

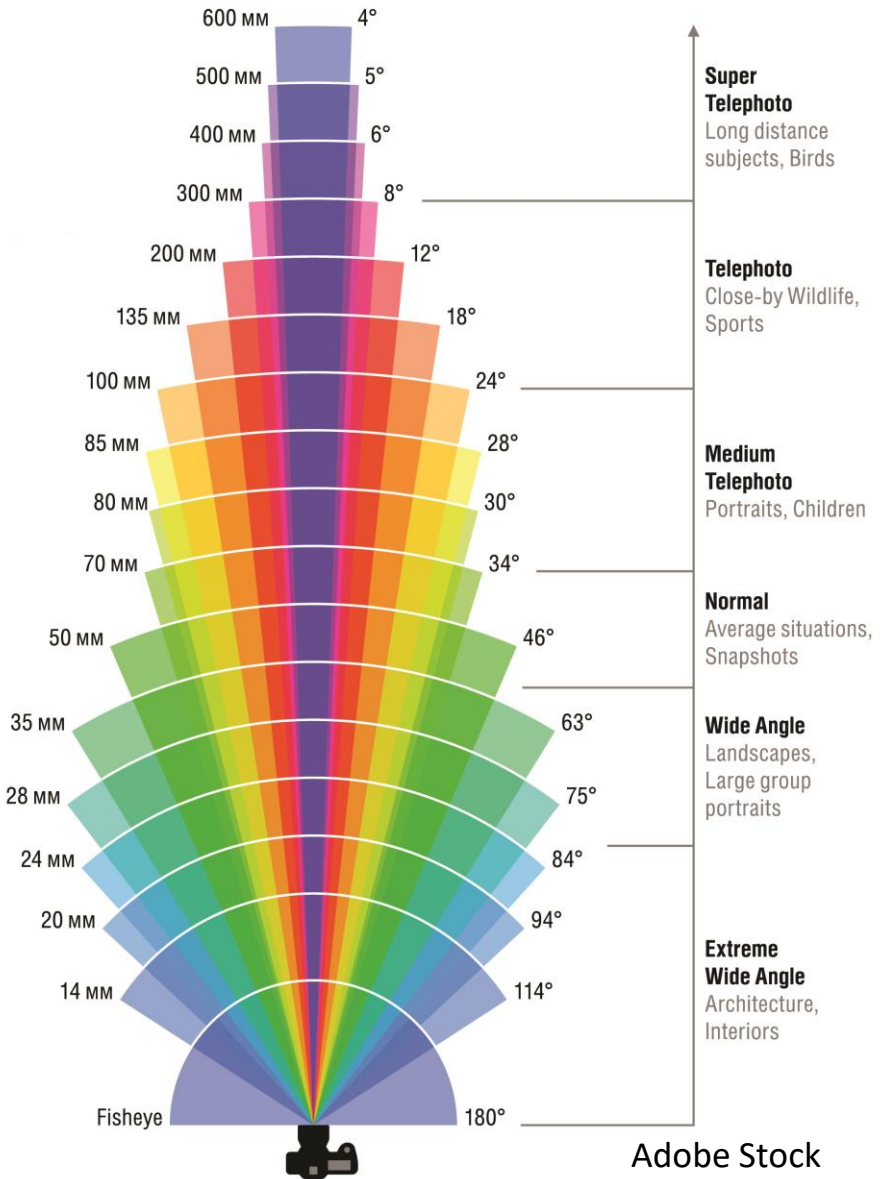
Focal Length

The focal length setting on your lens affects the **angle of view** when you point your camera at a scene or subject. This is measured in **millimetres**. The focal length values are displayed on your lens.



Focal Length Values

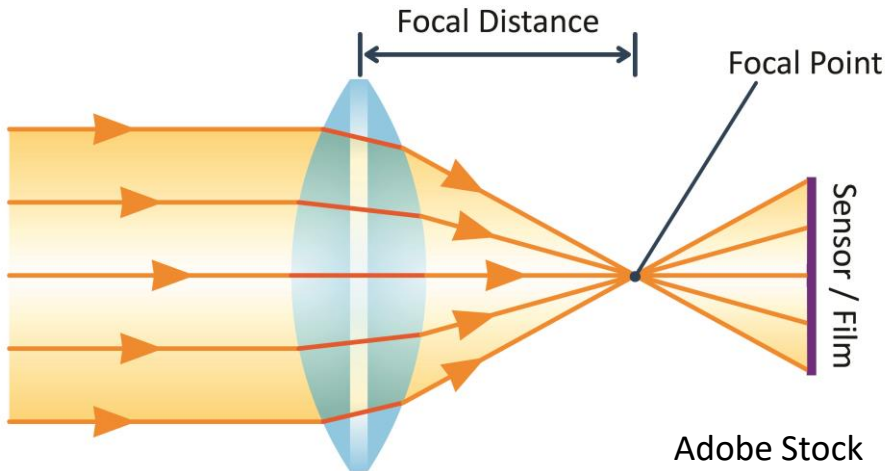
Shorter focal lengths allow a **wider angle of view** whereas **longer focal lengths** produce a **narrower field of view**. This enables you to zoom in closer to subjects that are further away.



This chart illustrates the angles of view that correspond with different focal length settings.

How is focal length measured?

The focal length is the **distance between the lens and the point where the light that enters the lens converges** before continuing on to the digital sensor or film. Take a look at the diagram below.



This point where the light converges is called the **focal point**. With zoom lenses, the focal length can be adjusted by turning the zoom ring on the lens to your desired setting.

Here are brief descriptions of the main types of lenses and their focal lengths:

Wide Angle

Wide angle lenses as the name suggests allow a **wide angle of view**. The focal length tends to range from about **10 to 24 mm**.



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Wide Angle Lens (10-20 mm)

They are particularly useful for landscape photography as they allow you to capture wide vistas. I also use a wide angle lens for photographing the interiors of buildings.



Cividale del Friuli | 10 mm

A focal length of 10 mm enabled me to capture the whole of the stone bridge in this scene with the picturesque northern Italian town of Cividale del Friuli in the background.

The bridge in this photo is called the Ponte del Diavolo. Local legend says that the devil made a deal with the townspeople. He would build the bridge you see in the photo but in return, he got to keep the first soul to cross the bridge. The

residents of Cividale del Friuli then sent a cat across the bridge first much to the devil's annoyance! The lesson for photographers is: Always check that your contract with a customer is absolutely watertight!

Some lenses can produce an **even wider angle of view**. These are known as **fish-eye lenses** and can have a focal length range of **8-10mm**. They produce much distorted images though.



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Fisheye Lens

Mid-Range

Mid-range lenses fall somewhere in **between wide angle and zoom lenses**. They allow a field of view that ranges from moderate wide angle to moderate zoom, about **24-70 mm**.

This range most closely matches the human field of vision. It's without a doubt, the lens I use the most often due to its versatility.



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Mid-Range Lens (24-70mm)

Mid-range lenses have a wide range of uses from landscape and street photography to portraits.



Street Musician in Bucharest | 45 mm

Zoom / Telephoto



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Telephoto Lens (70-200 mm)

Zoom or telephoto lenses have a **much narrower field of view**. They have focal lengths that can range from **70 mm up to several hundred mm**. Some super telephoto lenses have focal lengths of several thousand mm.

Zoom/telephoto lenses are used to zoom in close to subjects and scenes that are relatively far away. They can also be used to zoom in close to a subject to capture close up detail.



Island of Coin de Mire in Mauritius | 125 mm

A focal length of 125 mm allowed me to zoom right in on this fisherman on a small boat and the island behind him. I actually took this from my hotel room terrace.

One issue that often arises when using telephoto lenses is camera shake. Think about how difficult it is to keep binoculars on your subject when you have zoomed in on something very far away.

The same principal applies to a camera with a long telephoto lens attached. For this reason, a sturdy tripod is essential when using these lenses.

Prime

Prime lenses have a **fixed focal length** i.e. you cannot zoom in or out. It's often said that you zoom with your feet when using a prime lens! They come in a range of focal lengths.

Prime lenses tend to be **very fast** due to their very **wide maximum apertures** which are often as wide as f1.2.

As we saw in a previous tutorial, wider apertures allow for much faster shutter speeds. These lenses also tend to be **exceptionally sharp**.



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50 mm Prime Lens

They can be used for a variety of subjects but they tend to be quite popular among portrait photographers in particular due to their sharpness. 50 mm prime lenses (known as a nifty fifty) are among the best-selling prime lenses.

The baby portrait on the next page was taken by my sister with a 50 mm prime lens. It's not just any baby either. He's mine! He's six years old now though.



Louis | 50 mm (by Janet O'Carroll)

Macro

Macro lenses are used for taking extremely **detailed close up photographs** of very small subjects such as flowers and insects. You can position the lens very close to the subject and focus from a very short distance of only a few centimetres.



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100 mm Macro Lens

Macro lenses allow you to photograph your subject with a **1:1 ratio** which results in highly detailed shots.

This means that the size of the subject in real life is the same size as it's reproduced on the sensor.

For example, a small flower measuring 20 mm in diameter will still measure 20 mm in diameter when projected onto a 35 mm sensor.



Water Droplet Macro (by Vera Kuttelvaserova)

All in One

The “all in one lens” is the "Jack of all trades" of lenses. They tend to have **very wide focal length ranges** often starting at a wide **18mm** and go right up to a moderate telephoto focal length of **200mm**.

They are definitely useful for beginners who are learning what different focal lengths are capable of producing. They are also relatively inexpensive to purchase.

The downside of “all in one” lenses is that they don't tend to be quite as sharp as lenses with narrower focal length ranges. They are also not particularly fast with maximum apertures of about f4.

Focal Length and Perspective

One of the most noticeable ways your choice of focal length affects the look of your photograph concerns **perspective**.

Wide angle lenses exaggerate perspective

making different elements in your frame look further apart than in reality.

Telephoto lenses have the opposite effect. They **compress perspective** making different elements in the frame seem close together than in reality.

Take a look at these two photographs taken in Venice to see this effect in action.



Gondolas of Venice | 20 mm

For this photo I used a wide angle lens and set a focal length of 20 mm. I set up my tripod right on the water's edge. The island and tower appear to be quite far away across the Venice Lagoon.



San Giorgio Maggiore in Venice | 60 mm

For the next photo, I set up my tripod about 50 metres back from where I was standing for the first photo and zoomed in to 60 mm.

Even at this moderate zoom, the island and church now appear much larger and closer to the water's edge. The perspective has been completely compressed. The elements in scene seem to be "stacked" much closer together. I still wouldn't advise trying to swim to the island.

Focal Length and Depth of Field

In a previous tutorial, we learnt that your choice of aperture has a major effect on the depth of field in your photograph.

We saw that generally speaking, wide apertures result in a shallow depth of field and a blurred background. On the other hand, narrow apertures result in a deep depth of field where everything from the foreground to the background is sharp.

Your choice of focal length also has an effect on the depth of field of your photograph.

- **Short focal lengths** (wide angle) allow for a **deeper depth of field** even at wider apertures.
- **Long focal lengths** (zoom/telephoto) result in much a **shallower depth of field** even at relatively narrow apertures.



Belfast City Hall Council Chamber | 24 mm

In this photo of the interior of Belfast City Hall, I used a wide focal length of 24 mm to include as much of the council chamber as possible.

At this wide angle, a relatively wide aperture of f7.1 was enough to ensure that the whole scene was sharp from foreground to background.

I used a wider aperture than I normally would in this situation as I was shooting hand held and so needed to ensure a fast exposure time to avoid

camera shake. I also used a high ISO setting of 3200 to guarantee a fast enough shutter speed.



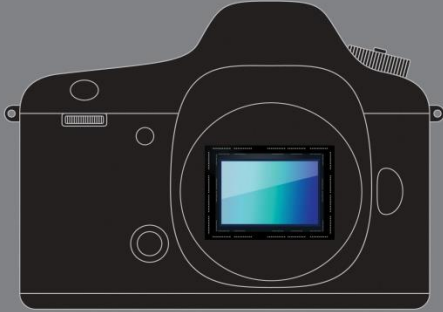
Flowers in my Garden | 70 mm

I used a focal length of 70 mm to zoom in close to these yellow flowers in order to capture plenty of detail.

Even though I used a narrow aperture of f16, the depth of field is quite shallow with the flowers in the background being out of focus and blurred.

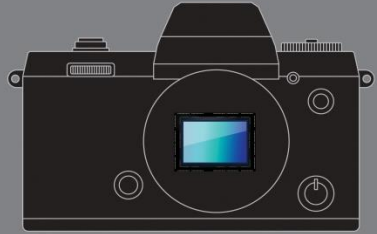
Focal Length and Crop Factor

Full Frame



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APS-C



4/3



1-inch



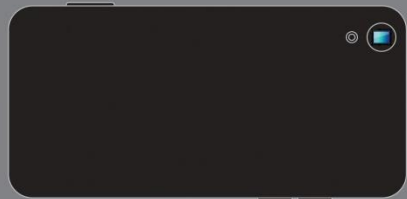
17 x 13mm

13.2 x 8.8mm

1/2.3"



1/2.5"



6.17 x 4.55mm

5.76 x 4.29mm

Digital camera **sensors come in a variety of sizes**. Full frame sensors measure 36 mm on the longest side. Full frame cameras tend to produce higher quality results with plenty of detail. They also perform very well at higher ISO settings.

Cropped sensors are smaller than full frame sensors. The most common crop-sensor format is the APS-C format which measures a much smaller 23.6 mm on its longest side.

This results a crop factor of about 1.5X. In practice this means that a focal length of 24 mm on a full frame camera will convert to 36 mm on an APS-C cropped sensor camera.

Olympus four thirds cameras have a crop factor of 2X. This means that a focal length of 150 mm on a full frame camera becomes 300 mm. This can be useful for those who require plenty of zoom such as wildlife or sports photographers.

Compact cameras can have even smaller sensors with much higher crop factors and huge zoom

capabilities as a result. These cameras are much smaller as well as more portable and discreet.

I often use a compact one inch sensor camera for street photography for this reason. Large DSLR cameras and lenses tend to scare people, especially when thrown in their direction.

Smaller sensors however do not produce results of the same quality as a full frame sensor. Digital noise can be a much bigger issue with smaller sensors especially in low light or at higher ISOs. That said, as camera technology advances, even smaller sensors perform better and better with each new camera model.

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Inside a Lens

I do not recommend doing this to your own lens.

In our next tutorial, we will take a look at the various focusing modes on your camera.