

BASIC CAMERA OPERATION

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- Camera
- General
 - The camera utilizes two devices that control the amount of light that will reach the sensor.
 - One of these devices is the shutter that can be likened to a normally closed opaque window shade. When activated the window shade will be opened for a predetermined period of time to admit light to the sensor.
 - The other device is the aperture control that is an iris diaphragm located inside the lens and the diaphragm functions much like the iris in the human eye. This diaphragm is made either larger or smaller in size to control the amount of light passing through the lens to the sensor.
- Shutter Speed
 - The shutter speed of the camera specifies how fast the shutter will operate that is for how long a period of time the shutter will be open to admit light through the lens. A faster shutter speed will be better to stop motion. A slower shutter speed can permit use of a smaller aperture that will result in a greater depth of field (to be explained in a few minutes). Shutter speeds are expressed in numbers such as 60, 125, 250 etc. The number 60 means 1/60 of a second and 125 means 1/125 of a second and so on. A special setting is sometimes included and labeled B. When B is used the shutter will remain open as long as the shutter release remains pressed. The B stands for Bulb an expression that goes back to operation of old cameras. Each time you increase the speed you reduce the light striking the film. As the shutter speed goes from 60 to 125 you cut the light in half. You do exactly the same if you go from 250 to 500. Full stop shutter speeds are; 1, 1/2, 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/8000.
- Aperture
 - The aperture controls the amount of light that passes through the lens to the sensor. On a cloudy day you need to make the diaphragm opening larger to allow more light to reach the film and conversely on a bright day at the beach you need to close down the diaphragm to let less light in. The numbers used to identify the discrete steps are 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, etc. and are known as f-stops. I know the numbers are strange looking but they have a basis in mathematics and as the number increases by one stop the light getting through the lens is cut in half. Thus if you go from f2 to f2.8 you cut the light in half. You also cut it in half if you go from f11 to f16. Just to reinforce the idea if you go from f16 to f11 you double the light reaching the lens. The term “stopping down” refers to closing down the diaphragm such as going from f11 to f16. Notice as the f-stop numbers get larger the diaphragm gets smaller.

- Interrelationship between Shutter Speed and Aperture
 - If your camera is set for the correct exposure and then you increase the shutter speed say from 60 to 125 guess what happens: you cut in half the light that will reach the film. In order to compensate for the reduced light you have to “open up” the aperture by one stop. Thus if the correct exposure was Shutter Speed = 60 and Aperture = f16 and you increased the shutter speed to 125 to stop some action you would have to open up the lens one stop to f11. In the same manner if you increase the shutter speed twice say from 60 to 250 you would have to open up the lens two stops to f8.
- ISO
 - The ISO setting determines how much light is necessary to create a correctly exposed image. Doubling the ISO will require half the light for a correct exposure and halving the ISO will require double the light for a correct exposure. In general it is best to use the lowest ISO setting you can. The higher ISO settings will yield more noise in the image, the equivalent of film grain. The issue is that the electrical noise of the sensor is rather constant over the range of ISO settings but as the ISO is increased the light signal required to form the image decreases thus the signal to noise ratio decreases and the noise is more noticeable in the image. Camera sensors and post processing noise reduction software keeps improving and noise is nowhere near the issue it was when digital cameras were introduced.
- Exposure Control – all three variables
 - You need to think about the three variables, shutter speed, aperture and ISO when considering the settings for a correct exposure. If you consider all three then if you need a faster shutter speed for an image you can hold the aperture constant and increase the ISO setting. Thus if you want to go from a shutter speed of 60 to 125 and you want to maintain a given aperture for depth of field control then you simply need to double the ISO from say 100 to 200..

- Depth of Field
 - Depth of Field refers to the depth of the picture or the amount of distance from the camera that will be in very sharp focus. The term “shallow depth of field” means that a very small portion of the depth of the image will be sharp and a “large depth of field” refers to an image that is sharp from foreground to background. There are three factors that effect depth of field. First if you are focused on a given point “stopping down the lens” which means decreasing the lens aperture as we discussed previously will increase the depth of field and a larger band from foreground to background will be rendered sharp. Conversely if you “open up the lens” which means making the aperture larger you will decrease the depth of field. This control over your camera can improve your photography greatly by allowing you to do such things as throwing distracting backgrounds out of focus so that they will not distract a person viewing the picture. The second factor that affects depth of field is the distance between the lens and the subject. If you focus the lens on something close the depth of field will be shallower than if you are focused on something further away. When you take close-ups the depth of field tends to be shallow. To compensate for this you must stop the lens down. The third factor that affects depth of field is the focal length of the lens. A shorter lens such as a 50mm lens will have a greater depth of field than say a 210mm telephoto. Special lens such as macro lens do not follow this general rule and a 100 mm macro lens that allows one to make extreme close-ups and photograph images life size on the negative have extremely shallow depth of field and can be as small as 1/16 of an inch.

- Lens Selection
 - Lens selection has a great affect on your images. Lenses are measured in terms of focal length. Telephoto lenses have a long focal length and wide-angle lenses have a short focal length. For 35mm a 50mm lens is called a “normal” lens since that lens sees approximately the same field of view that the human eye and brain see when they look at a scene. Let us look at lenses from the following perspective. Say that you are standing at one point and attempting to photograph a subject of a given size with a 50mm lens. If the object that you want to photograph appears too small in the viewfinder a longer telephoto lens will allow you to fill more of the frame with that subject without moving closer. On the other hand if you want to include more of the area surrounding your subject then you will need to change to a wider-angle lens. Thus if you want to do bird photography you will need a telephoto lens in the 400 to 600mm range because the birds will not allow you to get close to them as you would have to when using a shorter lens. The lens manufacturers have trained the birds in order to sell these more expensive lenses.
 - Depth of field changes dramatically with lens focal length. Long telephotos have a very shallow depth of field and wide-angle lenses have a very great depth of field. Wide-angle lenses in the 20mm range have such a large depth of field that you hardly need to focus them for most photographing. With a 600mm lens you have to be very critical with focus since the depth of field gets extremely small especially if you are photographing wide open in order to use a high shutter speed.
 - If you are going to handhold the camera the shutter speed that you need to use is dictated by the lens focal length. The general rule is that the shutter speed should be at least equal to the length of the lens to prevent your normal body shake from giving you a blurry image. Thus if you are hand holding a 50mm lens the slowest shutter speed that you should use is 50 (60 since there is no shutter speed of 50). If you are going to hand hold a 210mm telephoto you have to use a faster shutter speed, at least 250. This is why you start to photograph on a tripod. Image stabilization lenses will change that rule by one to two full shutter speeds.
- Zoom lenses
 - The day of the purist and fixed focal length lenses is gone because modern zooms are optically sharp and produce excellent results. With zoom lenses you need not carry around a large number of lenses and you can often stand in one spot and change the image size in your viewfinder. A starter set of lenses might be one zoom in the 28 to 85mm range and another in the 80 to 210mm range. You will be very satisfied for quite a while with those two lenses.

- Camera Exposure Modes - General
 - Camera exposure modes determine how the camera sets the correct aperture and shutter speed for the measured light.
- Camera Exposure Modes
 - Program Mode
 - The simplest Exposure mode to use in any camera is Program or the P mode. The camera in this mode chooses both the shutter speed and the aperture or f-stop for the lighting condition. Some cameras get very sophisticated and they know the focal length of the lens that you are using so that they can set a high shutter speed to reduce shake. Of course if you are shooting on a tripod you do not need this high shutter speed and you might not want to use P mode.
 - Shutter Priority Mode
 - In Shutter Priority or S/T_v mode you select the shutter speed and the camera calculates and sets the f-stop for the correct exposure. You might want to use this mode to select a fast enough shutter speed for action photography rather than relying on the camera selection of a shutter speed.
 - Aperture Priority Mode
 - In Aperture Priority or A/A_v mode you select the aperture and the camera calculates and sets the shutter speed for the correct exposure. You might use this mode to throw a distracting background out of focus by choosing a wide open lens aperture such as f 2.
 - Manual Mode
 - In this mode you set both the shutter speed and the aperture to obtain the correct exposure. This is a good mode for a more advanced amateur and it allows the photographer control over certain situations in which the built in light meter is inaccurate and not up to the task of calculating the correct exposure. For example the light meter is fooled by subjects that are not of average reflectance. If you photograph images of snow or black dogs the light meter will not be correct no matter how sophisticated the camera. Light meters are designed to handle average scenes with a reflectance of 18%, which is the value in an average outdoor scenic.
 - You might also want to consider this mode for other situations such as backlit shots that is an image in which the light is in back of your subject. If you have ever photographed a person when the light was falling on their back you probably got an image in which the face was very dark. That is because the camera light meter is measuring the light falling on the camera and not the light falling on the face.
 - Basic Variants
 - Digital electronics are sophisticated and inexpensive and this allows manufacturers to include variants of the above four camera exposure modes.

- Camera Metering Systems
 - General
 - Modern cameras thanks to digital electronics have become very sophisticated in their methods of calculating exposure. Their only limitation these days is the reflectance issue already discussed.
 - Center Weighted
 - The simpler cameras generally use a center weighted metering system, which means that the light in the center of the viewfinder is given more “weight” or importance in calculating the exposure. This works well for normal horizontal shots where there is sky filling the upper part of the image.
 - Matrix/Evaluative Metering
 - The next step up in metering systems is matrix/evaluative metering. In matrix/evaluative metering the viewfinder is divided into a series of cells. The meter averages the exposure value from each cell to determine the correct exposure. This method can get very sophisticated with the use of fuzzy logic to determine a host of conditions such as backlighting or contrasty situations.
 - Spot metering
 - The addition of a spot metering option on your camera will allow you to obtain correct exposures in a situation in which you have areas strongly lit and other areas that are deep in shadows. Film does not have enough latitude for both of these areas to be correctly exposed so you have to select whether you want the highlight or the shadow area exposed correctly. With slide films it is generally better to expose for the highlight area. Spot meters as the name implies will allow you to take a meter reading from a small spot in the viewfinder and use that as the exposure value.
 - Sunny 16 rule
 - If your camera meter fails or if you do not have one, there is one foolproof rule you can use to calculate correct exposure and it is called the sunny 16 rule. On a sunny day if you are photographing a subject in direct sunlight you can set your aperture to f16 and then set the shutter speed to the same or nearest value as the ISO of your film or digital camera setting and you will get a correct exposure. On a Sunny day using ISO 100 film or an ISO setting of 100 for your digital camera set your aperture to f16 and the shutter speed to 125 and you got it.

- Autofocus
 - Autofocus as the name implies will automatically set the correct focus of the lens. While this is a great advantage especially in action photography or any grab photography where you do not have the time to focus it does have some limitations. The older systems had one sensor smack in the middle of the viewfinder and this tended to create a kind of bullseye image in which everything is dead-centered. The systems are now very good with multiple, selectable sensors increasing the usefulness of autofocus. Speed of autofocus has also greatly increased in the last few years aided by computer design of lighter lenses that allow the focus motors to move the lens glass faster. Even if the camera is not used in autofocus mode there is generally a focusing assist feature visible in the viewfinder that informs you when the lens is in focus.

- Composition
- I will only say a few words about composition and include some borrowed notes
- The first is that if you pose Aunt Maude in front of the Eiffel Tower you must decide if you want a picture of Aunt Maude or the Eiffel Tower. You cannot do both in the same picture and be happy with it. If you include the entire Eiffel Tower, Aunt Maude will be a speck in your print. If you make Aunt Maude a reasonable size in the viewfinder you will miss 99% of the Eiffel Tower and no one will know it is the Eiffel Tower. The solution, take two pictures.
- Photography is involved in the selection of what not to include in your photograph and the beginner is more likely to include too much in the image rather than not enough. Learn to concentrate on what is important to the image and exclude all else. Ask yourself the question what am I trying to say with this image and what feeling do I want to convey and what elements in this scene will best answer those questions. Then compose the picture to include just those elements. If you want to photograph an old man and show the wizened face move in and photograph the face and exclude all else. If you want to show a beautiful young woman with a nice body back up and photograph the entire woman.
- For more information on composition see the next pages

PHOTOGRAPHIC COMPOSITIONS

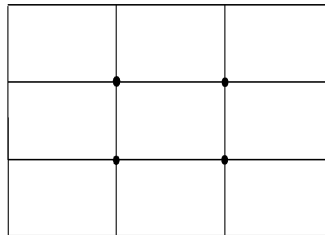
Good composition means placing the elements of a picture in a harmonious, interesting, and even unusual way to capture attention.

TAKING BETTER PICTURES

What's the difference between a basic snapshot and a really interesting photograph? The subjects you choose, the way you arrange them in the frame, and the light that you photograph them in all affect your photographs. There are many approaches to photographic composition, but the basic goal is to select and arrange the elements of a scene in a way that adds impact to the image. The tips on the following pages may not guarantee you great pictures, but they'll put you on the right path.

RULES OF COMPOSITION: Are guidelines to help you take more pleasing, interesting, and creative photographs. Remember these are only guidelines and sometimes rules are made to be broken.

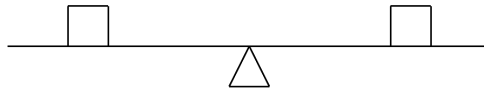
1. ***SIMPLICITY*** Instead of photographing your subject with a large background, move in closer to eliminate distractions.
 - Don't confuse the viewer.
 - Use an uncomplicated background.
 - Avoid competing subjects.
 - Only try to tell one story.
 - Don't be satisfied with only one camera angle.
2. ***RULE OF THIRDS*** Divide your photograph into thirds to make it more interesting and place the main subject at one of the intersections.



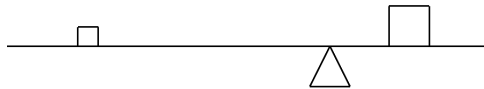
- Shift the point of view.
- Consider the path of a moving object and leave more room in front to show where it's going, or more room in back to show where it came from.
- Horizon lines should be placed in one of the thirds.

- 3 **LINES** Study the lines in a photograph and use them to tell your story.
- Vertical lines are said to show strength and power.
 - Horizontal lines represent peace and tranquility.
 - Diagonal lines represent action, speed, and movement.
 - S curves are said to reflect beauty.
 - Leading lines are used to direct the viewers eye. To get the viewer interested in a picture use leading lines. Leading lines will actually take the wandering eye of the viewer under control and lead it to the actual center of interest.

4. **BALANCE** Shapes, colors, lights and darks should balance in a complimentary way.
- Formal balance is used for object of the same size.



- Informal balance is used for objects of different sizes.



5. **Framing** Objects you choose to use around your subject area. Foreground framing will create depth. You can use trees, columns and buildings for example.