

# Introduction to the Different Types of Camera Lenses

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Lenses are one of the most important components in cameras. Even though the image making happens inside the camera body and on the film itself, the lens is what handles the light and determines the quality of the resulting image. You can't really hope to take a picture without a lens, so it is important to understand how they work.

We can tout out versions of mushy phrases about hi-def equipment, but at the end of the day, photographers that are perfectionists need to know what they're doing and what their equipment is capable of.

## How Does a Lens Work

In the spirit of learning, let's talk lenses. A lens is basically an assembly of different elements which help focus light onto the film and remove any aberrations. You can attain decent exposure using a simple pinhole camera, but it will not be of high quality. In fact, it'll appear blurry. Although such imagery has its own quaint charm, it is not what's always desired. Plus, you can't increase the size of the hole to get a coherent image.

In its simplest form, a lens places a glass convex lens where the pinhole is so the aperture can be opened wide to let more light in and make faster exposures. Through the lens, the light can still be properly focused to get a sharp image. But it's really not that simple, lens assemblies are complex and have various other glass elements that help fine tune the quality of the image further.

The main factors that are used to define lenses are focal length and aperture, which control the angle of view and amount of light respectively. Various lenses play with these two elements to help produce quality photographs.

## Focal Length

In simple words, focal length is the distance between the optical center and the film plane. The optical plane is the point where multiple rays of light from the object entering the camera converge or cross over. You might ask why this matters. Well, this distance is what determines your angle of view, as well as the magnification of the image.



What this means is that the wider the angle of view is, the shorter the focal length becomes. Imagine this as two triangles pointing at each other with the two bases being the object and the film plane. The wider these get, the shorter the height of the triangles. In the same way, a narrower field of view would be achieved with a longer focal length.

Focal length can also determine subject magnification, especially where lenses have variable focal lengths as in a zoom lens. As you increase or decrease the focal length, the subject can start looking smaller or bigger. In certain cases, the focal length also affects perspective, mostly in architectural or landscape shots where the subject fills the frame. Shorter depth of field can elongate perspective, making closer objects look much closer and bigger, and objects further away looking distant and smaller. On the other hand, longer depth of field can flatten or compress the subject.

Focal length is measured in millimeters, and is used as the lens name. For example, 50 mm or 200 mm. Different lenses have different focal lengths. Wide angle lenses have a very short focal length, usually between 10 mm and 42 mm, whereas telephoto lenses have anything between 100 mm and 800 mm.

## Aperture

The second most important element is the aperture, which a lot of you may already know a bit about since it is an integral part of controlling exposure. The aperture is the lens opening which controls the amount of light that enters the camera and also determines your depth of field. It is denoted by an f number, which looks like f/n or f:n. f is not focal length, and the number reflects the diameter of the opening. However, this confuses a lot of people since the number decreases to denote a larger opening.

The reason for this is that f/n is basically an equation of sorts which gives you the diameter. So if your focal length is 50 mm, and your aperture is closed down to 22, your aperture diameter is  $50 \div 22 = 2.27$  mm. Subsequently, every time the number decreases, the diameter would increase as the focal length is divided by a smaller number and vice versa.

Usually the lens will come with its widest possible aperture printed on it, which is because this is usually more important when considering flexibility in terms of exposure and depth of field. Lenses with wider maximum apertures (smaller f numbers) are considered to be faster as you get more light in. This results in the ability to shoot images at faster shutter speeds. This is of course desirable especially for low light situations. Prime lenses tend to be faster lenses, while zoom lenses may have a range of maximum apertures, which denotes the maximum apertures at different focal lengths.

Minimum apertures are usually not mentioned on lenses because most people never use them due to blurring affects caused by lens diffraction. Similarly, it is advisable to shoot as 1 or 2 stops down from the maximum aperture for the best results. However, it is always desirable for a lens to have a wide range of apertures for flexibility in exposure setting.



## Types of Lenses

Variations of these factors in lenses should determine the type and quality of lens and pictures you get. A basic standard lens which sees the way our eyes see is different for different formats. 50 mm lenses are normal for a 35 mm SLR camera, while for a medium format 6x6 camera an 80 mm lens would give you a natural perspective. For the 4x5 format that fits a large format camera, a 150 mm focal lens is the normally preferred choice.

However, this is not all that determines the types of lenses. Here's a brief list of the main types of lenses:

- **Prime Lenses**

Prime lenses have a fixed focal length, which means you cannot zoom in and out. Prime lenses are considered to be of a much higher quality than zoom lenses and are easier on the wallet. You also have the advantage of higher maximum apertures which means they perform really well in low light settings.

- **Zoom Lenses**

Zoom lenses offer a range of focal lengths, for example 24 – 200 mm. The obvious benefit is more control and flexibility in terms of perspective and composition, but you should know having a zoom lens does not mean you can shoot pictures while moving around. Zoom lenses are useful when you want a tighter shot or want to move in close without cropping the subject, but they should not be an excuse for a lazy shot. It is still recommended you use your legs more than the zoom.

With zoom lenses you have to compromise on quality, however, the various extra elements available mean you have limited aperture settings and lesser light to work with.

- **Wide Angle**

As mentioned, lenses with shorter focal lengths are called wide angle lenses because of the wider field of view they provide. These are usually 10 mm to 42 mm, and can be prime as well as zoom. Zoom lenses may provide both wide angle and telephoto focal lengths depending on the range they have. These are ideal for landscapes and architectural shots, and are great for getting all the elements in a large area in, but of course there are no rules and you may use them for any purpose. They give an interesting perspective with certain subjects because of how they elongate the perspective. They also have a deep depth of field.

- **Telephoto Lenses**

Telephoto lenses have a longer focal length, ranging from 100 to up to 800 mm. These lenses can see great distances and provide a shallower depth of field. The field of view here is also much narrower and they tend to compress the perspective and make things appear closer to each other. All of this makes them ideal for wildlife, sports, and portrait photography. Again, these can be prime as well as zoom lenses.

- **Macro Lenses**

Macro lenses are used mainly for close-up or macro photography. They allow for sharp focus at very close distances while objects further off would be completely out of focus. Their focal length ranges from 50 to 200 mm, and they are used to photograph tiny objects with extreme clarity.

## **Equipment Matters**

This was a small introduction to the different kinds of camera lenses to help you understand how they function and how you can use them to create higher quality images.

While the quality of your images, the sharpness, resolution, focus, and brightness are all affected by the lens you have, know that these cannot limit you. Even broken lenses can capture some great pictures. Equipment matters but at the end of the day, it is the photographer that works the magic.