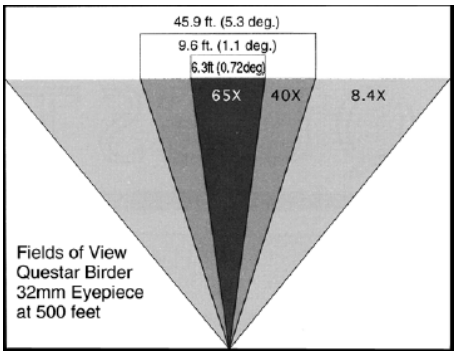

Although magnifying an object makes it appear larger, the view also gets smaller as the diagram to the left shows. Every combination of telescope and eyepiece produces its own Field of View (FOV), usually stated in angular terms. For example, a combination that gives an angular FOV of 10° in diameter will easily let you see the entire full moon, which is only 0.5° in diameter. But if you use a lens with 40 times more magnification, the FOV is now only 1/4° so you only see ½ of the full disk of the moon in the eyepiece.

By itself, an eyepiece allows incoming light to be brought to a focus for the human eye or camera. The incoming light rays can come from many different directions within a cone whose vertex is the focus point for the lens. The angle of the cone's vertex defines the FOV for the eyepiece. The table below shows the FOVs for various eyepieces that are used with telescopes:

Vendor	Model	Focal Length	Apparent FOV (°)	Actual FOV (°)	Magnification	Price
Orion	Optilux 2"	40	60	1.18	51	$140
Televue	Panoptic 2"	35	68	1.17	58	$370
Orion	FMC Plössl 2"	50	45	1.11	41	$120
Orion	DeepView 2"	42	52	1.07	48	$70
Edmund Optics	RKE Erfle 2"	32	68	1.07	64	$225
Meade	SWA 2"	32	67	1.06	64	$240
Orion	Optilux 2"	32	60	0.94	64	$140
Teleview	Panoptic 2"	27	68	0.90	75	$330
Teleview	Plössl 1.25"	40	43	0.85	51	$110
Celestron	Ultima 1.25"	35	49	0.84	58	$108

The apparent FOV for each eyepiece ranges from 45° to 68° and is a result of how the eyepiece is designed. When used in this example with an 8-inch telescope with a focal length of 2032 millimeters, the magnifications range from 41x to 75x. The resulting telescope FOV is then just FOV = Eyepiece FOV/magnification. For the Optilix 2" eyepiece, the FOV is then 60°/51 = 1.18°.

Problem 1 – An astronomer wants to design a system so that the full moon fills the entire FOV of the telescope. He uses an eyepiece with a FOV of 60°. What magnification will give him the desired FOV?

Problem 2 – An amateur astronomer upgrades to a larger telescope and keeps his old eyepieces, which have FOVs of 50°. His old telescope provided a 2.0° FOV for his most expensive eyepiece. Because the focal length of the new telescope is twice that of his older telescope, all magnifications on the new telescope will be twice as high. What will the FOV be for his most expensive eyepiece on the new telescope?

Problem 1 – An astronomer wants to design a system so that the full moon fills the entire FOV of the telescope. He uses an eyepiece with a FOV of 60°. What magnification will give him the desired FOV?

Answer: $0.5^{o} = 60^{o} / M$ so the magnification is M = **120x**.

Problem 2 – An amateur astronomer upgrades to a larger telescope and keeps his old eyepieces, which have FOVs of 50°. His old telescope provided a 2.0o FOV for his most expensive eyepiece. Because the focal length of the new telescope is twice that of his older telescope, all magnifications on the new telescope will be twice as high. What will the FOV be for his most expensive eyepiece on the new telescope?

Answer: Because FOV = eyepiece FOV/magnification, if the new telescope provides magnifications that are twice the older system, then the FOV will be half as large for this eyepiece or 1.0°.