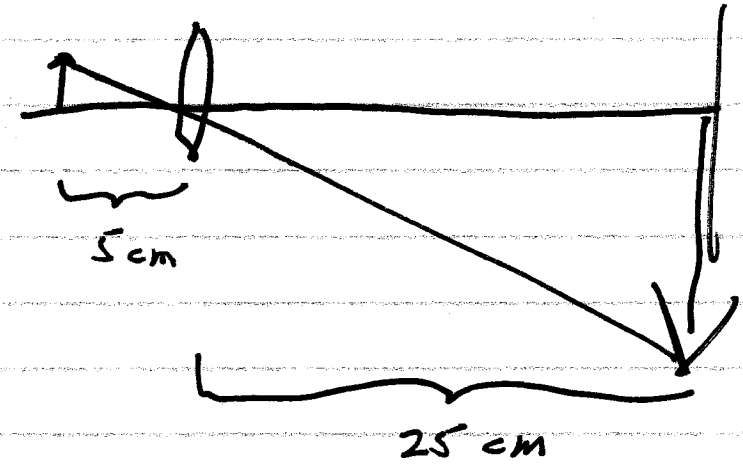
① Phys 2426 2014-11-26

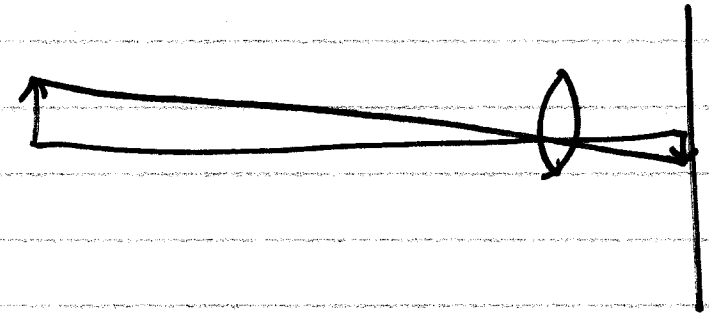
Last "new information":

A projector has the lens 5 cm from the object, and the screen is 25 cm from the lens. Where else could the lens be placed and still produce a focused image (w/o moving the obj or screen)?

Initial



$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f} \qquad p+q = (\text{const})$$



	Microscope	Telescope
Objective	Converging	Converging
First Image	Real	Real
Obj position	Close to Lens (Tiny bit) $p = f + \delta$	Very Far $p = \infty$

How can a real image be produced?

Mathematically, q is $\oplus$.

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f} \qquad M = \frac{h_i}{h_o} = \frac{-q}{p}$$

$$\frac{1}{p} = \frac{1}{f} - \frac{1}{q}$$

$\frac{1}{p}$ is smaller than $\frac{1}{f}$

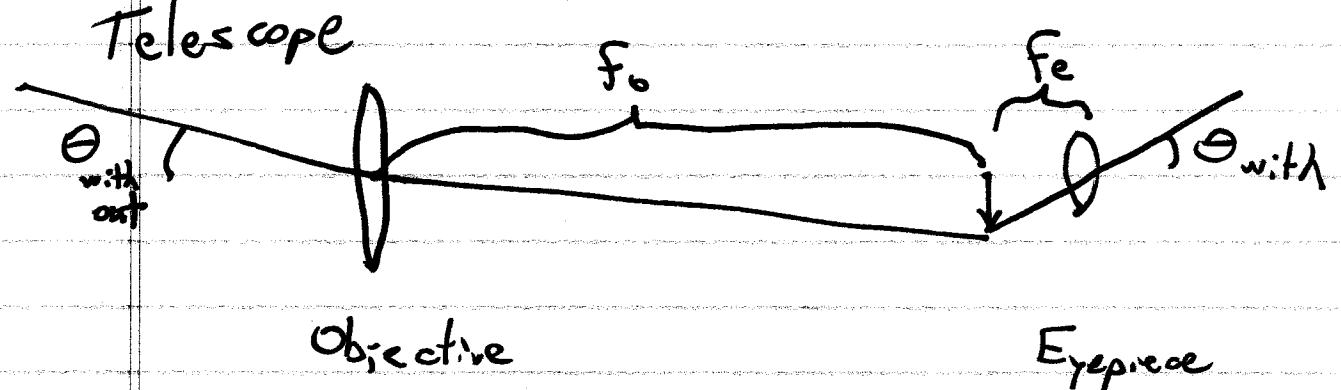
p is larger than f.

First Image Position	q = large $q = L$	$q = f_o$
Mag of Objective	$M_o = \frac{-L}{f+\delta} = \frac{-L}{f_o}$	$M_o = \frac{-f_o}{\infty} = 0$
Eyepiece	Converging Lens	Converging Lens
Final Image	Virtual Image	Virtual Image
Eyepiece Mag	$m_e = \frac{d_{np}}{f_e}$	

③

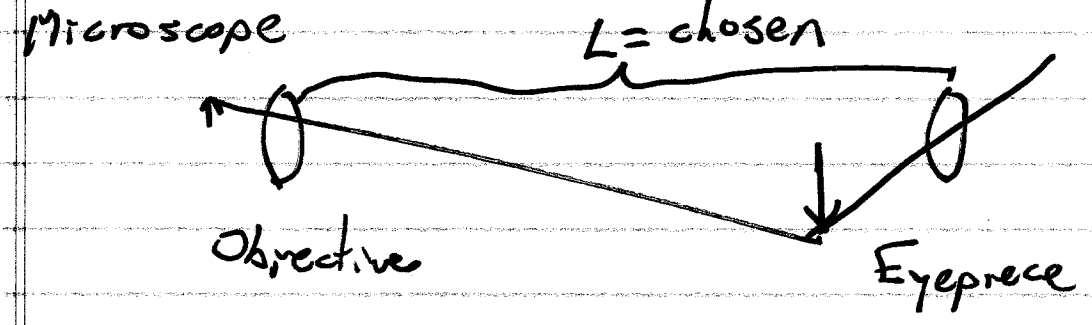
Microscope: $m = M_o m_e = \dfrac{-L d_{np}}{f_o f_e}$

Telescope: $m = \dfrac{\theta_{with}}{\theta_{without}} = \dfrac{-f_o}{f_e}$



For the eyepiece: $p = f_e - \delta$

$q = -\infty$



HW6 #2 Rayleigh criterion

$$\sin\theta_{min} = 1.22\frac{\lambda}{D} \approx \theta_{min}$$

D ← Diameter of iris.

For small objects, angular size is

$$\tan\theta = \frac{Y}{L} \approx \theta \text{ (in radians)}$$

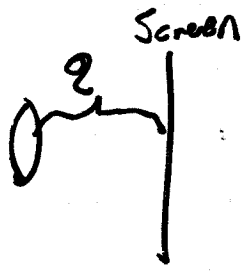
#10 Curved Mirror $f = \frac{\pm R}{2}$

⊖ if convex
⊕ if concave

#13

Initial

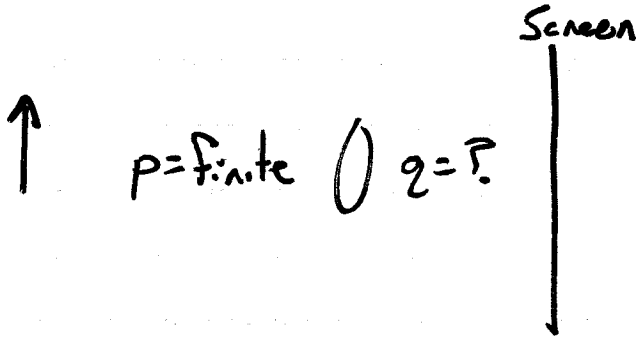
$p = \infty$



$q = f$

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$

Final



Smaller p
Larger q