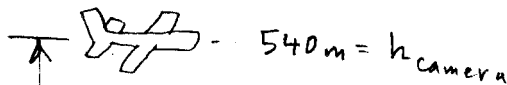
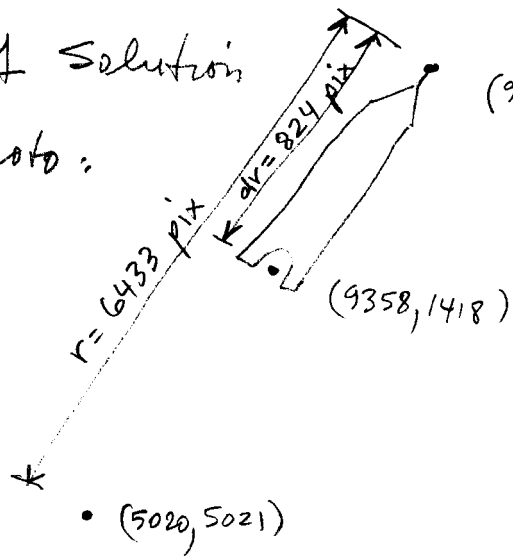
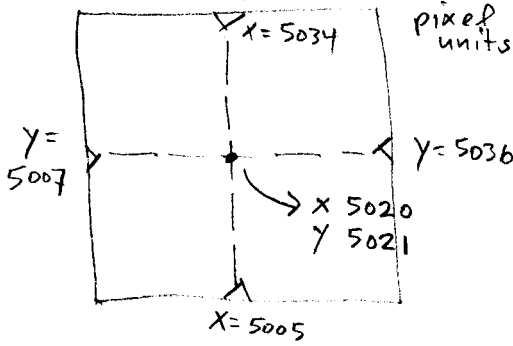


15 Sept 09

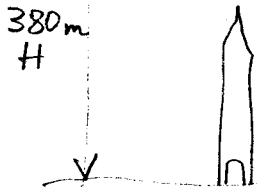
# Photo1 2009 Homework 1 Solution

(9988, 887)

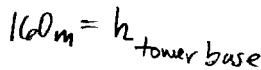
## 1. Relief Displacement on "near" vertical photo:



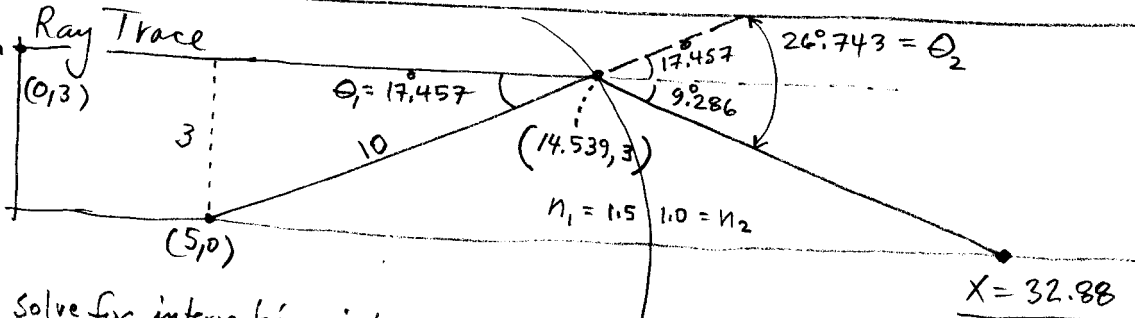
$$\begin{aligned} \text{tower height } h &= H \times \frac{dr}{r} \\ &= 380 \text{ m} \times \frac{824}{6463} \\ &= 48.4 \text{ m} \end{aligned}$$



$$\begin{aligned} \text{Web check} &= 160 \text{ ft} \times .3048 \text{ m/ft} \\ &= 48.8 \text{ m} \end{aligned}$$



## 2. Ray Trace



Solve for intersection point:

$$(x-5)^2 + (3)^2 = 100^2$$

$$x^2 - 10x - 66 = 0$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

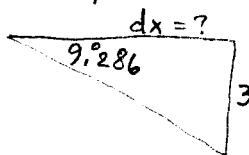
$$x = 14.539392, y = 3$$

refraction:

$$\theta_1 = \sin^{-1} \frac{3}{10} = 17.457603$$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\theta_2 = \sin^{-1} \left( \frac{1.5}{1.0} \times .3 \right) = 26.743684$$



$$\begin{aligned} dx &= \frac{3}{\tan(9.286)} \\ &= 18.347856 \end{aligned}$$

intersection w/ x-axis

$$x = 14.539 + 18.347 = 32.88$$

dpreview.com gives for 1/2.5" CCD

$$\text{Diag} = 7.18$$

$$W = 5.76$$

compare to our

$$\text{Diag} = 7.11$$

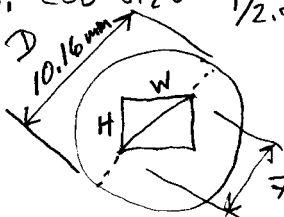
$$W = 5.69$$

note: 70% is approximate value

## 3. CCD size

$$\frac{1}{2.5} \text{ " vidicon diameter} = \frac{1}{2.5} \text{ "} = 0.4 \text{ "} = 10.16 \text{ mm}$$

$$\left( \frac{25.4 \text{ mm}}{1 \text{ in}} \right)$$



$$\text{CCD } H:W:\text{Diag} = 3:4:5$$

$$W = \frac{7.11}{5} \times 4 = 5.69 \text{ mm}$$

$$H = \frac{7.11}{5} \times 3 = 4.27 \text{ mm}$$