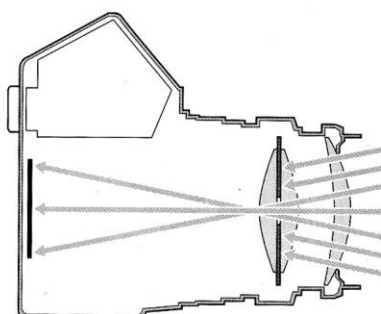| f/2 | f/22 |
|---|---|
| 50mm | 50mm |
| 2' away | 2' away |

Aperture and Scattered Light Rays

Wide Aperture                    Small Aperture
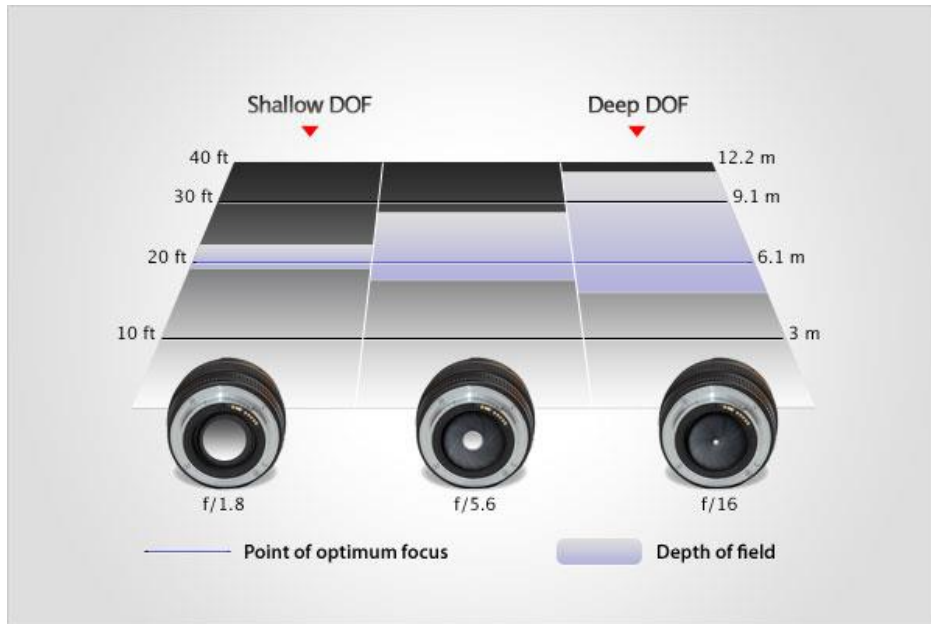
Subject distance from camera affects depth of field:
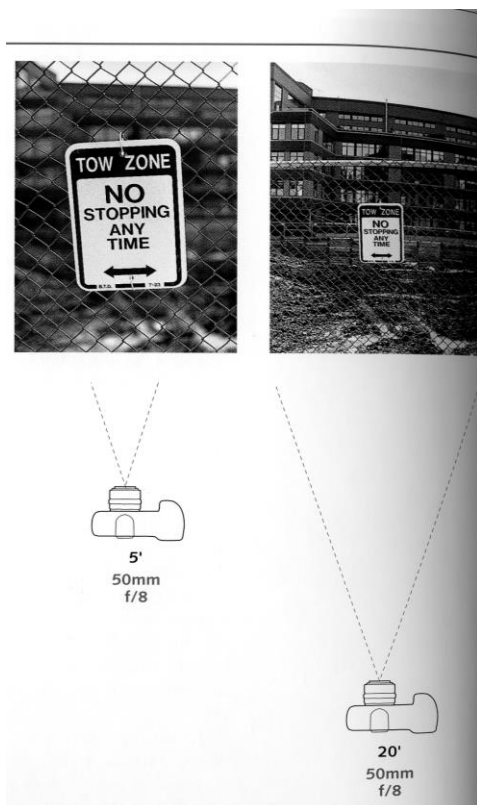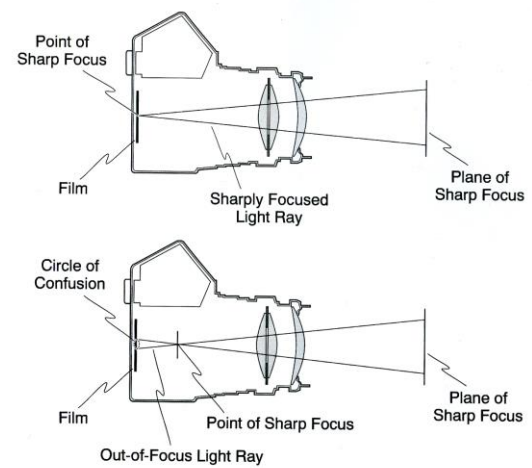
Focal length affects depth of field (artificially).  Larger focal lengths can result in the appearance of a shallower depth of field.



Focal Length: 300mm                                    Focal Length: 14mm

**To help you remember the f-stop numbers in regards to depth of field:**

**Higher f-stop numbers present more information visible (larger depth of field) (f/22)**
**Lower f-stop numbers present less information visible (shallower depth of field) (f/2.8)**

# Portrait

**To create a shallow depth of field, use a large aperture like f/1.7, f/2.8, f/4 like this:**



**To create a large depth of field, use a small aperture like f/16, f/22 like this:**



**Often the best light to shoot a portrait is in**

**Soft, diffused light:**

- **open shade (in the shade of a building or tree but there is open sky above you)**
- **overcast day**
- **studio lighting**
- **window light**

# Aperture Priority or Aperture Value Mode

A or Av
(Aperture Priority or Aperture Value Mode)

F20 ISO400

Av  -2..1..0..1.:2

AWB  ONE SHOT

C.Fn

L  435
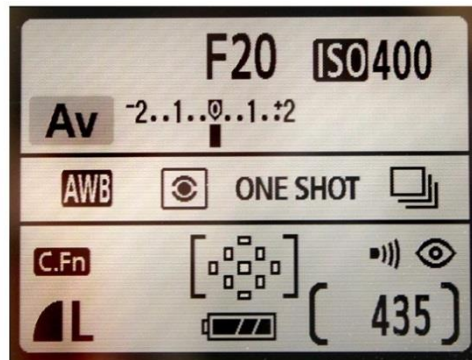
Change aperture by moving dial

You set aperture, camera sets the shutter speed

**Aperture Value mode is helpful to use when depth of field is most critical in your image so this would be good to shoot on for a portrait or a landscape, for example.**

# Exposure Control

**An Exposure is:**
combined effect of volume of light hitting the film or sensor and its duration.

- **Volume is controlled by the aperture (f-stop)**

- **Duration (time) is controlled by the shutter speed**

**Equivalent Exposure:**

denotes all combinations of shutter speed and relative aperture settings that give the same amount of light striking the light sensitive surface

| Shutter Speeds | Apertures |
| --- | --- |
| Fractions of seconds | Fractions |
| 1 | f/22 |
| 2 | f/16 |
| 4 | f/11 |
| 8 | f/8 |
| 15 | f/5.6 |
| 30 | f/4 |
| 125 | f/2.8 |
| 250 | f/1.7 |
| 500 | |
| 1000 | |
| 2000 | |

More Light — Less Light (Shutter Speeds column)
Less Light — More Light (Apertures column)

**Why is equivalent exposure important?**

- **To expose your image properly (not to light or too dark)**

- **As you shoot in different light conditions or shoot for different effects, you must change your apertures and shutter speeds accordingly**

# Exposure Compensation

## Exposure Compensation while on Program, S (Tv), or A (Av) Modes



- Hold +/- button while moving dial
- This current displayed setting would overexpose every shot by one stop

Exposure compensation can be done while in Manual Mode or can be done in one of the modes listed above. This is good to use for backlit subjects or other subjects that may be brighter or darker than a "normally" lit subject.
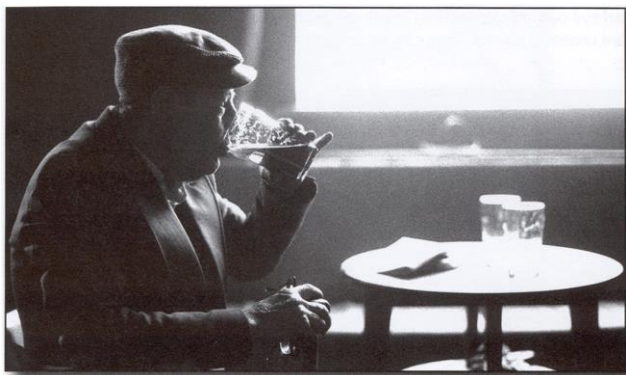


The Rhondda - Mark Galer

# Shutter Speed

The shutter speed controls the duration of an exposure.

Shutter speed numbers represent fractions like f/stop numbers do when displayed on the camera

The shutter speed number on your camera is the denominator
For example, 125 = 1/125 of a second, 1000 = 1/1000 of a second

## Freeze Motion



To shoot freeze motion 1/250 is about as slow as you can set the shutter speed, but usually you should try to use faster shutter speeds like 1/500 or faster. It depends on the subject's speed.

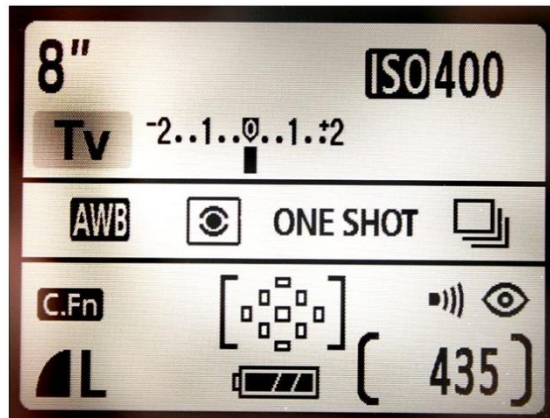## Pan and Blur Motion



To shoot pan or blur with a handheld camera, 1/60 is optimal shutter speed to use.
Slower shutter speeds may require a tripod.

# Shutter Priority or Time Value Mode

S or Tv Mode
(Shutter Priority or Time Value Mode)



You set shutter speed, camera sets the aperture

**Time Value mode is best to shoot on when visible motion is most critical in your composition.**

# Motion Photography Guidelines

**Freeze Motion**

**Camera settings:**
ISO = Higher (400-6400 – depending on brightness of light – try to shoot as low ISO as possible)
Shutter speed = **1/500** second or faster
Aperture (f-stop) = use light meter if available to set up an equivalent exposure

**Holding the camera:**

Having subjects move downward and holding your camera in portrait position often makes it easier to capture freeze motion. However, you can hold your camera in the landscape position and have your subject moving horizontally.

*Hold your camera steady while shooting freeze*.  You want your background and subject to be steady and frozen in space.

**Photographic subject information:**

Subject's position in relation to photographer:
Photographer should be close enough to the subject to clearly see the subject, yet not so close as to lose the spatial context in which the subject is shot.  We must be able to tell the subject is in motion and if the photographer is too close then motion will not be evident.

Subject's type of motion:
Subject must be making somewhat dramatic and obvious motion.  A photo of three people walking down the sidewalk is not freeze motion.  The subject should be running or jumping, etc.

Shooting cars is not allowed on this shoot.  A car sits on four wheels, so when a car is frozen in a photograph, we often cannot tell whether the subject is moving or parked.

**Compositional Reminder**
Be aware of the space surrounding your subject.  Avoid mergers and avoid letting your subject get lost in the background (a dark-clothed person in front of a dark background will not show up very well, for example).

**Blur Motion**

**Camera settings:**
ISO = low if in bright conditions (100-400)
Shutter speed = **1/60** second or faster
Aperture (f-stop) = use light meter if available to set up an equivalent exposure

If no light meter is available, use the BDE chart and your green and yellow aperture and shutter speed strips to set up an equivalent exposure.

**Holding the camera:**

Having subjects move horizontally while you hold your camera in a landscape position usually works best.  However, you can have your subject move vertically while you shoot in portrait position.

***Hold your camera steady while shooting blur***.  You want your background steady and clear while your subject will blur.

**Photographic subject information:**

Subject's position in relation to photographer:
Photographer should be close enough to the subject to clearly see the subject, yet not so close as to lose the spatial context in which the subject is shot.  We must be able to tell the subject is in motion and have a background that is steady to make more dramatic the blur effect.  If the subject is far away, the subject will likely not blur at all.

Subject's type of motion:
Subject must be moving fairly fast, but does not need to be moving incredibly fast.

Shooting moving cars is allowed on this shoot.

**Compositional Reminder**
Be aware of the space surrounding your subject.  Avoid mergers and avoid letting your subject get lost in the background (a dark-clothed person in front of a dark background will not show up very well, for example).  However, a dark-clothed subject against a light background (or light-clothed subject against a dark background) can be very effective and dramatic in blur motion.

**Pan Motion**

**Camera settings:**
ISO = low if in bright conditions (100-400)
Shutter speed = **1/60** second or faster
Aperture (f-stop) = use light meter if available to set up an equivalent exposure

If no light meter is available, use the BDE chart and your green and yellow aperture and shutter speed strips to set up an equivalent exposure.

**Holding the camera:**

Having subjects move horizontally while you hold your camera in a landscape position usually works best.  Portrait camera position and vertical movement rarely ever work with pan motion.

*Follow your subject while shooting pan. Press the shutter release button when the subject is in a good position in front of you.  Keep the camera moving in the same direction after you fire the shutter release button.*  The background will streak and your subject will still be in focus.  Try to keep your camera motion centered on the head and  torso of a moving body.

**Photographic subject information:**

Subject's position in relation to photographer:
Photographer should be close enough to the subject to clearly see the subject, yet not so close as to lose the spatial context in which the subject is shot.  We must be able to tell the subject is in motion and have a background that is streaked to make a more dramatic the pan effect.  If the subject is far away, it will likely not be seen at all.  Also

Subject's type of motion:
Subject must be moving fairly fast.

Shooting moving cars is allowed on this shoot.

**Compositional Reminder**
Be aware of the space surrounding your subject.  Avoid mergers and avoid letting your subject get lost in the background (a dark-clothed person in front of a dark background will not show up very well, for example).  However, a dark-clothed subject against a light background (or light-clothed subject against a dark background) can be very effective and dramatic pan motion.

However, A completely dark or light background with no detail will likely be ineffective because there will not background to streak.

# White Balance
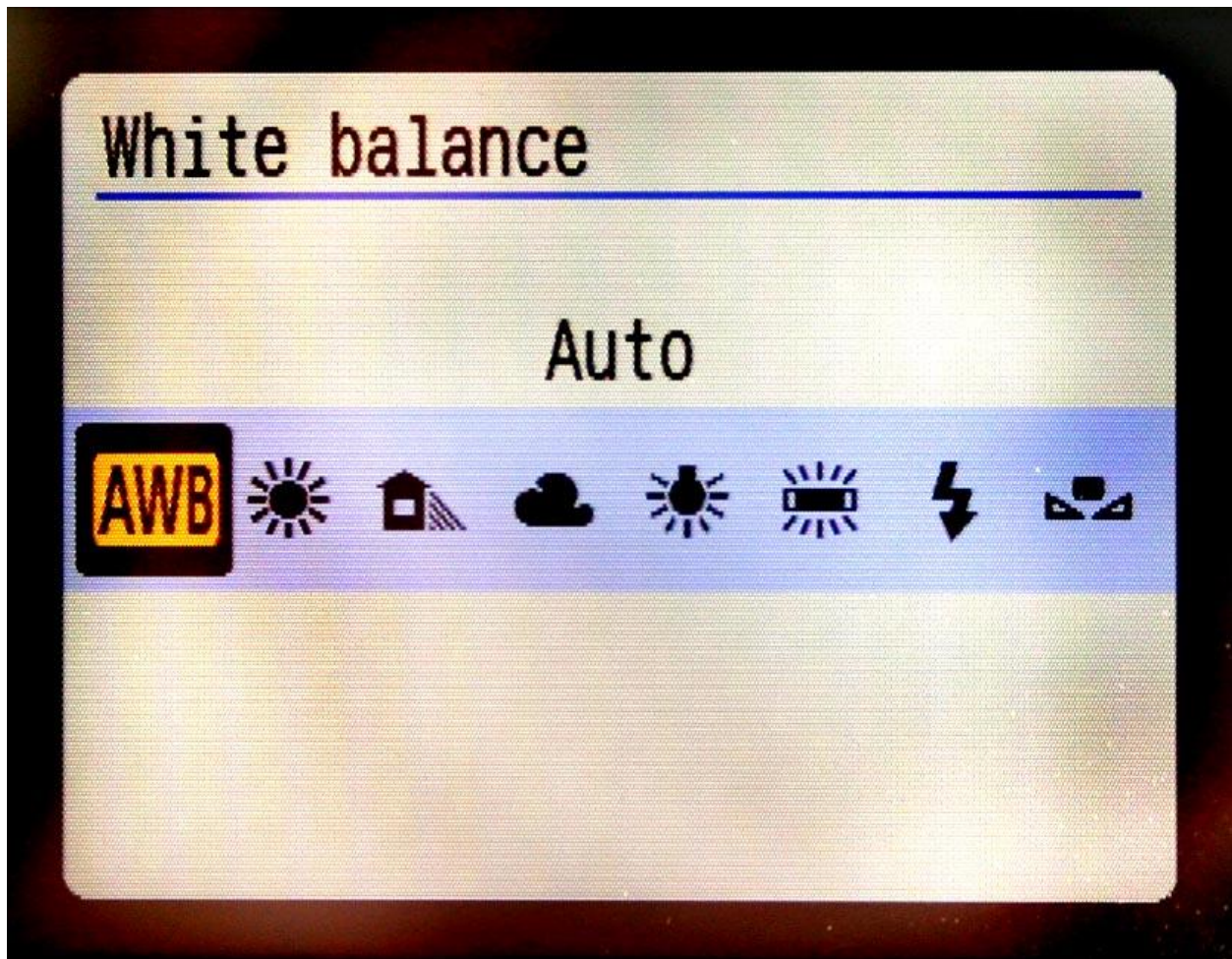


**White balance**

is a function of a digital camera used to compensate for different colors of light being emitted by different light sources. In digital photography the term is generally used to describe a function of a digital camera that allows you to calibrate the device to correctly display the color white. Once this calibration has been done, the camera should then display other colors correctly as well.