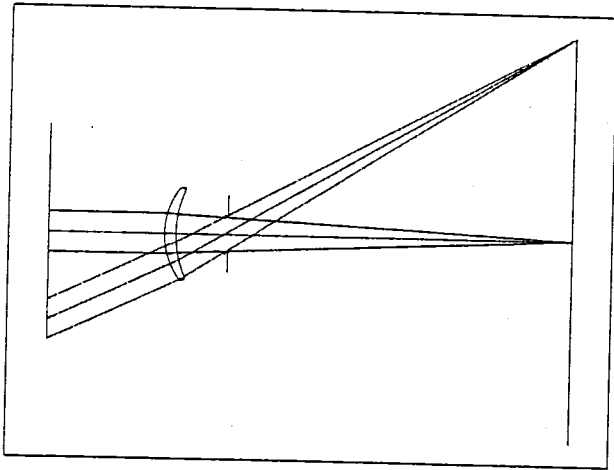


Landscape Lens - Pupils and Vignetting



| | |
|-------------------------|-----------|
| Focal length | 38 mm |
| Lens to stop separation | 5 mm |
| Stop diameter | 3 mm |
| Maximum image height | +/- 18 mm |

a) EP and $f/\#$

The stop is to the right of the lens and is the XP

For the EP:

$$\frac{-1}{z'} = \frac{-1}{z} + \frac{1}{f} \quad z = 5 \text{ mm}$$

$$\underline{z' = 5.76 \text{ mm}} \quad (\text{to the right of the lens})$$

$$m = \frac{z'}{z} = 1.15$$

$$\underline{D_{EP} = 3.45 \text{ mm}}$$

$$f/\# = \frac{f}{D_{EP}}$$

$$\underline{f/11}$$

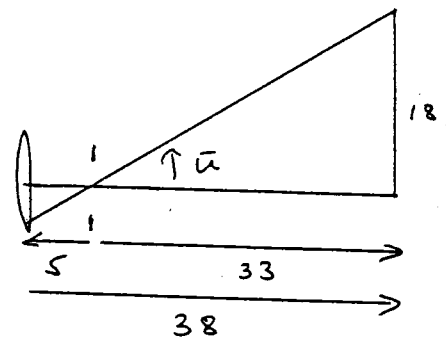
b) Lens Diameter for unvignetted system:

Need the marginal and chief ray heights at the lens.

$$y = D_{EP} / 2 = 1.73 \text{ mm}$$

At the stop: $\bar{u} = \frac{18 \text{ mm}}{38 \text{ mm} - 5 \text{ mm}}$

$$\bar{u} = .545$$



At the lens:

$$\bar{y} = -5 \bar{u}$$

$$\bar{y} = -2.73 \text{ mm}$$

For unvignetted

$$a \geq |y| + |\bar{y}|$$

$$a \geq 4.46 \text{ mm}$$

$$\text{Dia Lens} > \underline{8.9 \text{ mm}}$$