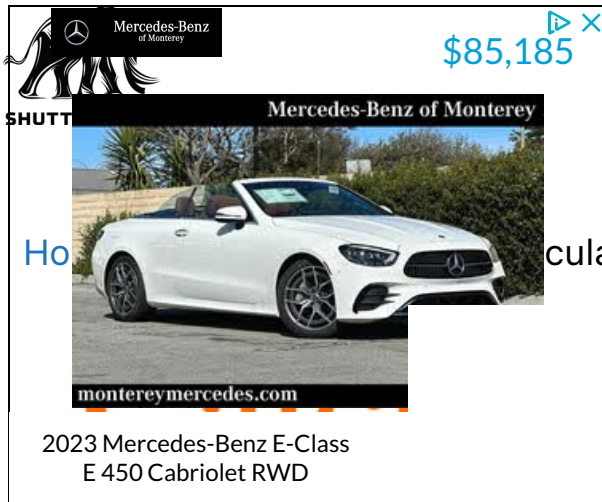




How To Calculate Field of View In Photography

Calculating Field of View



How To Calculate Field of View In Photography

March 29, 2016 by [Dan Carr](#)

As I continue to build out the photographic knowledge base with articles like [Understanding Neutral Density Filters](#) and [Understanding Aperture](#), I thought I'd write a quick guide to calculate field of view for a photographic lens. Lenses are typically described by focal length, expressed in **mm**, but how does this translate to the field of view?

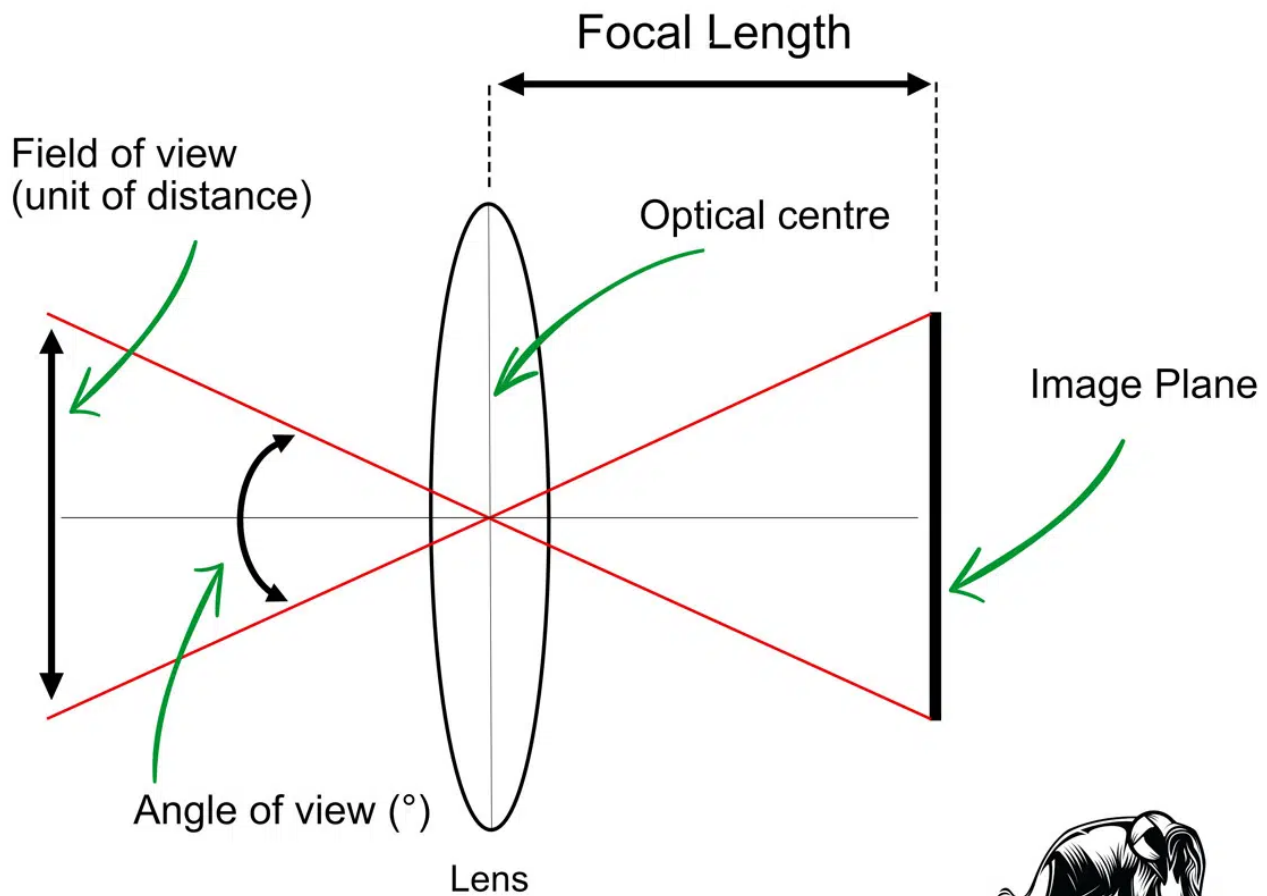


length. When they do this in photographic terms, they're talking about horizontal field of view in degrees, and whilst any lens will also have both a vertical and a diagonal field of view, they are rarely talked about in relation to photographic lenses.

The larger the field of view, the wider the lens is and the more of a scene you are going to see with your camera. Telephoto and super telephoto lenses have very small fields of view, just a few degrees, so they aren't able to see very much of the scene in front of them, although the compensating virtue is that what they *do* see, is much larger in the frame. A wide angle lens for landscape photography has a very small focal length, and therefore a large field of view that lets you record broad landscapes in a single shot.

Equation For Calculating Angle of





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Simple trigonometry will give us the equation:

length)) * (180/π)

Note: If your calculator is working in radians, you need the (180/π) part at the end. if your calculator is working in degrees, you do not need that bit! If you aren't sure... it will become pretty obvious when you run the equation as results will be wildly wrong.

Equation for Calculating Linear Field of View

As well as calculating the angle of view, we can also use the same trigonometry to calculate the field of view as a linear measurement, as long as you know the distance to your subject, or, if you know the size of your subject and the focal length you are going to use, it could tell you how far away from it you need to be to get it to fill the frame. The units of measurement will be constant in the equation, so if you use metres as your distance to subject, the linear field of view will also be in metres.

Linear field of view = 2 (Tan (Angle of view/2) X Distance to Subject)

Common Focal Lengths and Their Corresponding FOVs

Since the equation for field of view contains the **crop factor of a sensor**, this is another way the **crop factor of a camera** has on an image. The smaller the crop factor, and the smaller the field of view for a given focal length, the more detail is included in the image. The following table includes data for full frame field of view, as well as the three most common



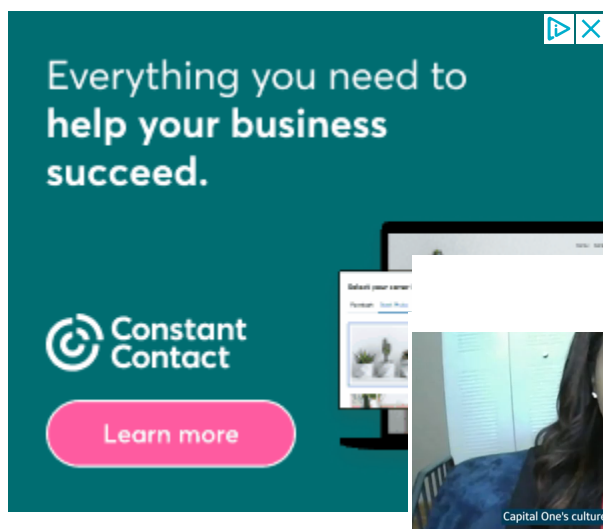
If you want to use the field of view equation on this page to calculate the field of view for a sensor size other than the four that have been provided, you'll need to refer to use [this list of common sensor sizes and their crop factor](#).

Full frame 35mm (36mm sensor width)

Focal Length	Field of View
15mm (Fisheye)	180.0
11mm	117.1
14mm	104.3
16mm	96.7
24mm	73.5
35mm	54.0
50mm	39.6



100mm	20.4
150mm	13.7
200mm	10.3
300mm	6.9
400mm	5.2
500mm	4.1
600mm	3.4
800mm	2.6
1000mm	2.1
1200mm	1.7



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Focal length (35mm)	Equivalent focal length	Field of View
11mm	16.5	94.0
14mm	21	80.3
16mm	24	72.8
24mm	36	52.4
35mm	52.5	37.3
50mm	75	26.6
85mm	127.5	15.8
100mm	150	13.5
150mm	225	9.0
200mm	300	6.8
300mm	450	4.5
400mm	600	3.4
500mm	750	2.7
600mm	900	
800mm	1200	
1000mm	1500	

Canon APS-C (1.6x) (22.5mm sensor width)

It must be noted here that [Canon has actually used difference sensor sizes for their APS-C cameras over the years](#). Since the sensor dimension does affect the field of view, this should be taken into account in order to be 100% accurate. For the data table below I have chosen to use the sensor width of 22.5mm because this is the one that Canon seem to have stuck with for their own calculations, and it is also the dimension that gives exactly a 1.6x crop factor. Whilst they do have 22.3mm and 22.4mm sensor widths on the market as well, this minuscule difference would not actually make any noticeable difference to your images, but if you ran your own calculations for your own camera and found they did not match my numbers, this will be the cause of the difference. It was the source of some head scratching for me when I was figuring all this out myself!

Focal length (35mm)	Equivalent focal length	Image
11mm	17.6	
14mm	22.4	
		1 / 1.6

24mm	38.4	50.2
35mm	56	35.6
50mm	80	25.4
85mm	136	15.1
100mm	160	12.8
150mm	240	8.6
200mm	320	6.4
300mm	480	4.3
400mm	640	3.2
500mm	800	2.6
600mm	960	2.1
800mm	1280	1.6
1000mm	1600	1.3
1200mm	1920	1.1



Micro Four Thirds (2x) (22.3mm sensor width)

Focal length (35mm)	Equivalent focal length	Field of View
11mm	22	78.6
14mm	28	65.5
16mm	32	58.7
24mm	48	41.1
35mm	70	28.8
50mm	100	20.4
85mm	170	12.1
100mm	200	10.3
150mm	300	6.9
200mm	400	5.2
300mm	600	
400mm	800	
500mm	1000	

1000mm	2000	1.0
1200mm	2400	0.9

Dan Carr

Professional photographer based in Yukon, Canada, and founder of Shutter Muse. His editorial work has been featured in publications all over the world, and his commercial clients include brands such as Nike, Apple, Adobe and Red Bull.



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12 thoughts on "How To Calculate Field of View In Photography"

Ernie

March 19, 2019 at 5:03 pm

Thanx for the math. Can the view angle and/ or field of view for fish-eye lenses both rectilinear and circular image types also be calculated? It is my understanding the formulas are more complicated.

I am interested because I have two fisheye Zuiko lenses from OM-2 & 4 cameras which I would like to use with adapter on Panasonic G 85 or Canon M 50. Can you help? TIA

[Reply](#)

Dan Carr

March 21, 2019 at 4:53 pm



I would imagine that is more complicated but I'm afraid I'm not sure.

[Reply](#)

michael Ardis

May 5, 2019 at 11:44 am

Field of View. How many feet both horizontally and vertically in FOV using a 2000mm lens at 800 yards? I am trying to decide if I want to spend the money on a Nikon that comes with that lens.

[Reply](#)

Dan Carr

May 6, 2019 at 6:43 pm

I'll be honest Michael, I don't have time to create a resource for people to calculate the equations you need are right here on the page in 😊



[Reply](#)

S.B.

August 30, 2019 at 10:59 am

your FOV table is wrong. i think you took 36mm width instead of the diagonal.

$$=2*\text{ARCTAN}(\text{SQRT}(24^2+36^2)/(2*"\text{focallength}"))*(180/\text{PI}())$$
[Reply](#)**Dan Carr**

August 30, 2019 at 4:46 pm

As far as I can tell, it is correct. I just plugged some values into other online FOV calculators and the FOV calculator in the most popular photography iPhone app and all got the same answers that are in my table. 36mm is the width of a full frame sensor.

[Reply](#)**Kay Warren**

January 5, 2020 at 9:35 am



little feedback. Please understand that I don't necessarily have the right language to ask the right questions. What I was really looking for is a way to know what general lens size to use to get a "how large a field of view. The math is helpful, but really not intuitive, especially if your last experience with higher math was 30+ years ago. What was a very useful visual for demonstrating angle of view is the first illustration you had, namely, the "topdown" view of the camera with cones coming forward in different colors. A visual chart or series of charts showing an object at say 200 yards, with the focal point in the center, and a second overlay on top of that showing how much distance to the front & back of the focal point remains in focus relative to the aperture would be ideal. I realize you are probably laughing out loud at this, & don't have anywhere near enough time for a project of that size, & probably even less inclination to actually do it, but it would be enormously helpful, and a lot more visually intuitive. Thanks so much.

[Reply](#)

Dan Carr

[March 1, 2020 at 12:58 pm](#)



Thanks for the suggestion Kay. I like the idea, but there are many phone apps out there that offer this already, and they do a better job than I could ever do. I would suggest buying the app called "PhotoPills", it has angle of view and depth of field calculators in it and it's a great app for many things related to photography.

[Reply](#)

4CardsMan

[May 7, 2020 at 1:32 pm](#)

I need to shoot down on a square card table, 35 inches on each side (including margins) at a distance of about 1 meter. I am using a Panasonic G6 with the 14-42mm kit lens set at 14mm. Online calculators using the formula $FOV \text{ (rectilinear)} = 2 * \arctan (\text{frame size}/(\text{focal length} * 2))$ indicate that the 14mm focal length should cover 35.14 inches in the vertical dimension at a distance of 41 inches. When I actually tried it, I had to be at least 11 feet back from the table. What gives?

[Reply](#)



Max Henkart

[May 18, 2021 at 8:28 am](#)

I would check that your camera is in full output. If you use are using a smaller output resolution, your FoV will be cropped. The frame size input will be smaller.

Note that this equation $HSize/2=f*\tan(FoV/2)$ is inaccurate if your DSLR lens has >1% distortion. So, it shouldn't be used for lenses like the Canon 11mm-22mm and most <15mm EFL 35mm-format type lenses. The G6 14mm has ~5% distortion.

The equation with distortion is quite a bit more complicated, so even apps like PhotoPills haven't modelled it. It has 4 variable coefficients and an additional SIN function. Here is a calculator which extends to lenses with distortion:

<https://commonlands.com/pages/fov-calculator>

[Reply](#)

Dan Carr

May 18, 2021 at 3:05 pm

Thanks Max! Interesting stuff. Thanks for

[Reply](#)



Faz

November 30, 2020 at 9:51 am

How about a compact camera such as Olympus tg4 and tg5

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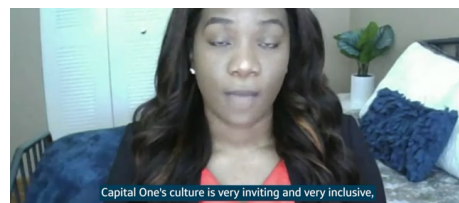


















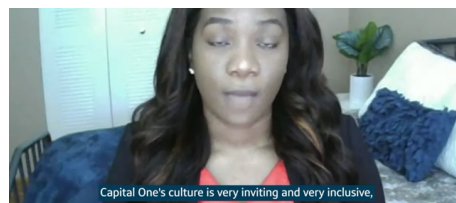
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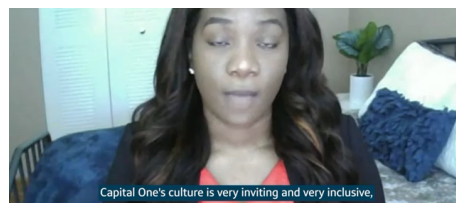
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