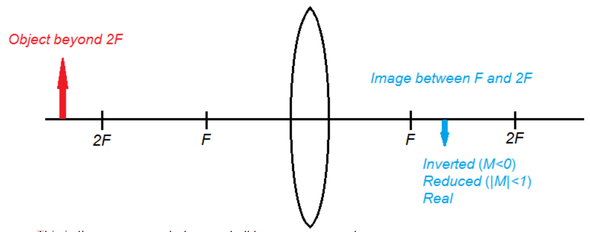
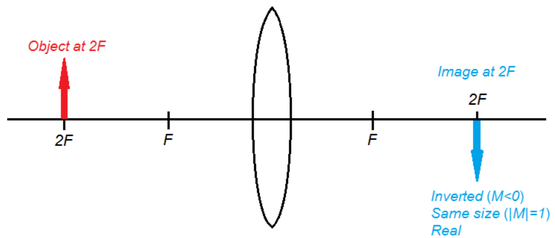
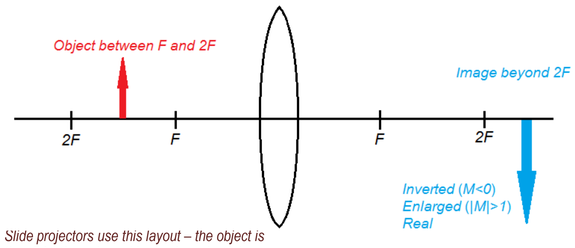
Lenses and (Curved) Mirrors – Image Location

Converging Lens

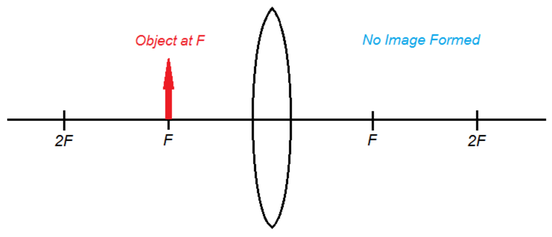


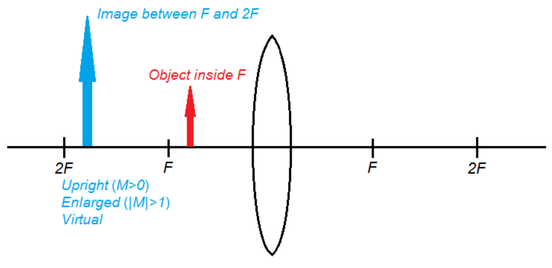
This is the arrangement of an eyeball lens or a camera lens;
the eye's retina or the camera's film or CCD array is at the image position.



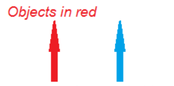


Slide projectors use this layout – the object is
the slide; the enlarged image is projected on a screen.

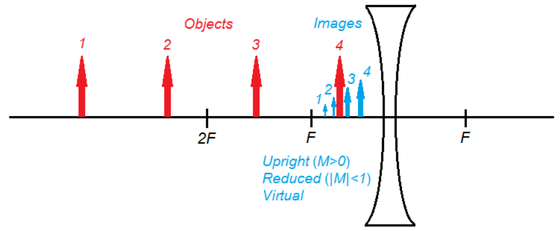




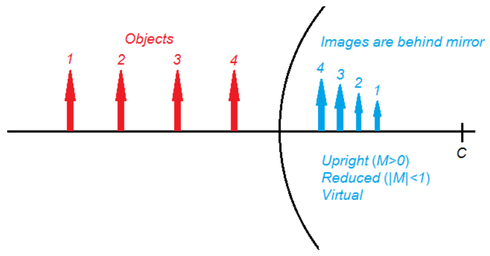
This is a converging lens being used as a magnifying lens.



Diverging Lens



Convex Mirror



"Objects in mirror are closer than they appear."

$$\frac{1}{f} \approx (n-1)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$$
Lens maker equation for thin lens

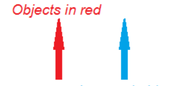
$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$
Thin lens equation

$$M = -\frac{d_i}{d_o} = \frac{h_i}{h_o}$$

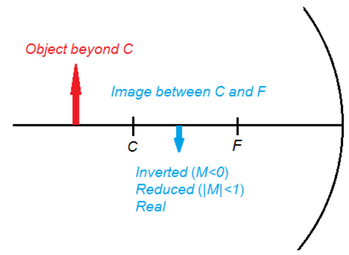
$$M = M_1 \times M_2 \times M_3 \times \ldots$$
Magnification for multiple lenses

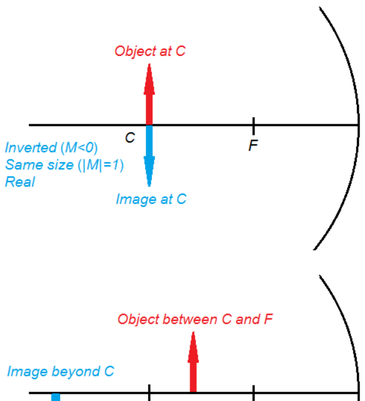
$$P = \frac{1}{f}$$
Optical power in diopters (m^{-1})

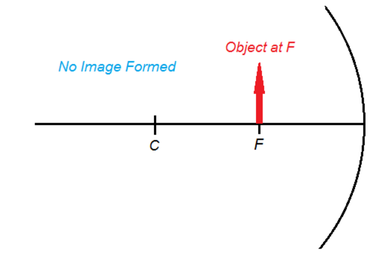
$$P_{\text{eff}} = P_1 + P_2 + P_3 + \cdots$$
Optical power for multiple lenses

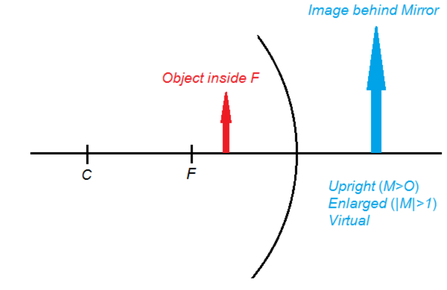


Concave Mirror









This is a mirror being used as a make-up or shaving mirror.

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