

Basic Manual Control of a DSLR Camera

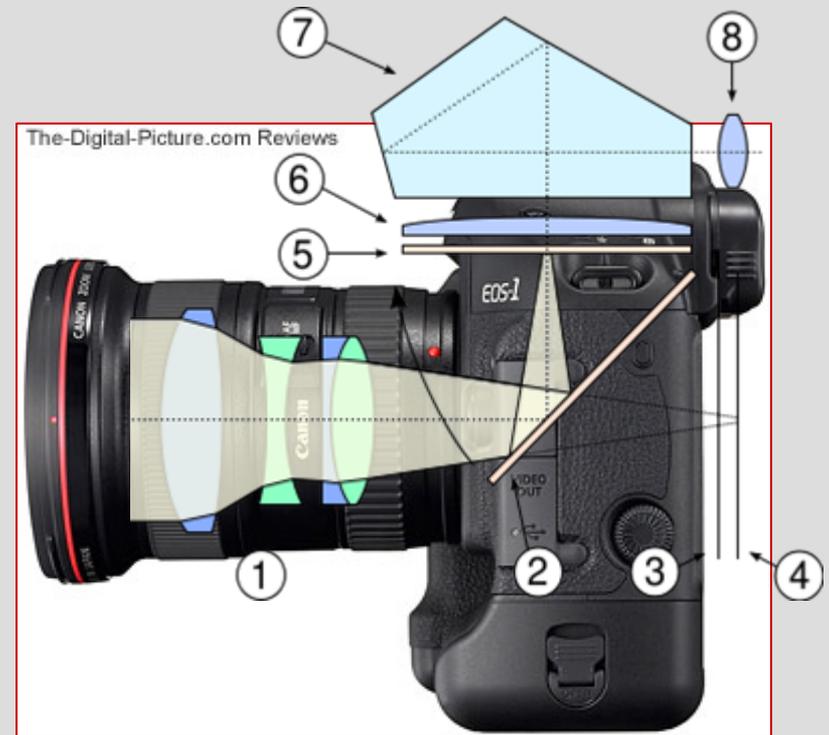
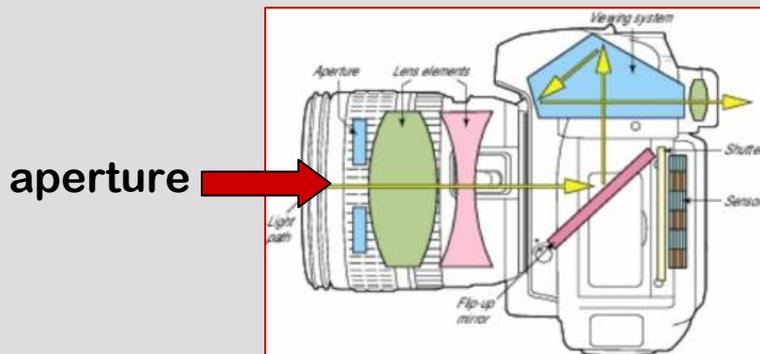


Naixn 2008

*Photographers don't just take photographs -
they make them !*

Digital Single Lens Reflex Camera

The basic operation of a DSLR is as follows: for viewing purposes, the mirror reflects the light coming through the lens upwards at an approximately 90 degree angle. It is then reflected by the pentaprism to the photographer's eye. During exposure (when the photograph is taken), the mirror swings upward, and a shutter opens, allowing the lens to project light through the aperture onto the film / sensor.



Cross-section view of DSLR system

- 1 - 4-element lens + aperture
- 2 - Reflex mirror
- 3 - Focal-plane shutter
- 4 - **Sensor** / film
- 5 - Matte focusing screen
- 6 - Condenser lens
- 7 - Pentaprism
- 8 - Eyepiece

Photography is the Art of Recording Light

In order to record light successfully you need to know how to **control your camera settings** manually. Understanding photography **exposure** allows you to give correct instructions to your camera about:

Film / Sensor Speed

Aperture

Shutter Speed

Light Metering

**Your camera
is just a tool -
you are the
artist**

Basic DSLR Camera Operation

The **constant** = ISO setting = sensitivity of film / sensor to light

The **variables** = Aperture = adjustable opening in lens
= Shutter Speed = duration of exposure

The **aperture** controls **volume of light** = the **science** of photography

The **aperture** controls **depth of field / focus** = the **art** of photography

The **shutter** controls **duration of exposure** = the **science** of photography

The **shutter** controls **appearance of motion** = the **art** of photography

Aperture + Shutter Speed = Exposure

the science of
photography

Aperture + Shutter Speed = Pictorial Outcome

the art of
photography

Camera: Mamiya RB 6x7 + 65mm wide angle lens*

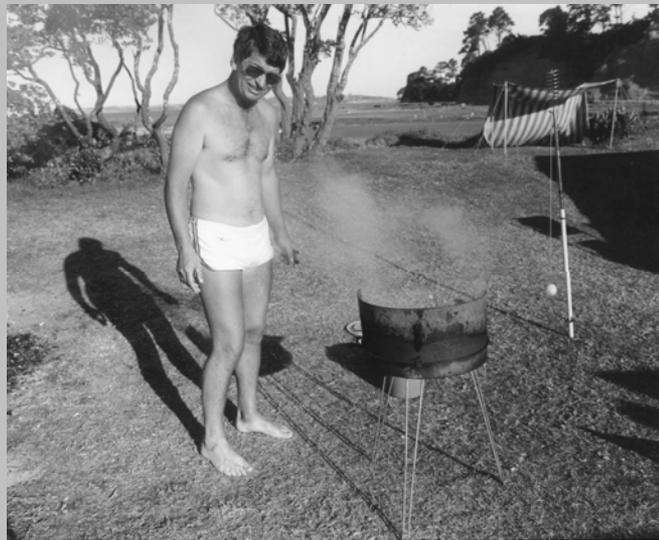
Exposure

Scene: strong
directional sunlight
from behind the
photographer

Film ISO: 100

Aperture Priority: f/22

Camera mounted on
tripod



Clive Stone, mid 1980's

Pictorial Outcomes

Medium format negative:
detail retained when
enlarged

100 ISO: broad tonal range

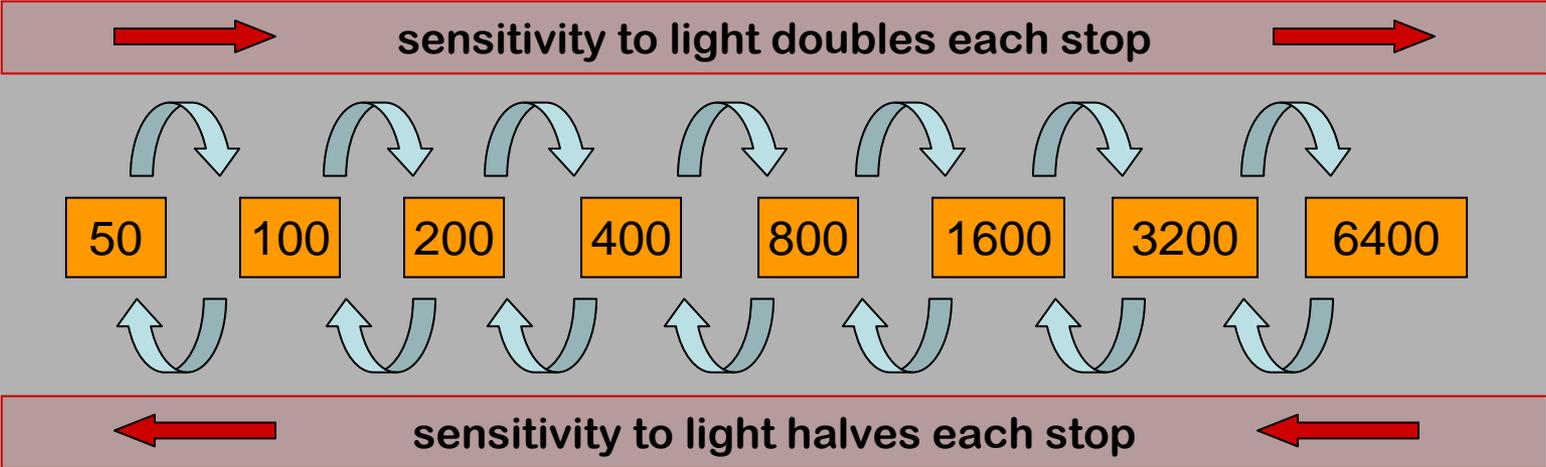
f/22: broad depth of field;
precise edge definition

No camera shake

*distortion of space

Film / Sensor ISO

ISO rating



the science:
sensitivity of
film/sensor
to light

Slow
more light required

Fast
less light required

the art:
pictorial
outcome

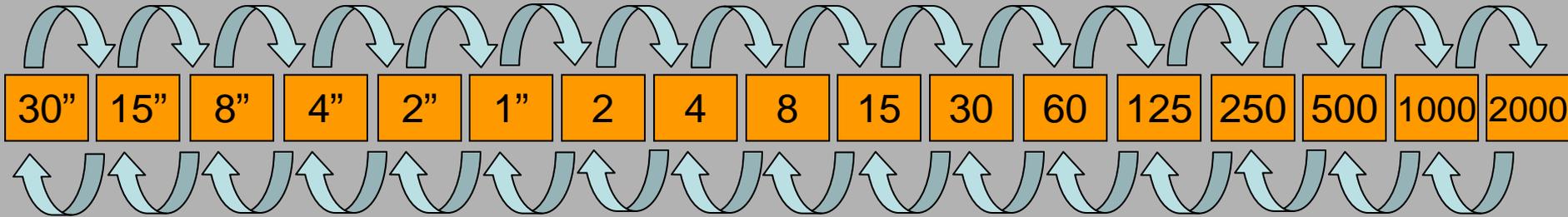
fine grain
(DSLR) less noise
more tonal detail
precise edge definition

coarse grain
(DSLR) more noise
less tonal detail - high contrast
looser edge definition

Shutter Speed



duration of exposure halves each stop



duration of exposure doubles each stop



slow shutter speed
= longer exposure to light

the science:
sensitivity of
film/sensor
to light

fast shutter speed
= shorter exposure to light

Motion appears blurred *

the art:
pictorial
outcome

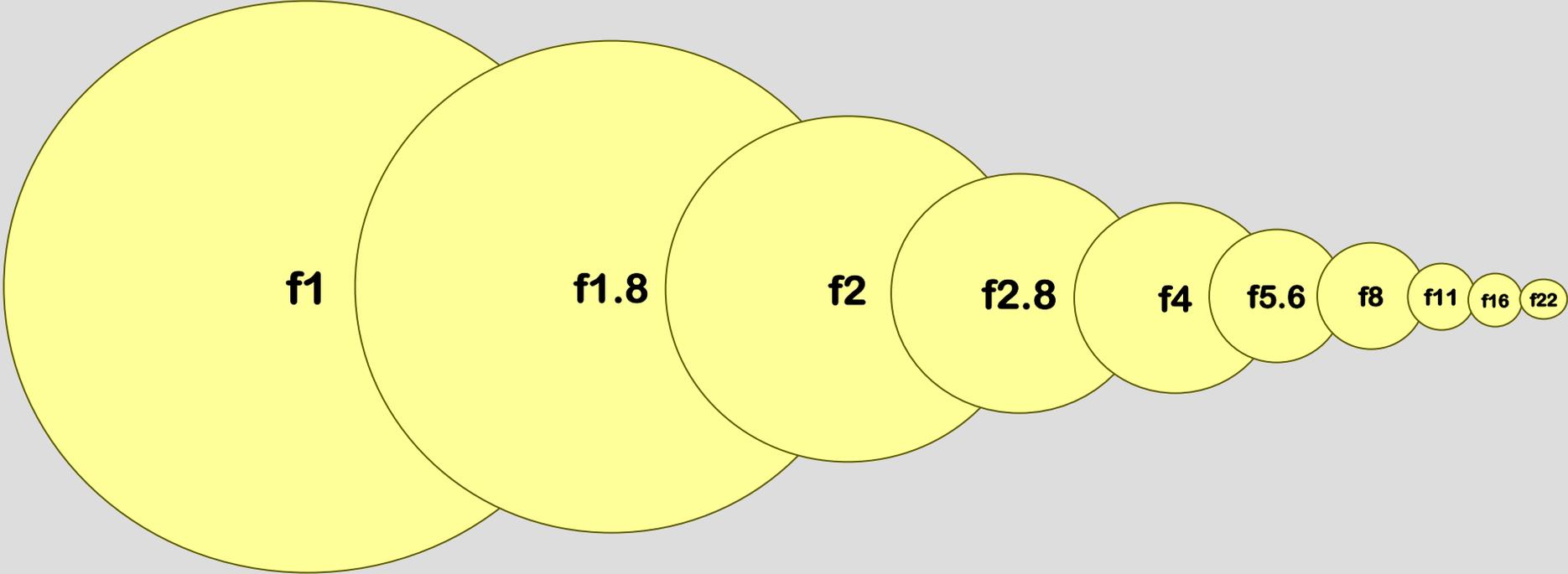
Motion appears frozen*

* relative to speed of motion being photographed

Aperture



aperture size halves each stop



aperture size doubles each stop



Large aperture
larger volume of light

the science:
sensitivity of
film/sensor
to light

small aperture
smaller volume of light

narrow depth of field

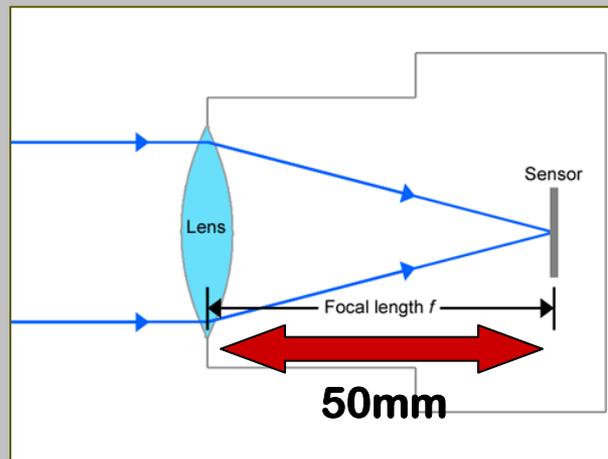
the art:
pictorial
outcome

wide depth of field

The f/stop = $\frac{\text{focal length of the lens}}{\text{diameter of the lens}}$

The f/stop number is the **ratio** between the diameter of the aperture in the lens and the focal length of the lens. The focal length is generally measured in millimeters.

On a standard 50mm SLR lens with an aperture diameter of 25mm, the f/stop number is $2 = f/2$.



= $f/2$

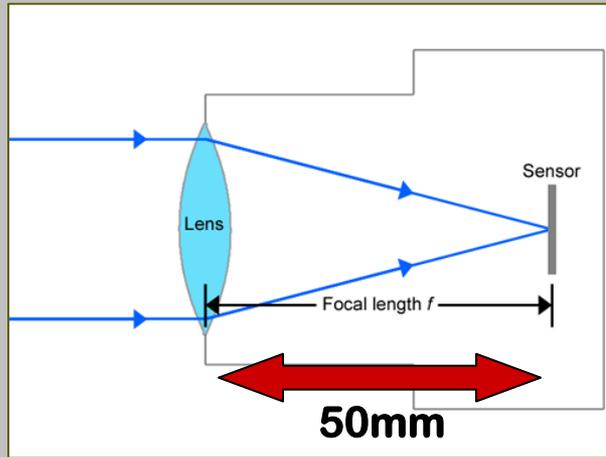


25mm

Images not to scale

On the same 50mm lens with an aperture diameter of 12.5mm, the f/stop number is 4 = $f/4$

and with an aperture diameter of 6.25mm, the f/stop number is 8 = $f/8$



12.5mm = $f/4$
6.25mm = $f/8$

Images not to scale

Exposure Combinations

“Correct” exposure can be selected by using various combinations of film / sensor speed, shutter speed, and aperture setting.

One way to think of apertures and shutter speeds is to use the analogy of a tap for the aperture and a timer for the shutter speed.

When you open a tap all the way, water pours out and a container is filled in a very short time.

When you open a tap just a little, water trickles out and so it takes a much longer time to fill the same container.

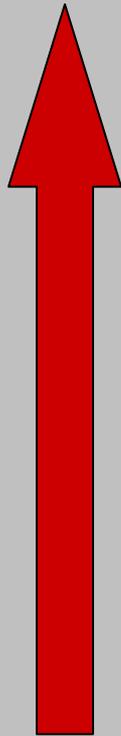
No matter which combination of volume (flow of water) and duration (length of time the tap is on) you choose, the bucket will be filled the same amount.

Likewise, the film or sensor in a camera can be exposed the same amount by various aperture and shutter speed combinations.

For example, the **exposure combinations** below allow the **same volume of light** to enter the camera. However, **the pictorial outcomes** are quite different.

Exposure Combinations =
same volume of light

Aperture size increases



f/2	@	1/1000
f/2.8	@	1/500
f/4	@	1/250
f/5.6	@	1/125
f/8	@	1/60
f/11	@	1/30
f/16	@	1/15
f/22	@	1/8

Shutter speed lengthens

Pictorial Outcomes

Depth of field is shallow and there is little possibility of subject or camera blur.

Depth of field increases slightly and the possibility of subject or camera blur increases.

Depth of field increases even more as does the possibility of subject or camera blur.

Using the Aperture and Shutter Together

Aperture Priority - manually select the aperture first, then use light meter to select the shutter speed

Aperture Priority Mode - manually select the aperture, and the camera automatically selects shutter speed

Shutter Speed Priority - manually select the shutter speed first, then the light meter to select the aperture

Shutter Speed Priority Mode - manually select the aperture, and the camera automatically selects shutter speed

The photographer prioritises the zone of sharp focusing, that is, the **depth of field**.

The photographer prioritises the **appearance of motion**, whether it is blurred or frozen

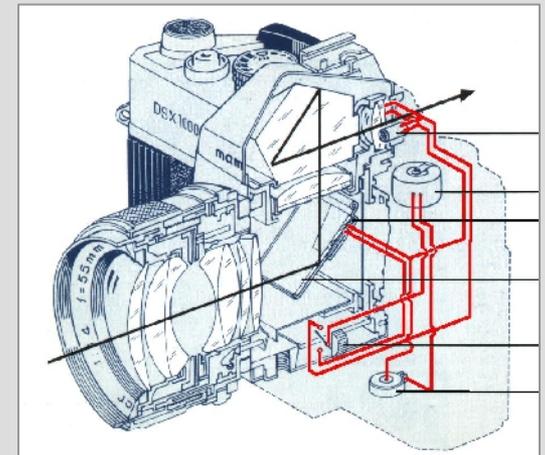
Through the Lens (TTL) Light Meter

The TTL meter is a **reflective meter** as it measures the light bouncing off the subject and into the camera lens.

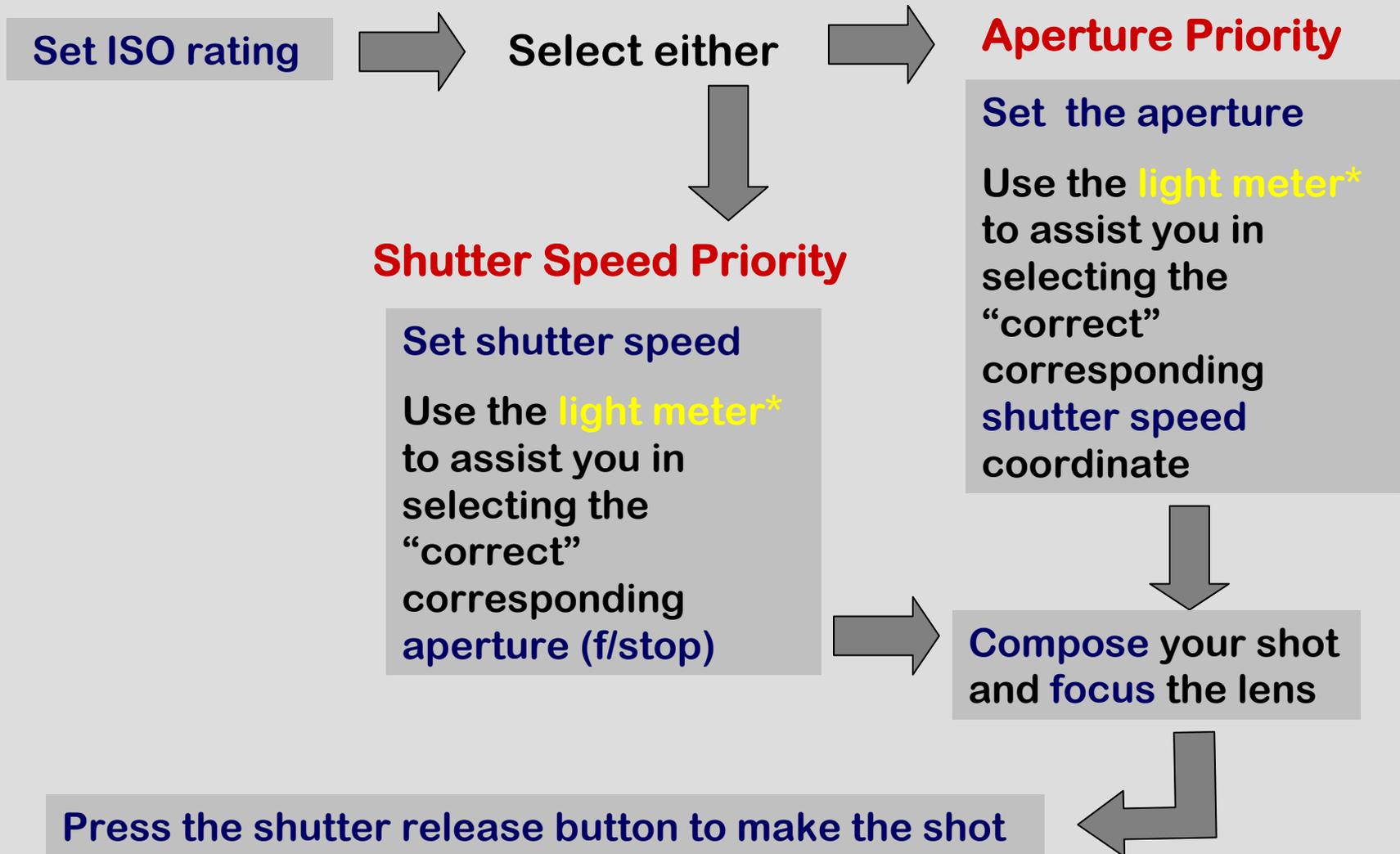
DSLR cameras provide limited area metering including **centre-weighted** and **spot metering** options.

The light meter is calibrated to “read for” **average light reflectance (18%)**. This equates to  in black and white photography, hence the need to overexpose in bright lighting conditions and underexpose in dark lighting conditions.

This drawing shows how the exposure meter system of a DSX1000 works, the red lines describing the electric circuit. There is one light sensitive sensor for spot metering in the mirror, and two sensors (only one shown) for the area metering behind the prism.



Using the Light Meter in Manual Mode



*Learn about **light metering**: <http://www.moosetpeter.com/techtips/flash.html>

No light meter??
Don't worry ... use the
Rule of f/16

A “correct” exposure will be obtained on a sunny day using **ISO 100**, an aperture of **f/16** and a shutter speed of **1/125** (*the closest equivalent*) of a second.

f/16 @ 1/125

At an aperture of **f/16** on a sunny day, a suitable shutter speed will be **1 / the film speed**. For example if you are using **ISO 200**, your shutter speed will be **1/250** (*the closest equivalent*).

f/16 @ 1/250