

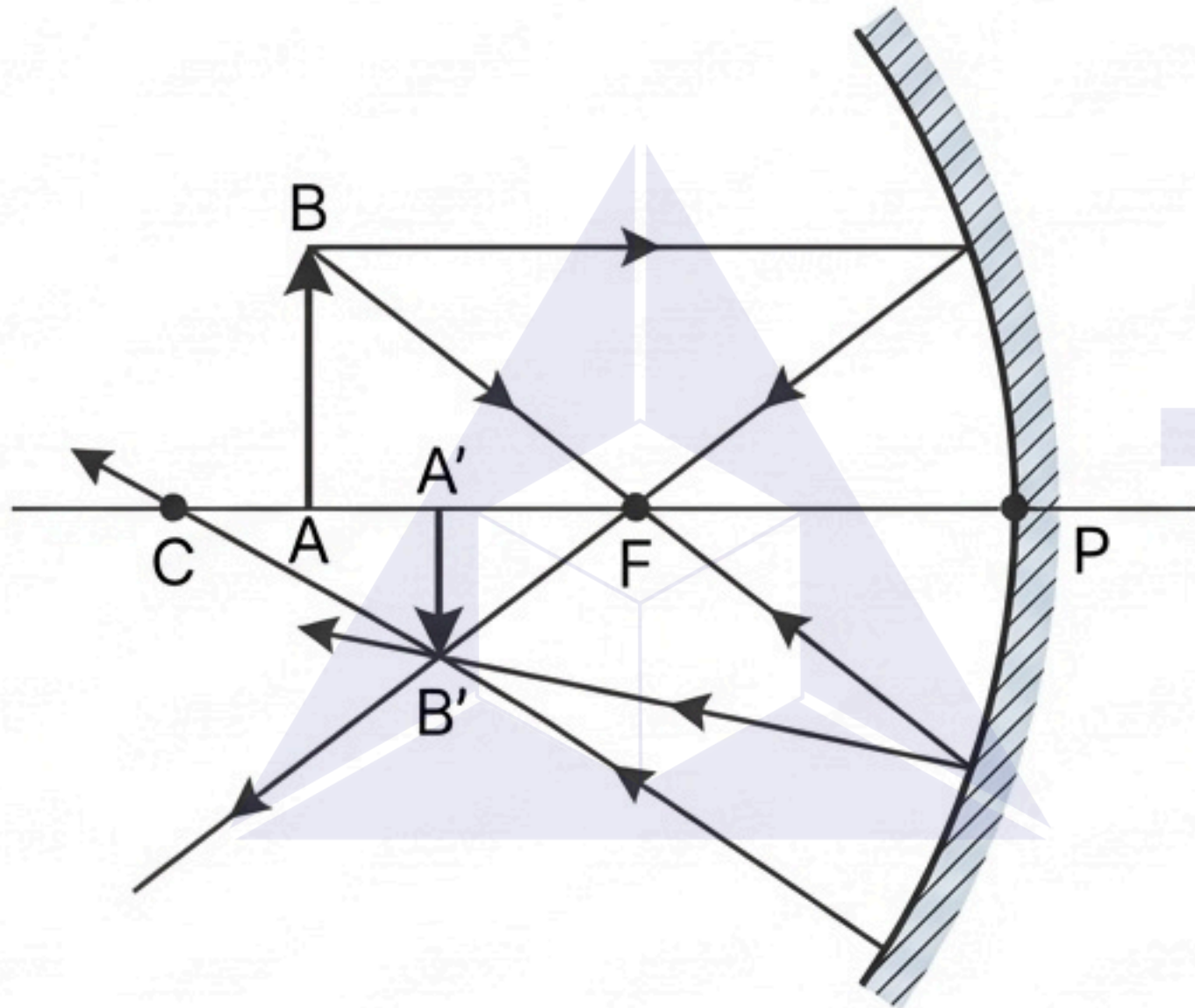
Class 12 Physics

Ray Optics

9.2.3 The Mirror Equation

Understanding image formation, distances, and magnification in spherical mirrors.

High-Yield Exam Prep Module

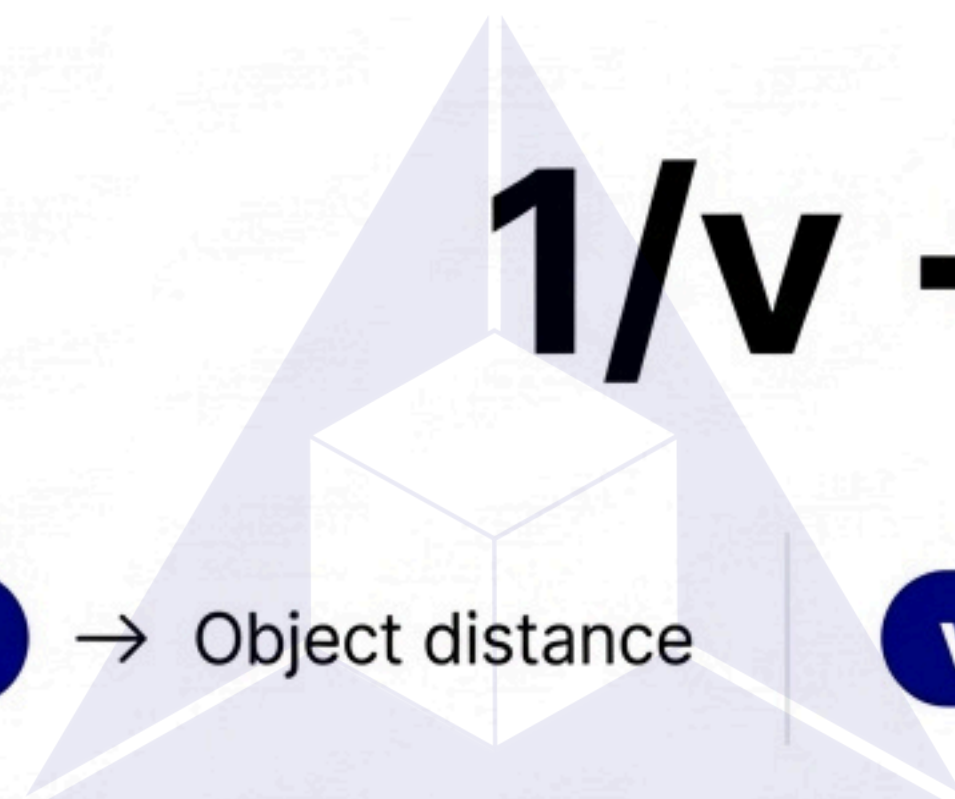


The Physical Setup

An image is a point-to-point correspondence with an object, established through the reflection of paraxial rays.

- P** = Pole (The geometric center of the mirror)
- F** = Principal Focus (Where parallel paraxial rays converge)
- C** = Center of Curvature

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

**u**

→ Object distance

v

→ Image distance

f

→ Focal length

Universal Application: Valid for all spherical mirrors (concave and convex) when applying the Cartesian sign convention. Distances measured in the same direction as incident light are positive.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

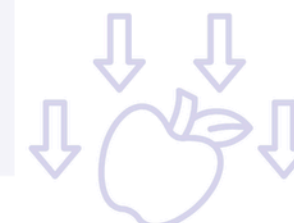
Practice Now



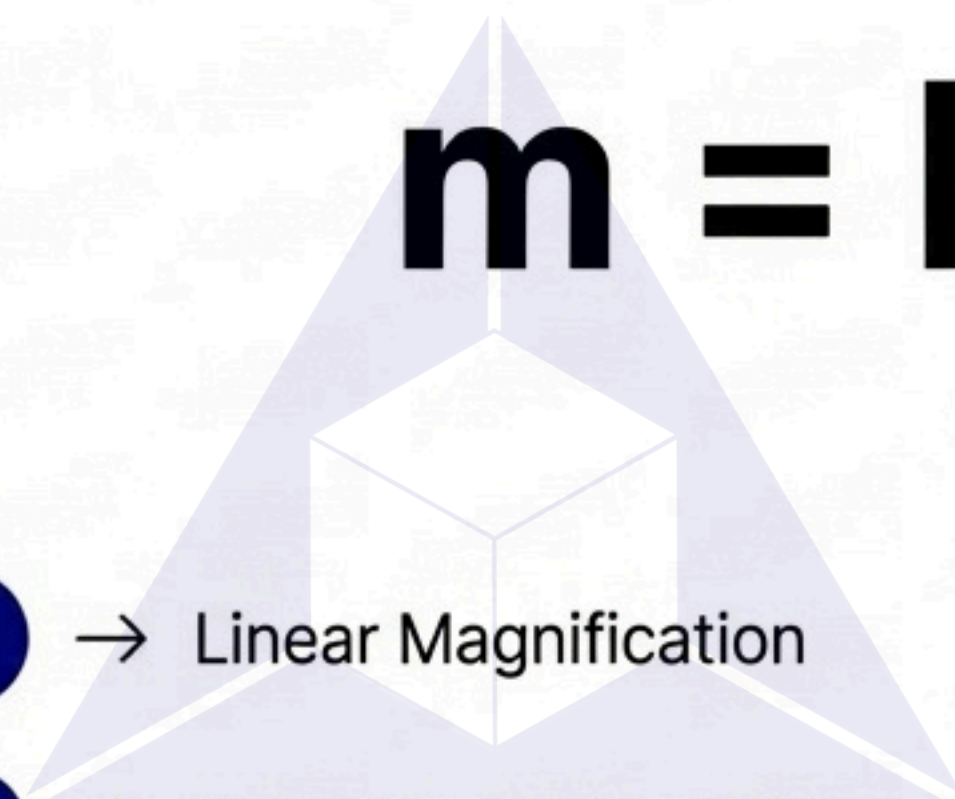
At prep.topall.app

Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



$$m = h'/h = -v/u$$

- 
- m** → Linear Magnification
 - h** → Object height (positive upwards)
 - h'** → Image height

Diagnostic Mini-Matrix

Negative m

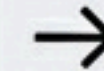


Image is Real &
Inverted.

Positive m

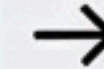
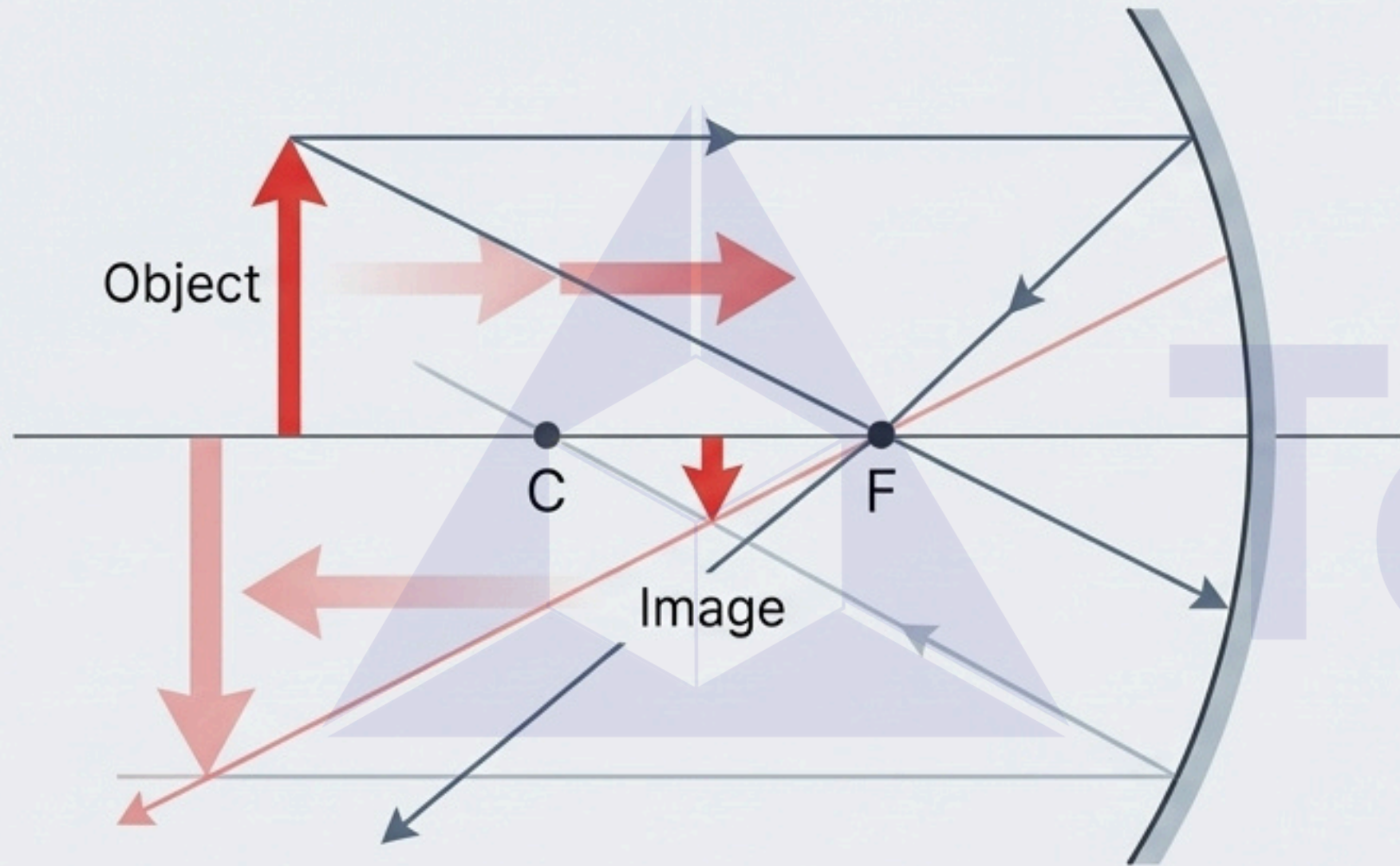


Image is Virtual &
Erect.



As object moves closer to F, the real image moves further away and enlarges.

Case 01: Real Images

Rays actually converge in front of the mirror.

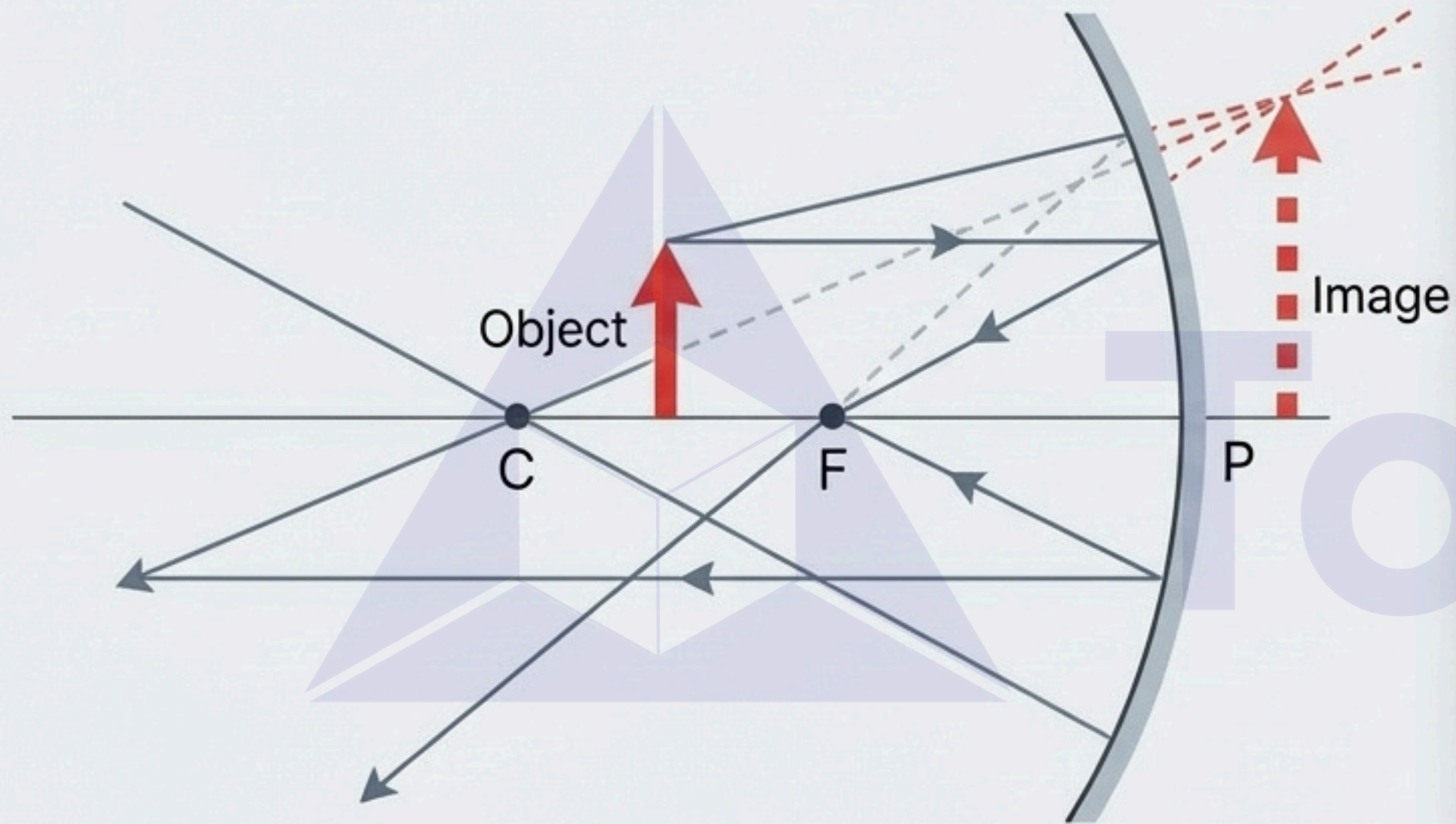
Cartesian Sign Breakdown

v is Negative formed in front

u is Negative object in front

m is Negative inverted image

NEET MCQ Platform



When object is between P and F, a virtual, erect, and magnified image is formed behind the mirror.

Case 02: Virtual Images

Rays appear to diverge from a point behind the mirror.

Cartesian Sign Breakdown

v is Positive formed behind mirror

u is Negative object in front

m is Positive erect image

Key Takeaways

Mirror Formula

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

Magnification Formula

$$m = -\frac{v}{u}$$

Diagnostic: Real vs. Virtual

	Real Image	Virtual Image
Location	In front of mirror	Behind mirror
Intersection	Actual ray intersection	Apparent ray intersection
v sign	$v < 0$	$v > 0$
m sign & Orientation	$m < 0$ (Inverted)	$m > 0$ (Erect)



Module Complete



You've Learned the Theory.

Now Let's Test It.

Reading notes gets you knowledge.

Practicing MCQs gets you marks.

That's exactly what TopAll Pro is built for.

Try TopAll Pro Now

What TopAll Pro Does Differently

-  **Stuck? Snap it. Solve it. — Doubts AI**
Photo → step-by-step solution in seconds, 24/7
-  **Your AI Coach finds your blind spots**
Concept-level weakness detection — not just chapter-level
-  **4.5 Lakh+ questions. Never run out.**
13× more content than any other prep app in India
-  **Build your own test in 60 seconds**
Pick a chapter, set difficulty — AI does the rest instantly.
-  **AI Recommendation that helps you improve**
AI Recommendation Analysis your Tests and tell you where you need to improve.



Practice the moment you finish studying
Jump in while the concept is still fresh in your head

4.5L+
MCQs

1.5L+
Students

AI Powered
In-Depth Analysis