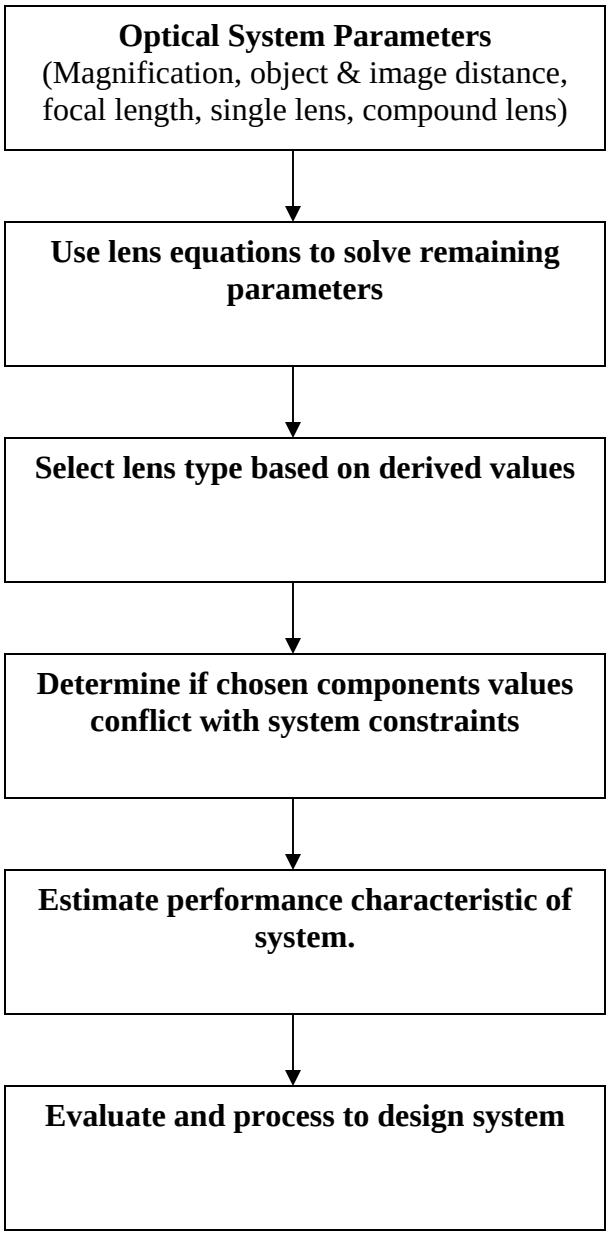
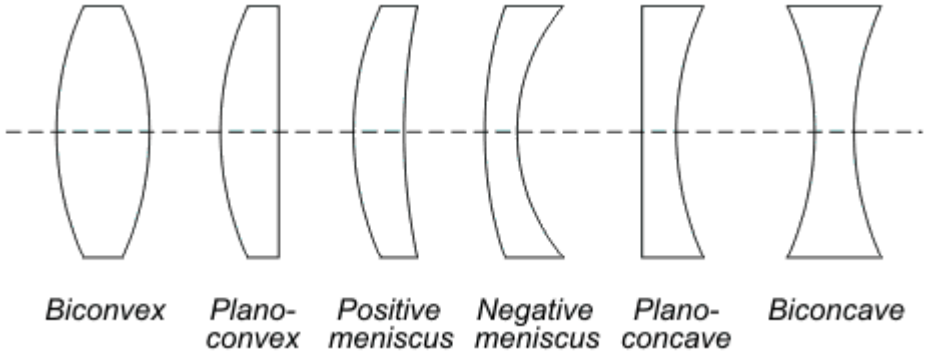
- Determine critical parameters:
  Magnifications, focal length, clear aperture, object and image positions, cost, availability
- Lens testing
  Aberrations, distortions, shapes, focal length, resolution, feasibility.

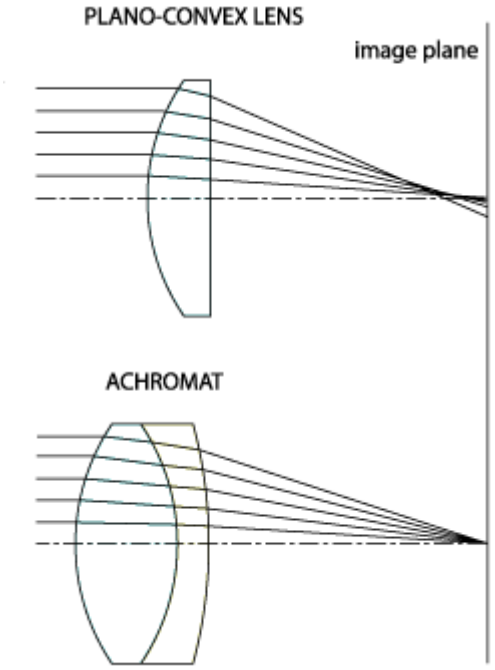


- Lens types

Single component



Double components



- Lens equations and sample calculation

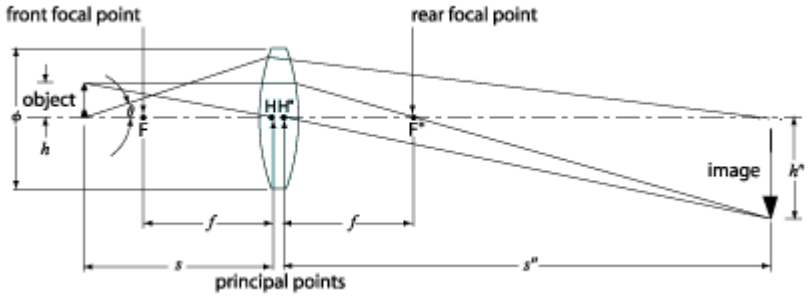
Find focal length and image distance, magnification.

$\frac{1}{f} = \frac{1}{s} + \frac{1}{s'}$, where f is focal length, s is object distance, s' is image distance

$m = -\frac{s'}{s}$, where m is magnification.

$\frac{1}{f} = \frac{1}{f} + \frac{1}{f'} - \frac{d}{f * f'}$, where f is focal length, f' is focal point, d is a symmetric constant.

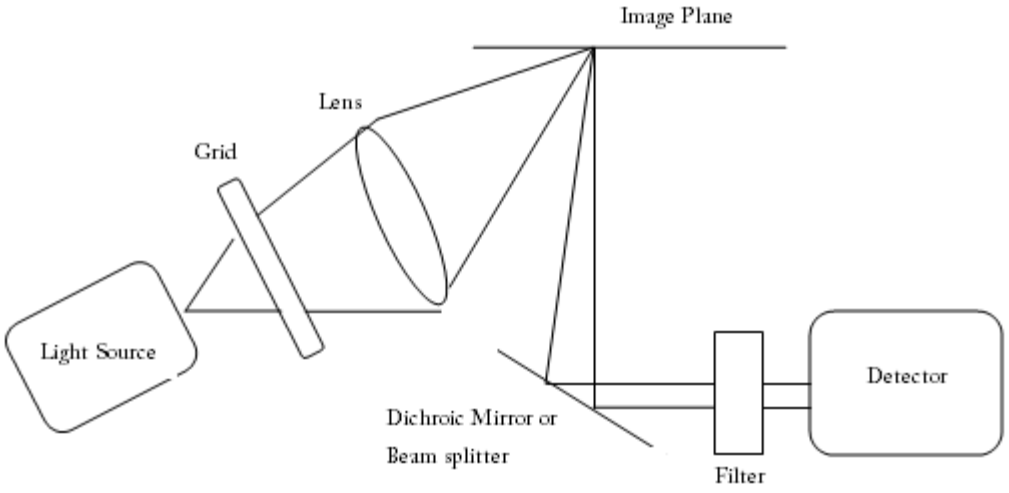
Parameters illustration



Sample calculation:

image distance (s) (cm)	object distance (s') (cm)	focal length (cm)	Magnification
7	5	2.92	0.7
7	6	3.23	0.9
7	7	3.50	1.0
7	8	3.73	1.1
7	9	3.94	1.3
7	10	4.12	1.4
7	11	4.28	1.6
7	12	4.42	1.7
7	13	4.55	1.9
7	14	4.67	2.0
7	15	4.77	2.1
7	16	4.87	2.3
7	17	4.96	2.4
7	18	5.04	2.6
7	19	5.12	2.7
7	20	5.19	2.9
7	21	5.25	3.0
7	22	5.31	3.1
7	23	5.37	3.3
7	24	5.42	3.4
7	25	5.47	3.6

System sketch



Design Risk Assessments

- Box is too small to fit all the optical components
- Optical system vibrations
- Grid distortion cause incorrect data scanning
- Alternating path.