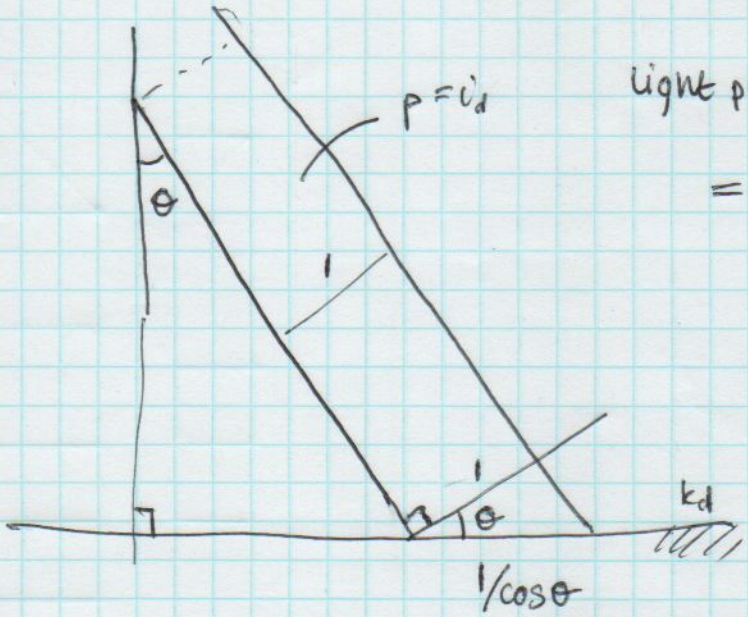
1.1




light power / area length.

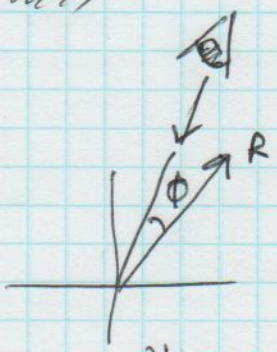
$= P / 1/\cos\theta = P\cos\theta$

$I_d = k_d\, i_d \cos\theta$

1.2

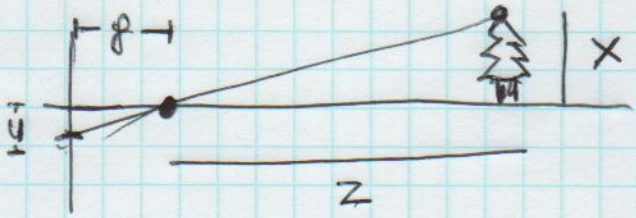
$I_s = k_s\, i_s \cos^{\alpha}\phi$

$k_s$ surface, $i_s$ light power




$\alpha$ = "shininess"

1.3

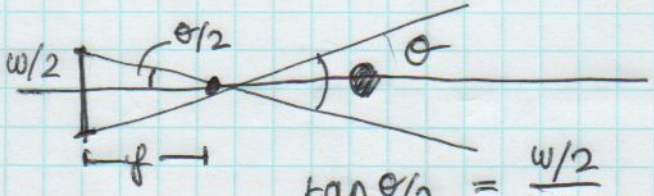



$\frac{u}{f} = \frac{X}{Z}$ $\quad u = f\frac{X}{Z}$

$v = f\frac{Y}{Z}$

$\therefore \begin{pmatrix} u \\ v \\ 1 \end{pmatrix} = \begin{pmatrix} f & 0 & 0 \\ 0 & f & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} X \\ Y \\ Z \end{pmatrix}$

1.4 Q fov 35mm camera 50/100mm lens




$w = 35\text{mm}$

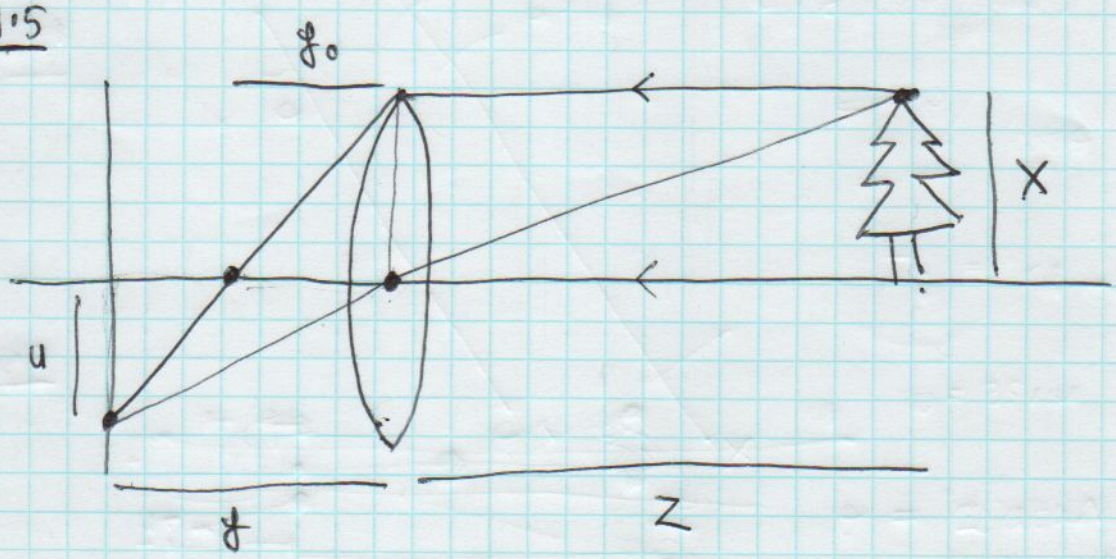
$\theta = 2\,\text{atan}\,\frac{w}{2f}$

$\tan\theta/2 = \frac{w/2}{f}$

$f = 50\text{mm} \quad \theta = 38.6°$

$100\text{mm} \quad = 19.9°$

1.5




$\frac{u}{f} = \frac{X}{Z}$ (pinhole).

$\frac{u}{X} = \frac{f}{Z} = \frac{f - f_0}{f_0}$

$\frac{1}{Z} = \frac{1}{f_0} - \frac{1}{f}$

$\frac{u}{f - f_0} = \frac{X}{f_0}$

$\frac{1}{f_0} = \frac{1}{f} + \frac{1}{Z}$

1.6

$$\begin{bmatrix} \rho_r \\ \rho_g \\ \rho_b \end{bmatrix}' = \begin{bmatrix} \lambda_1 & 0 & 0 \\ 0 & \lambda_2 & 0 \\ 0 & 0 & \lambda_3 \end{bmatrix} \begin{bmatrix} \rho_r \\ \rho_g \\ \rho_b \end{bmatrix}$$