4a) $K = \begin{bmatrix} f & 0 & P_x \\ 0 & f & P_y \\ 0 & 0 & 1 \end{bmatrix}$ given focal length = 721.5
given principal point (609.6, 172.9)

$$K = \begin{bmatrix} 721.5 & 0 & 609.6 \\ 0 & 721.5 & 172.9 \\ 0 & 0 & 1 \end{bmatrix}$$

b) The equation of a plane is $r \cdot \vec{n} = h$
h is the height of camera above ground.
n is the unit length normal out the ground
for eq. we know (u,v) mapping to 3d is

We know $\left\{ u = \frac{fX}{Z} \quad v = \frac{fY}{Z} \right\}$ so we have ...

$$X = \frac{uZ}{f} \quad Y = \frac{vZ}{f} \quad Z = Z \quad \text{then}$$

$$\left(\frac{uZ}{f}, \frac{vZ}{f}, Z \right) \cdot \vec{n} = 170$$

Coordinates are in centimeters since $h = 170_{cm}$ is in cm