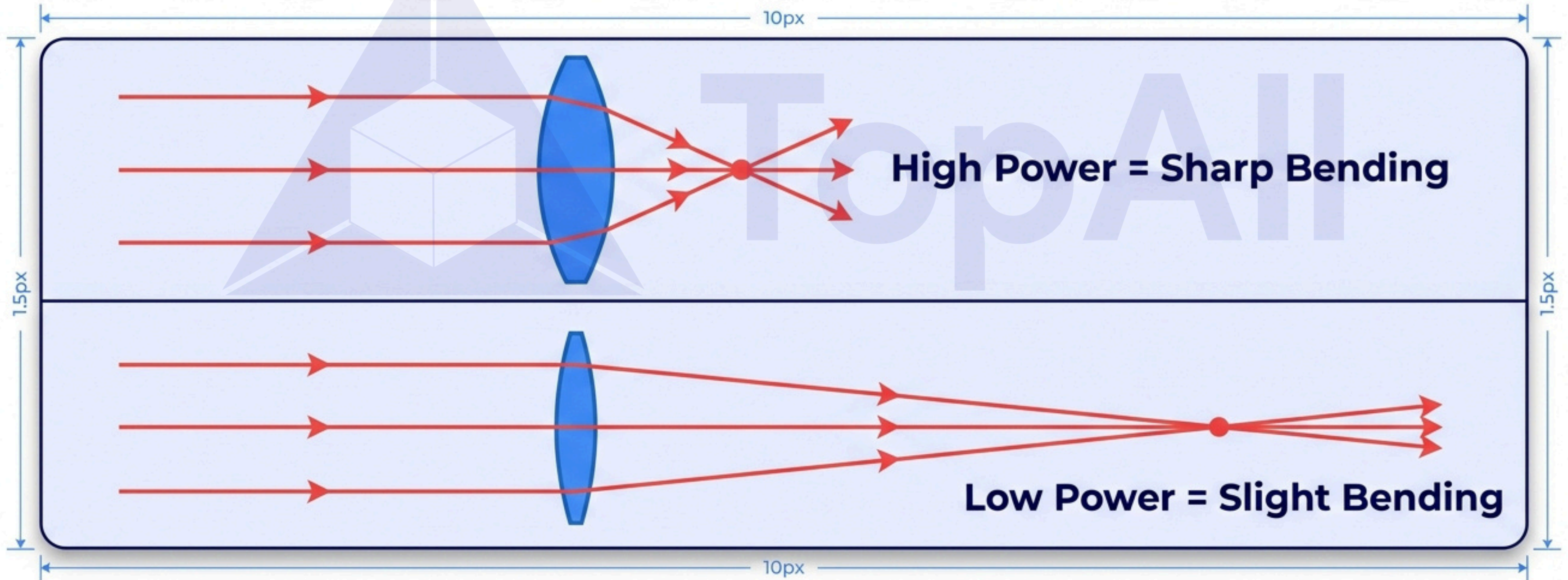


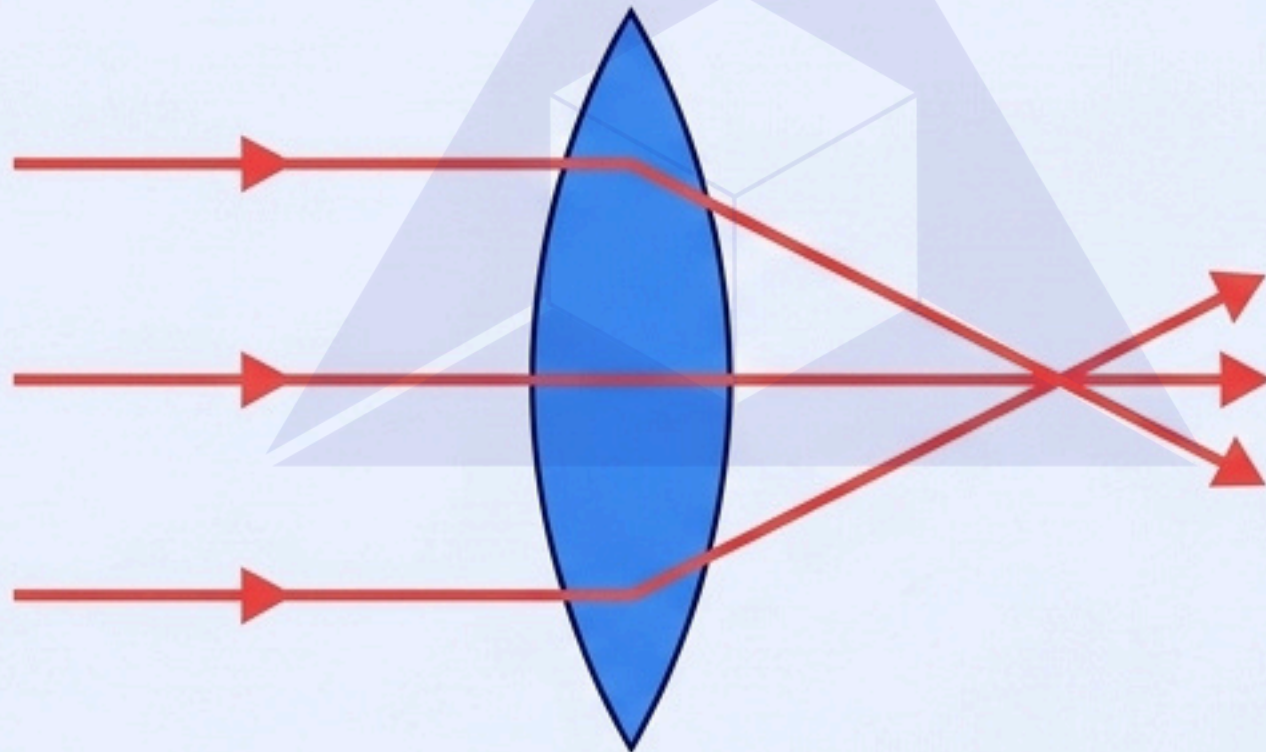
Power of a Lens



Defining Optical Power

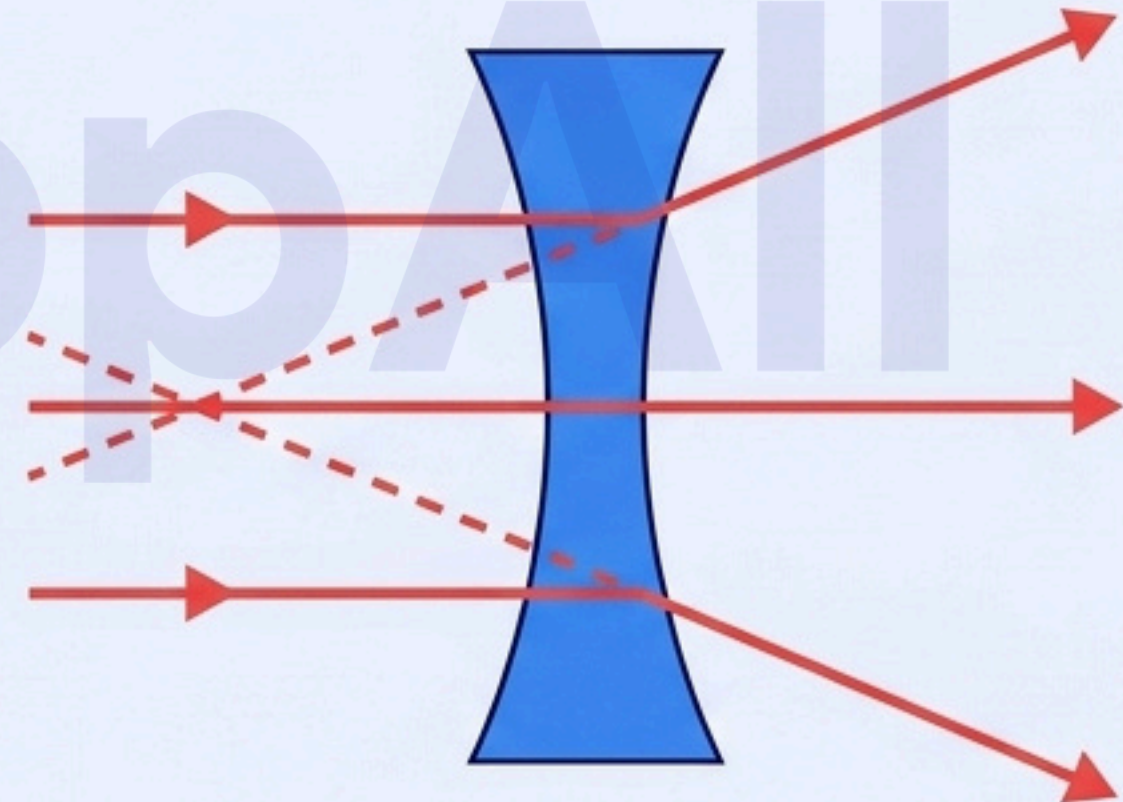
Power is a measure of the degree of convergence or divergence a lens introduces to incident light. It is the lens's pure "bending strength."

Convergence Strength



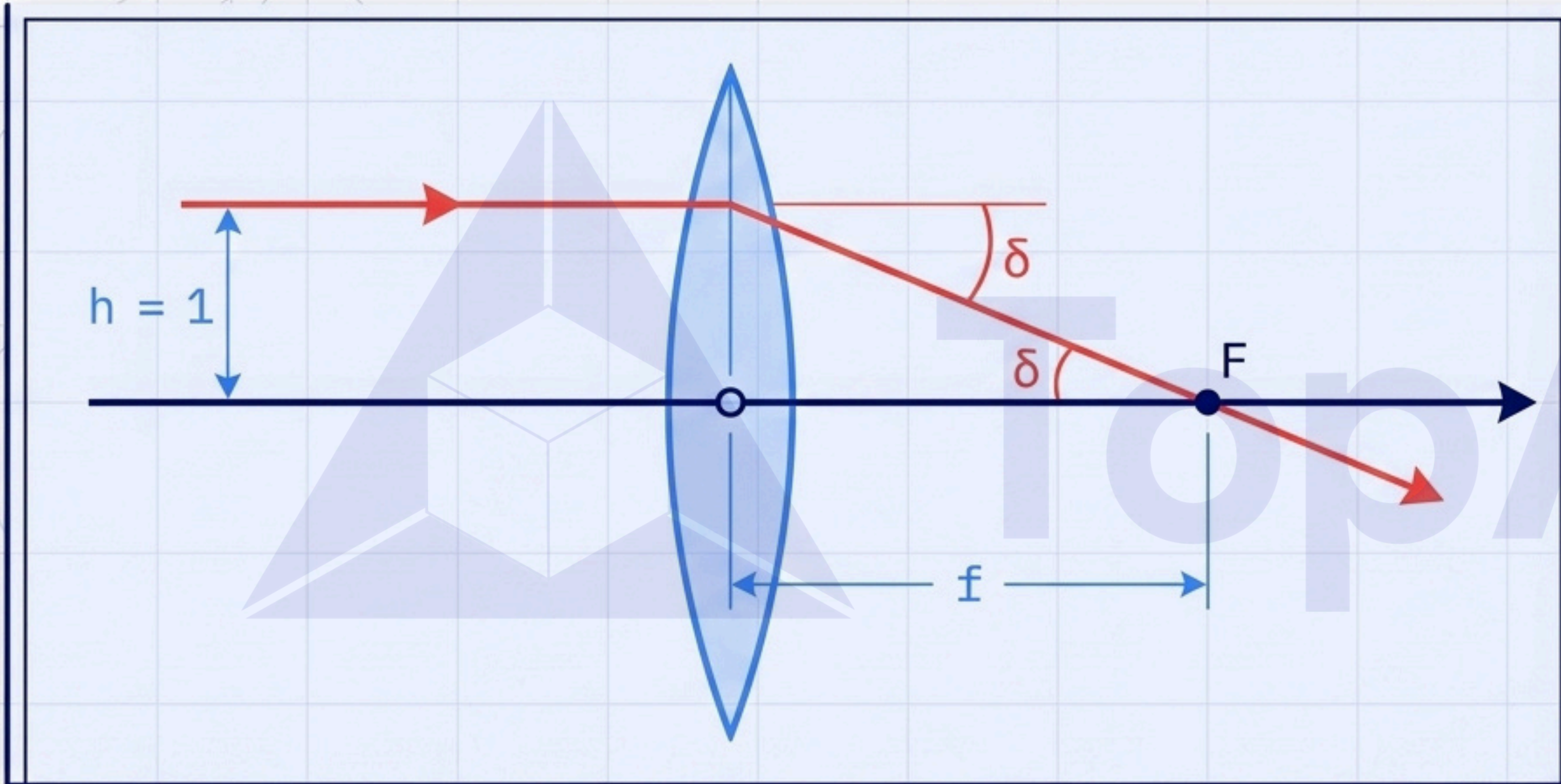
Convex Lenses = Converging Power

Divergence Strength



Concave Lenses = Diverging Power

The Geometry of Power



Step 1:

$$\tan(\delta) = \frac{h}{f}$$

Step 2:

Since $h = 1$,

$$\tan(\delta) = \frac{1}{f}$$

Step 3:

For paraxial rays (small δ),

$$\delta \approx \frac{1}{f}$$

Key Takeaway: A shorter focal length (f) requires a larger angle of deviation (δ). Therefore, smaller f = greater power.



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$$E=mc^2$$



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Formula & Unit Bank

$$P = 1 / f$$

The SI unit of power is the Diopetre (D).

$$1 \text{ D} = 1 \text{ m}^{-1}$$

*One diopetre is the power of a lens whose focal length is exactly **1 metre**.*



Standard SI Inputs: To get Power in Dioptries, your focal length **MUST** be converted to meters.



The Common Trap: Calculating $P = 1/f$ using centimeters.

If $f = 20$ cm, writing $P = 1 / 20 = 0.05$ D is INCORRECT.

The Shortcut Fix: Use the Centimeter Formula

$$P = 100 / f \text{ (in cm)}$$

Correct Exam Execution:

If $f = 20$ cm, $P = 100 / 20 = +5.0$ D.



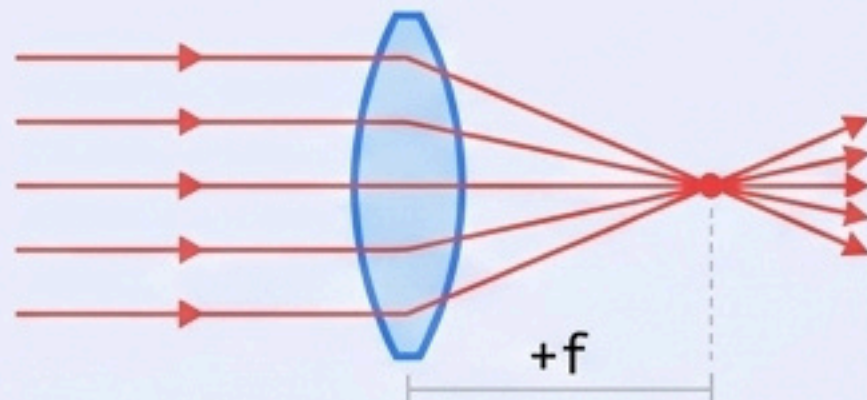
Application: Reading Prescriptions

How to instantly decode an optician's corrective lens prescription.

Patient A

+2.5 D

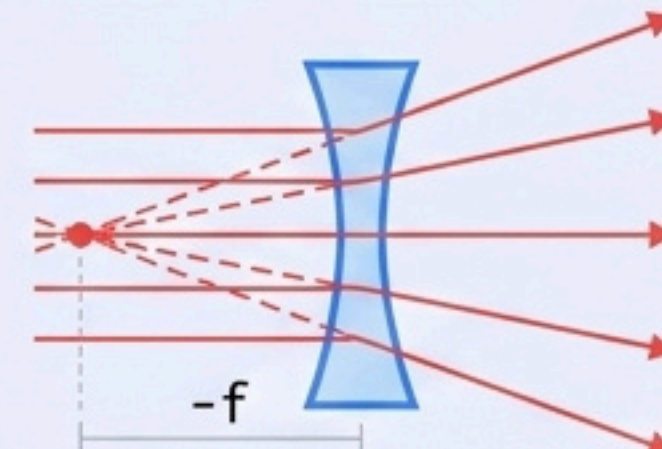
- **Step 1:** Sign is positive → Convex Lens
- **Step 2:** $f = 100 / P$
 $= 100 / 2.5$
 $= +40 \text{ cm}$



Patient B

-4.0 D

- **Step 1:** Sign is negative - Concave Lens
- **Step 2:** $f = 100 / P$
 $= 100 / -4.0$
 $= -25 \text{ cm}$



Master Synthesis

REVISION CARD



Property	Convex Lens	Concave Lens
Optical Behavior	Converging	Diverging
Focal Length (f)	Positive ($f > 0$)	Negative ($f < 0$)
Power (P)	Positive ($P > 0$)	Negative ($P < 0$)

Power is a pure reflection of focal length geometry and sign convention.



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