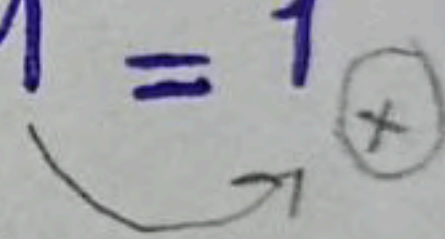


• Plane Mirror :-

- 1- Virtual
- 2- upright
- 3- not reduced or enlarged
- 4- $p = q$, $h = h'$, $M = 1$ 
- 5- Back (Dark) side.

$$\Rightarrow P = f$$

1 - real

2 - un upright (inverted)

3 - extra enlarged (أكبر صورة)

$$\Rightarrow P = \infty$$

→ extra reduced (أصغر صورة)

$$\Rightarrow P = C$$

→ real

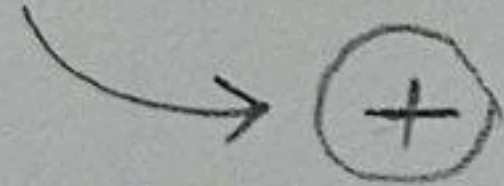
→ inverted

(نقطة حجم الجسم)
(ونقطة المكان)

- Convex Mirror
 - Concave lens
- diverging
مفرق

→ virtual
→ upright
→ reduced

→ $M < 1$ $h > h'$



→ $f \rightarrow \ominus$

• Con Cave mirror :- (Converging)

$\Rightarrow$ إذا $P > R \rightarrow CV$

مجمعة $\rightarrow$

1- real image $\rightarrow$ Front

2- Inverted

3- reduced $\rightarrow h > h'$

4- $P > q$, $M < 1$

5- $f \rightarrow \oplus$

$\Rightarrow$ إذا $P < f$

$\rightarrow \ominus$

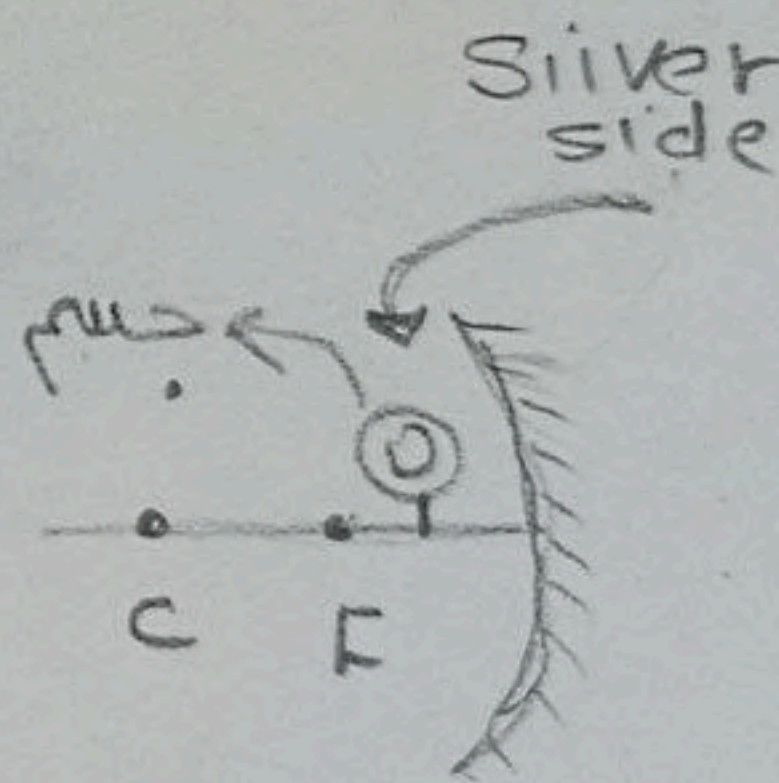
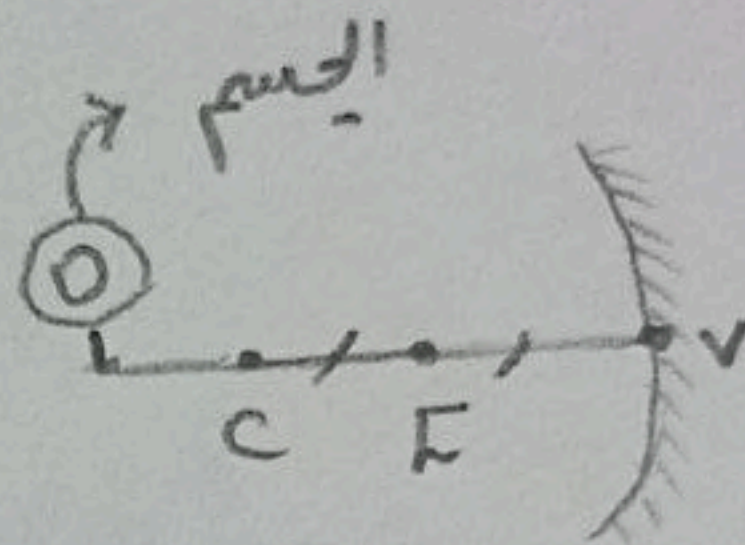
1- virtual (Dark side)

2- upright

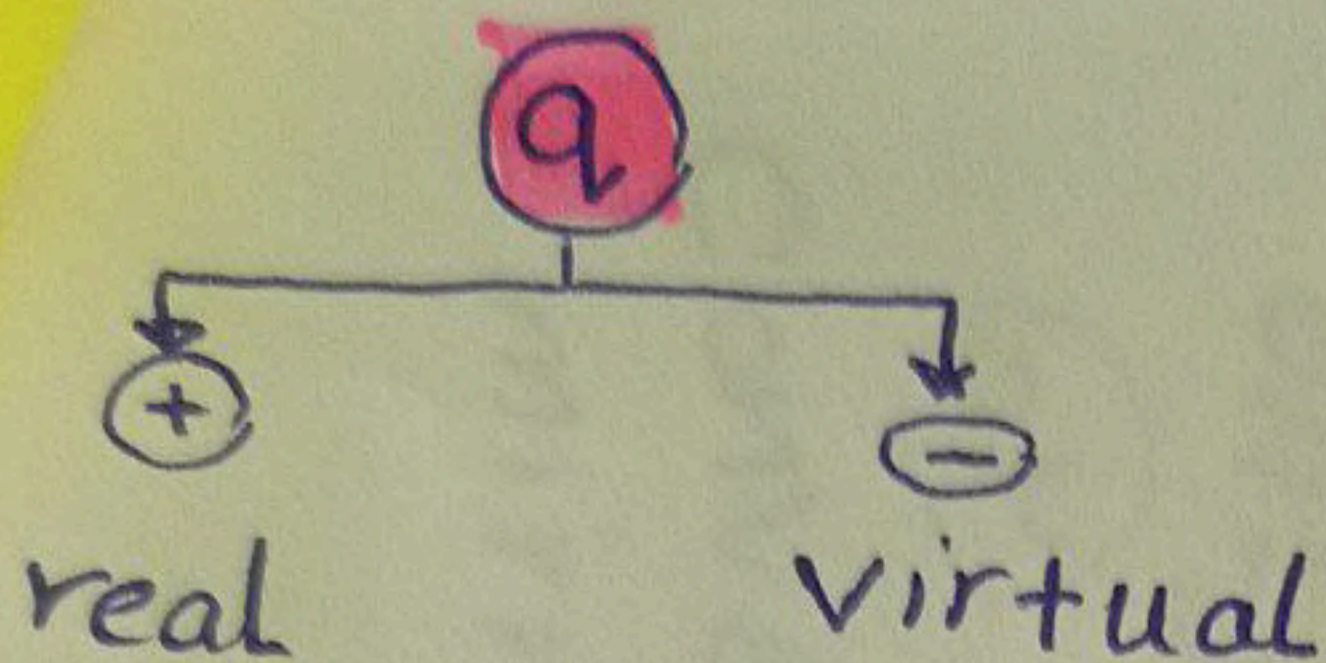
3- enlarged

$M > 1 \rightarrow \oplus$

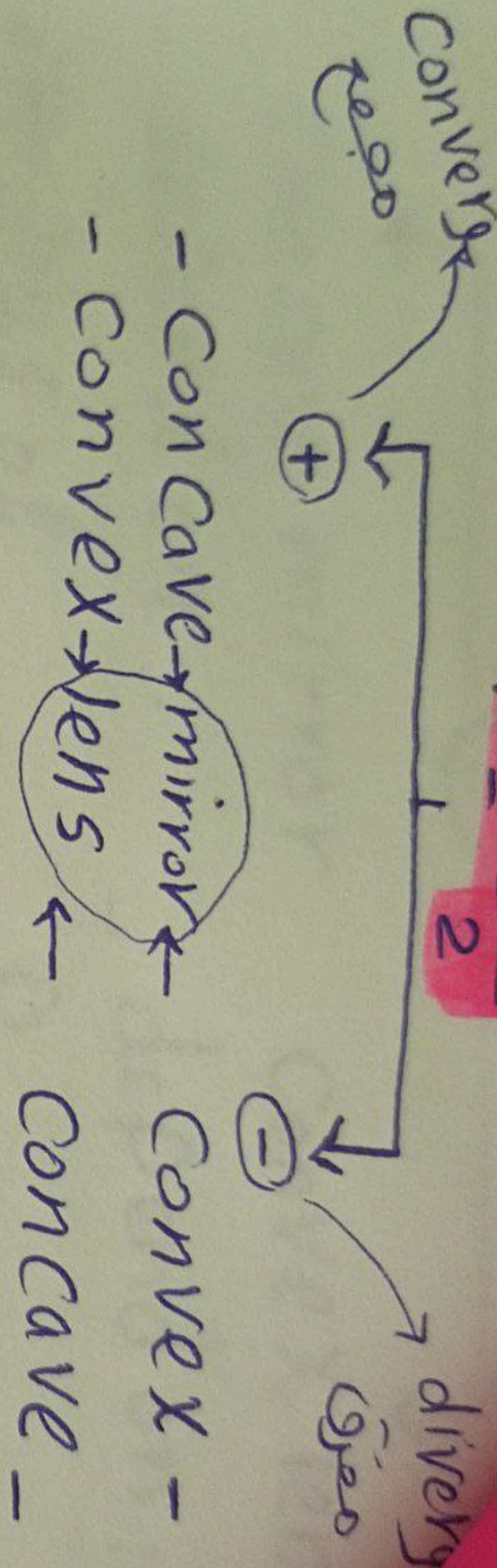
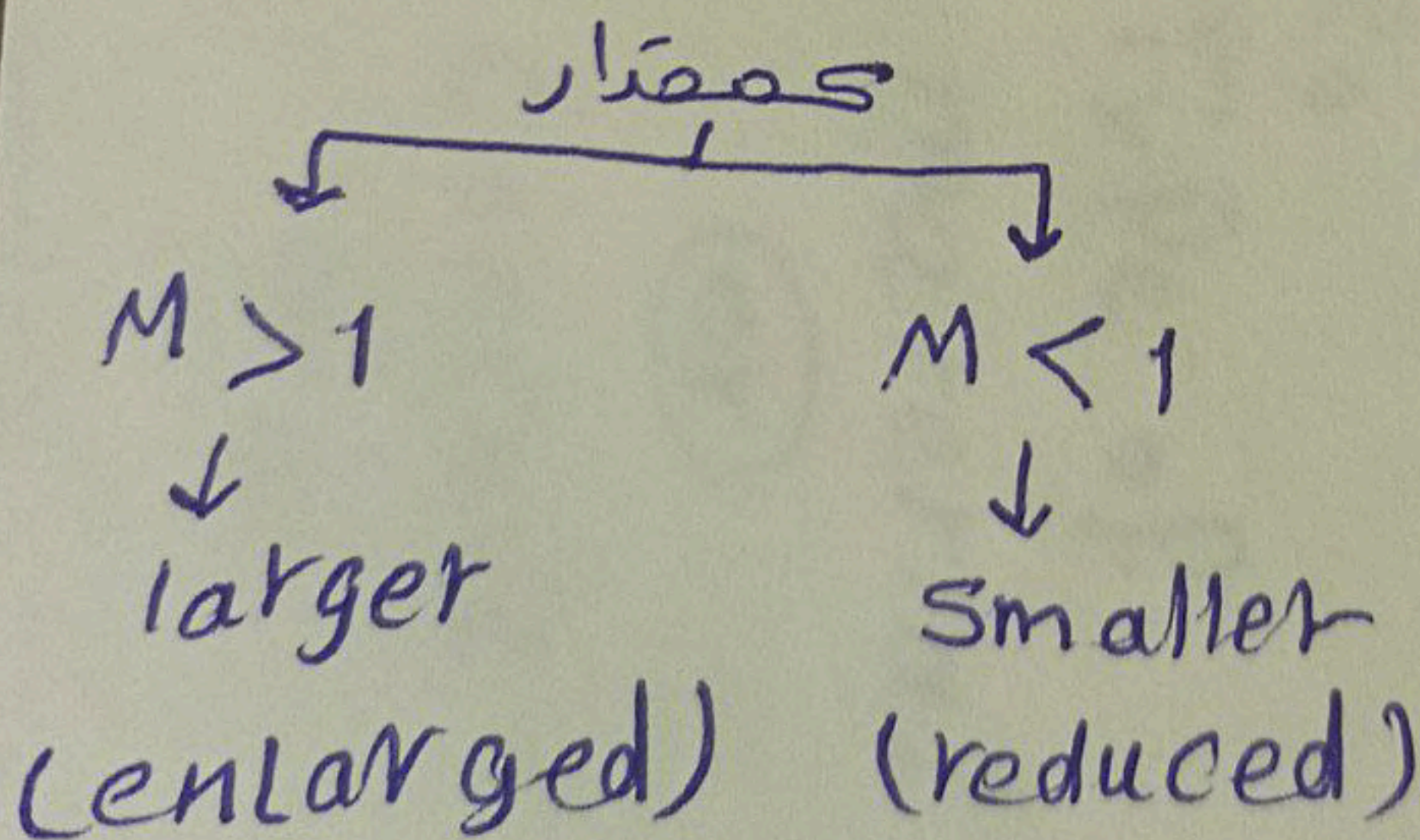
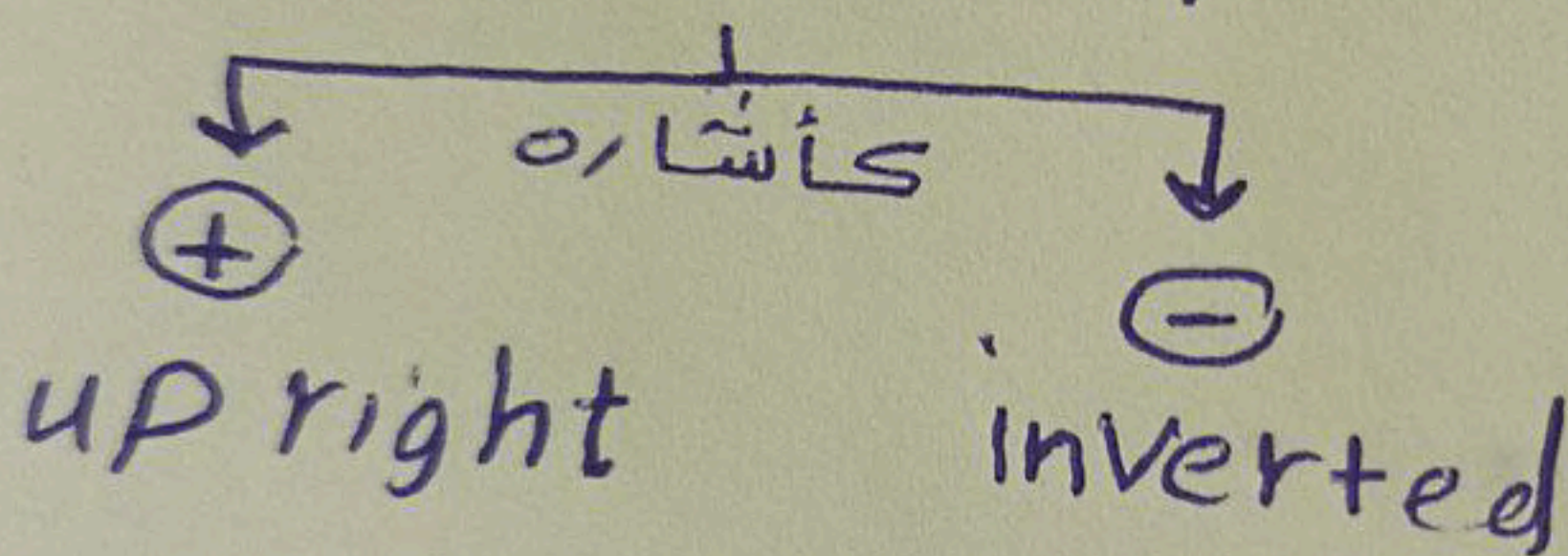
5- $f \rightarrow \oplus$



	+	-
q	Real image	Virtual image
p	Real object	Virtual object
h_i M	up right	inverted
F_1 R	Concave mirror	Convex mirror



$$M = \frac{h'}{h} = \frac{-q}{p}$$



$$-D = \frac{1}{F}$$

↳ diopeter $\swarrow$
focal

$$-m = \frac{\Theta}{\Theta_0}$$

↳ Angular magnification $\rightarrow$ with lens
 $\rightarrow$ with out lens

$$-M_{\min} = \frac{q}{F}$$

$q \rightarrow 25 \text{ cm}$
 $\rightarrow$ eye relaxed

$(P = F)$

$$-M_{\max} = \frac{q}{F} + 1$$

$q \rightarrow 25 \text{ cm}$

$(P < F)$

$$\rightarrow \frac{1}{q} + \frac{1}{p} = \frac{1}{f} = \frac{2}{R}$$

$$\rightarrow R = 2f \quad \rightarrow M = \frac{-q}{p} = \frac{h'}{h}$$

$$\rightarrow \frac{n_1}{p} + \frac{n_2}{q} = \frac{n_2 - n_1}{R}$$

$$\rightarrow \frac{n_1}{p} = -\frac{n_2}{q} \quad \text{Flat refrac surface} \quad \text{فيها R لا يوجد}$$

$$\therefore q = -\frac{n_2}{n_1} p$$

$$\rightarrow \frac{1}{f} = (n-1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

Flat surface of refracting

1- Virtual

2- Front side → مكان تلاقي مبداء
الاشعة دي

3- الوجه الى تتكسر فيه
Back side

4- $n_1 > n_2$ → Back side
Front side

→ near Point

- at age of :-

1 - 10 → 18 cm

2 - average → 25 cm

3 - increases with age → 50 cm

→ Far Point:

• normal vision - far Point
of infinity

• Paraxial rays:

الاشعة لها بؤرة واحدة
 $\theta_1 \rightarrow \text{small}$
← تحدث في مرآيا وعدسة

• spherical aberration:

الاشعة لها اكثر من بؤرة
 $\theta_1 \rightarrow \text{large}$
← تحدث في مرآيا وعدسة

• chromatic aberration:

اختلاف الاموال الموجية
للأشعة الساقطة في
الأحمر البنفسجي كل
بؤرة لها بؤرة اختلاف معامل انكسار
← تحدث في عدسة بئر

(F)

Concave mirror
depend on :
radius of
curvature
only.

(or)

convex
mirror

Convex lens
depend on :

• R_1

• R_2

• Type of
material

(or)

concave
lens