

4-30-14
ZB

CHZS 2 devices:

(A) • MAGNIFYING
glass

(B) • Telescope

FIG 28.14

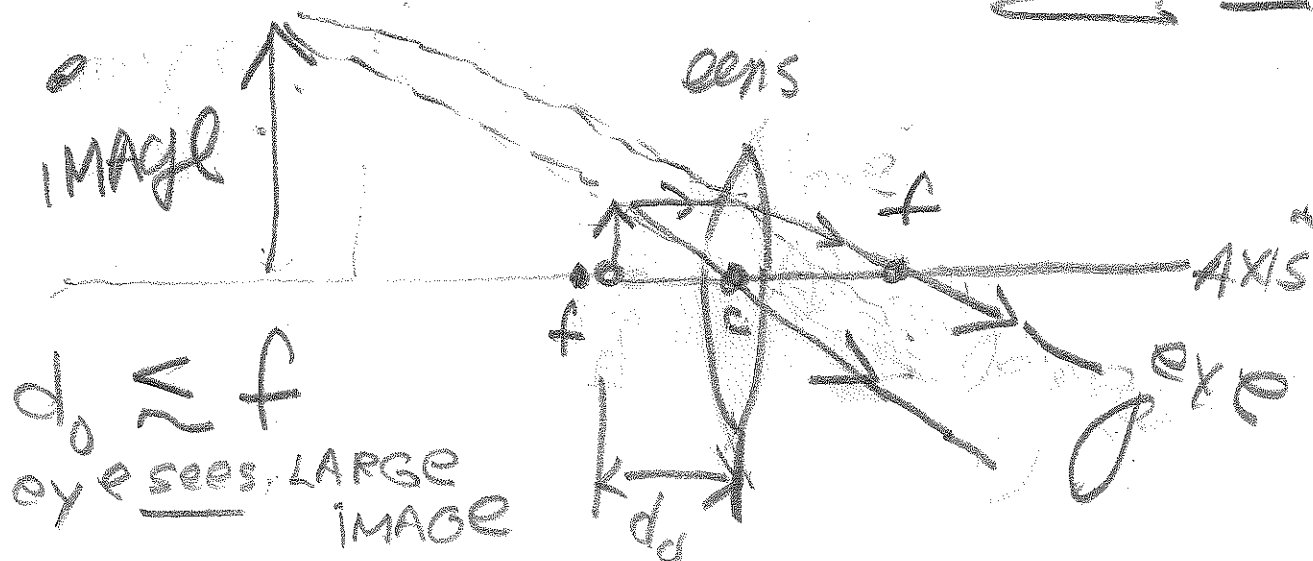
(A)

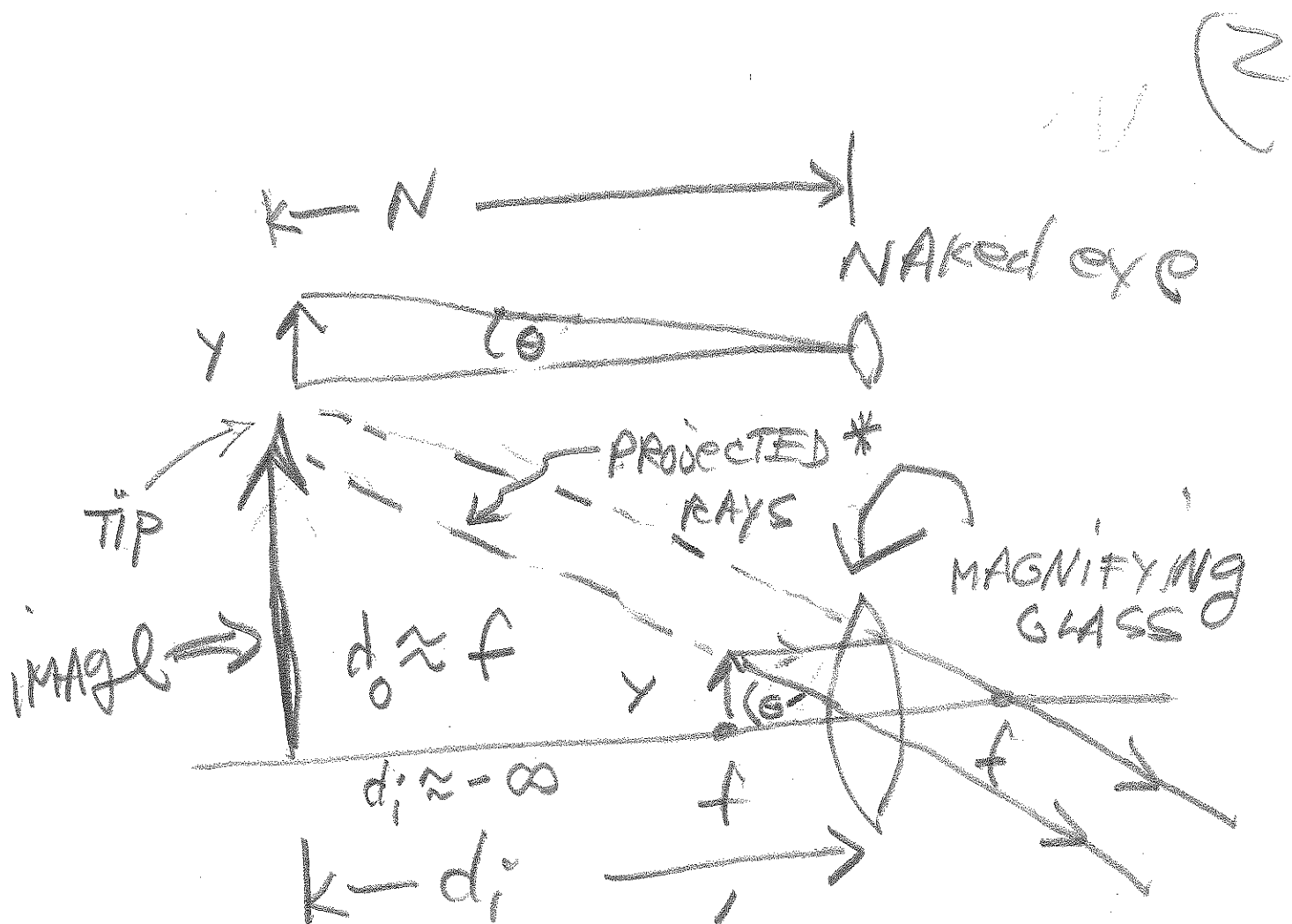
1310.1A



N = NEAR POINT distance

"NORMAL" ADULTS = 25cm = closest
observation distance with NAKED eye.





* converge
on image
tip.

$$M \equiv \frac{\theta'}{\theta} \quad \text{ANGULAR MAGNIFICATION}$$

$$\begin{aligned}
 M &= \frac{\theta'}{\theta} \\
 &= \frac{y/f}{y/N} \\
 &= \boxed{\frac{N}{f}}
 \end{aligned}
 \left\{
 \begin{aligned}
 \theta &= \frac{y}{N} \approx \tan \theta \quad (\theta \ll 1) \\
 \theta' &= \frac{y}{f} \approx \tan \theta' \quad (\theta' \ll 1)
 \end{aligned}
 \right\}
 \begin{aligned}
 &M \\
 &\text{when} \\
 &d_i = -\infty
 \end{aligned}$$

$N \approx 25 \text{ cm}$ for "NORMAL" ADULTS.

M

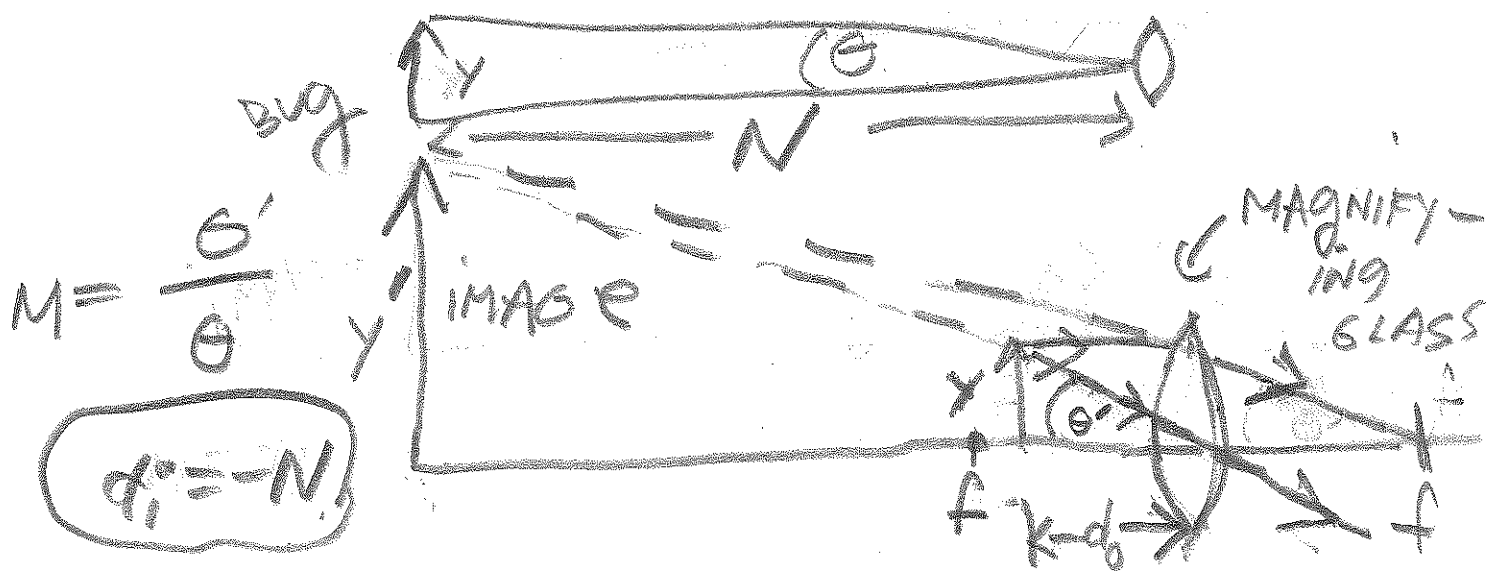
NOTE: ABOVE IS A SPECIAL
CASE:

more general: $d_o \neq f$
 $d_o < f$

$$M = \frac{\theta'}{\theta}$$

BUT, $\theta' \neq \frac{y}{f}$

"NAKED" eye



$$\theta' = \frac{y}{d_o}$$

NOTE: $\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$

$$\frac{1}{d_o} = \frac{1}{f} - \frac{1}{d_i}$$

BUT $d_i = -N$

$$\frac{1}{d_o} = \frac{1}{f} - \frac{1}{(-N)}$$

$$\frac{1}{d_o} = \frac{1}{f} + \frac{1}{N}$$

$$M = \frac{\theta'}{\theta} = \frac{y \cdot \left(\frac{1}{f} + \frac{1}{N} \right)}{y/N}$$

$$M = N \cdot \left(\frac{1}{f} + \frac{1}{N} \right)$$

$$M = \frac{N}{f} + 1$$

ANGULAR MAGNIFICATION
when $q_o = -N$

TAKE A BREAK AND WORK
ON CH 25 QUIZ.

$\Rightarrow$ POSTED DURING
BREAK.

Quiz 25: 5, 6, 7, 8, 11

CH 25

* 28, * 29, * 30, * 31

ADD: (40) * MAGNIFYING GLASS
TELESCOPE

$$(28.) M = \frac{\theta'}{\theta} = \frac{y/f}{y/N} = \frac{N}{f}$$

$$\theta' = 0.025 \text{ RAD}$$

$$\frac{0.025}{\theta} = M$$
$$y = 2 \times 10^{-3} \text{ m}$$

$$0.025 = \frac{y}{f}$$

Get f

$$f = 2 \times 10^{-3} / 2.5 \times 10^{-2} \approx 8 \text{ cm}$$

test 4 follow up: FIND M if $N = 25 \text{ cm}$
(b) " " FIND θ

$$(a.) M = \frac{N}{f} = \frac{25}{8} = 3.125$$

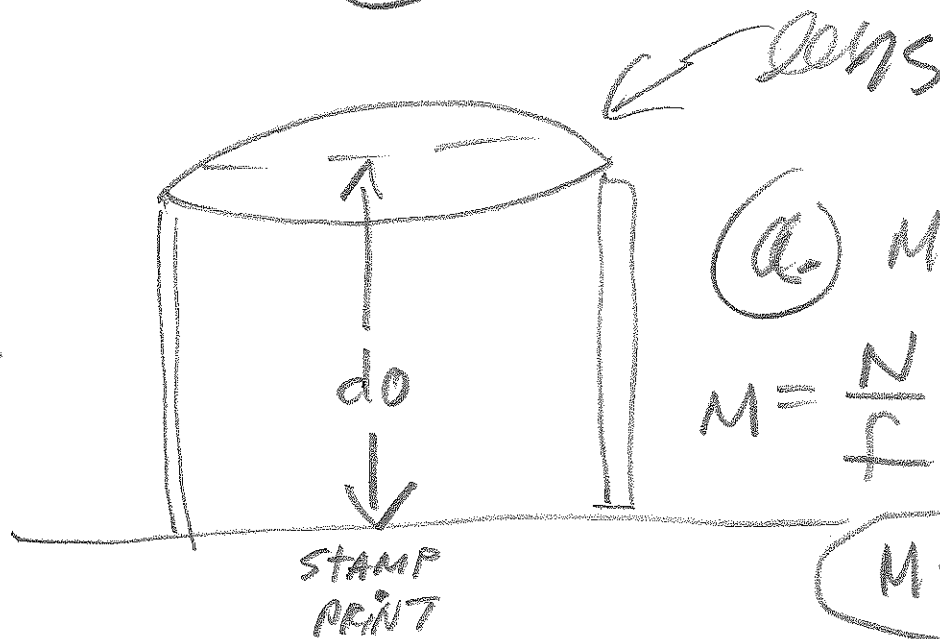
$$(b.) \theta = 0.025 / M = 0.008 \text{ RAD}$$

(7)

29.

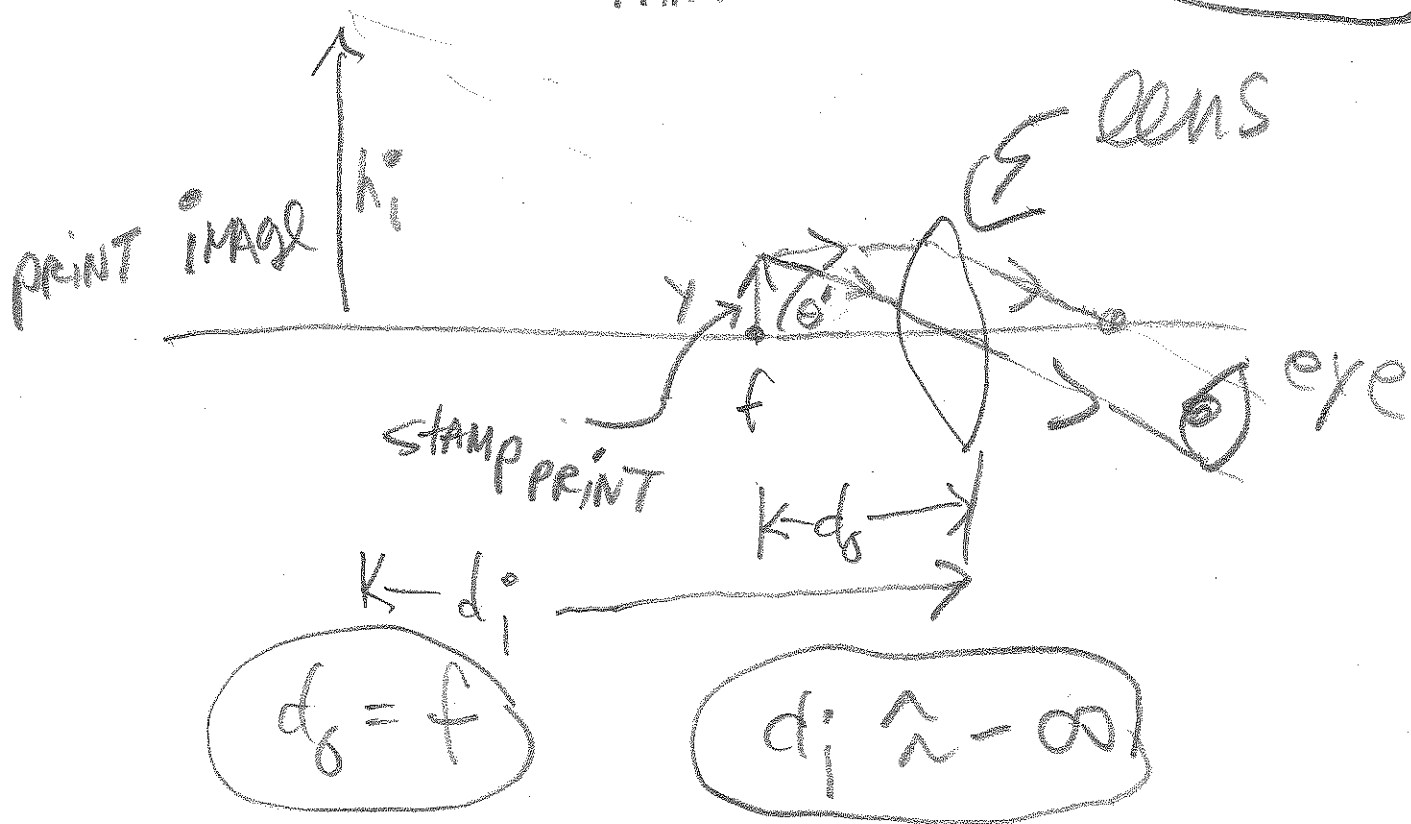
eye BALL

$$h \approx f$$



$$M = \frac{\theta'}{\theta}$$
$$M = \frac{N}{f} = \frac{25}{11.5}$$

$$M \approx 2$$



$$d_o = f$$

$$d_i \approx -\infty$$

(29.)
 (b.) $h = f.$

(8)

(31.)

$$M = 1 + \frac{N}{f} = \frac{N}{f} + 1$$

$$d_i = -N$$

$$N = 25 \text{ cm}$$

$$\Leftrightarrow d_o < f \text{ and } d_o \neq f$$

(a.)

$$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}, \quad f = 8 \text{ cm}$$

$$d_i = -N \Rightarrow \text{FIND } d_o \approx 6 \text{ cm}$$

HINT: $d_o > 0$ and $d_o < f.$

$$(b) \quad M = \frac{\theta'}{\theta} = \frac{N}{f} + 1 \quad (9)$$

$$\text{OR use } m = -\frac{d_i}{d_o}$$

$$(CH \underline{24})$$

$$\Rightarrow h_i = m \cdot h_o \hat{=} (4) \cdot 10^{-3} \text{ cm} = 4 \text{ mm.}$$

$$h_o = 1 \times 10^{-3} \text{ cm} \quad (N = \underline{25 \text{ cm}})$$

$$\text{and } m = -\frac{(-N)}{d_o} = \frac{25 \text{ cm}}{d_o} = \underline{4}$$

$$\text{part (a)} \quad \frac{1}{d_o} + \frac{1}{-25} = \frac{1}{8} \Rightarrow d_o = \frac{(8)(25)}{33} \hat{=} 6 \quad \text{part (a.)}$$