Optics

2014

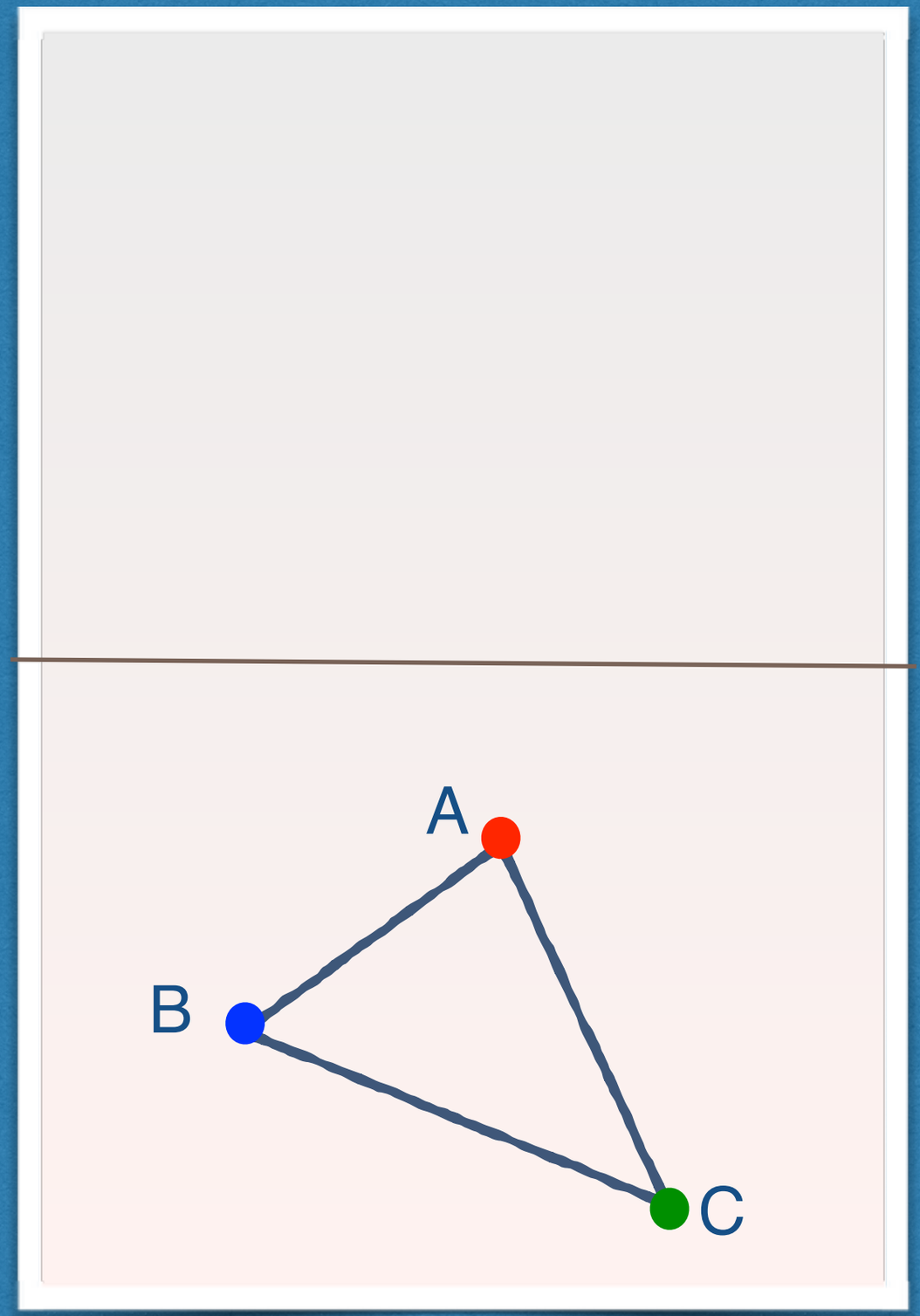
Mirror Lab

Pick up;
- a ruler
- a mirror
- a protractor
- a 200g or 100g mass
- 1 sheet of paper

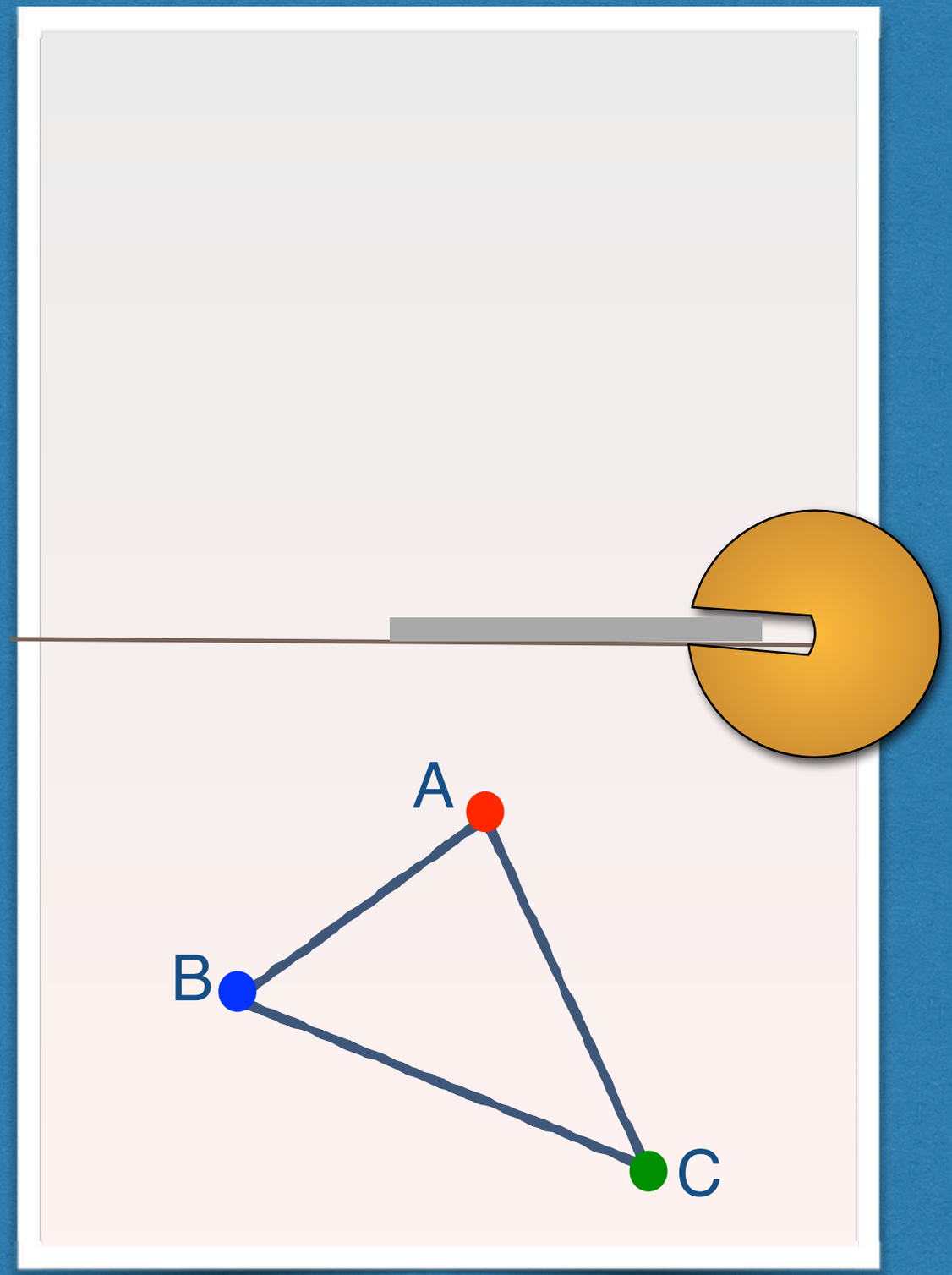
-Fold the paper in half

-Trace the center line

-Draw a simple object

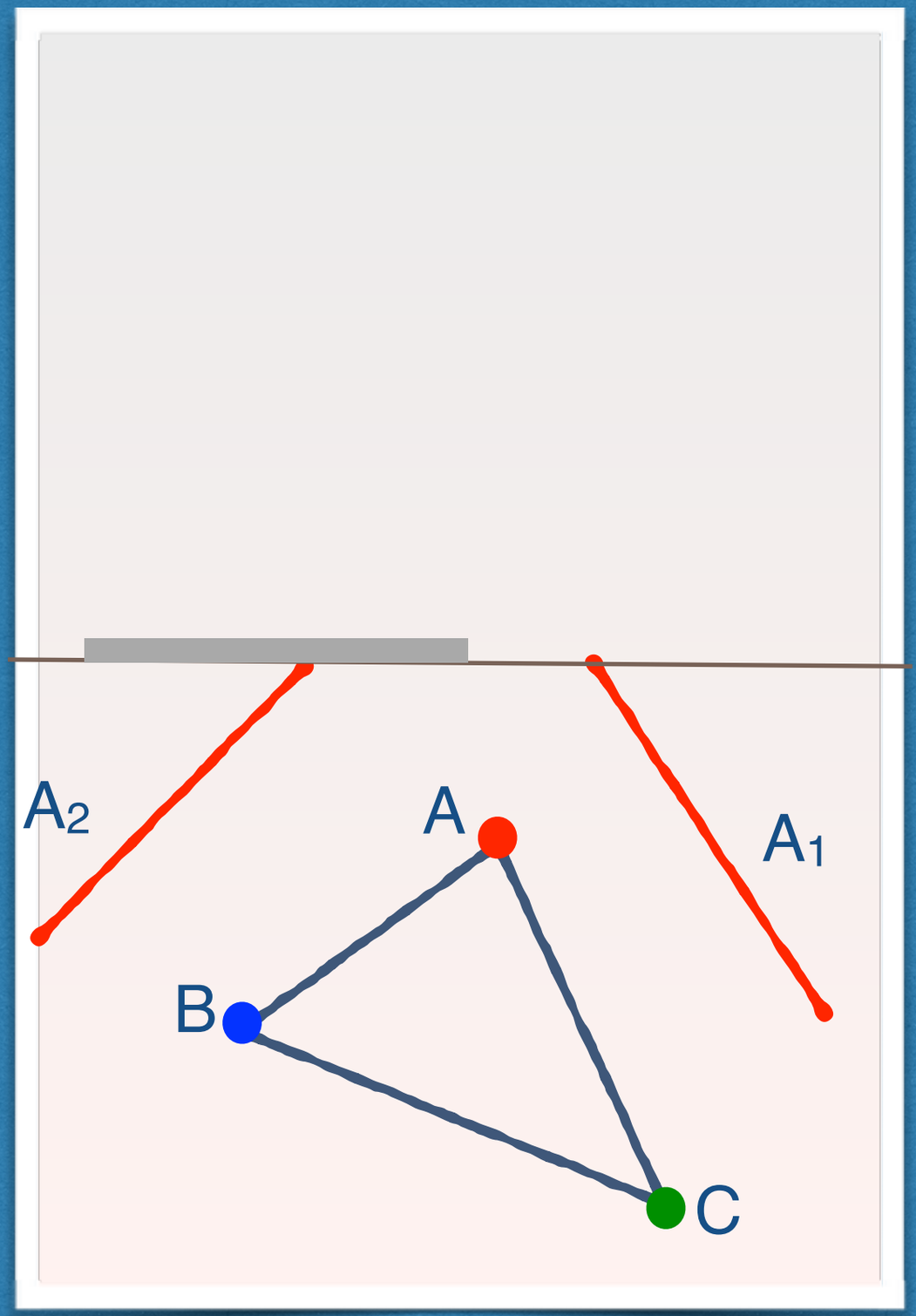


Stand up the mirror on the center line

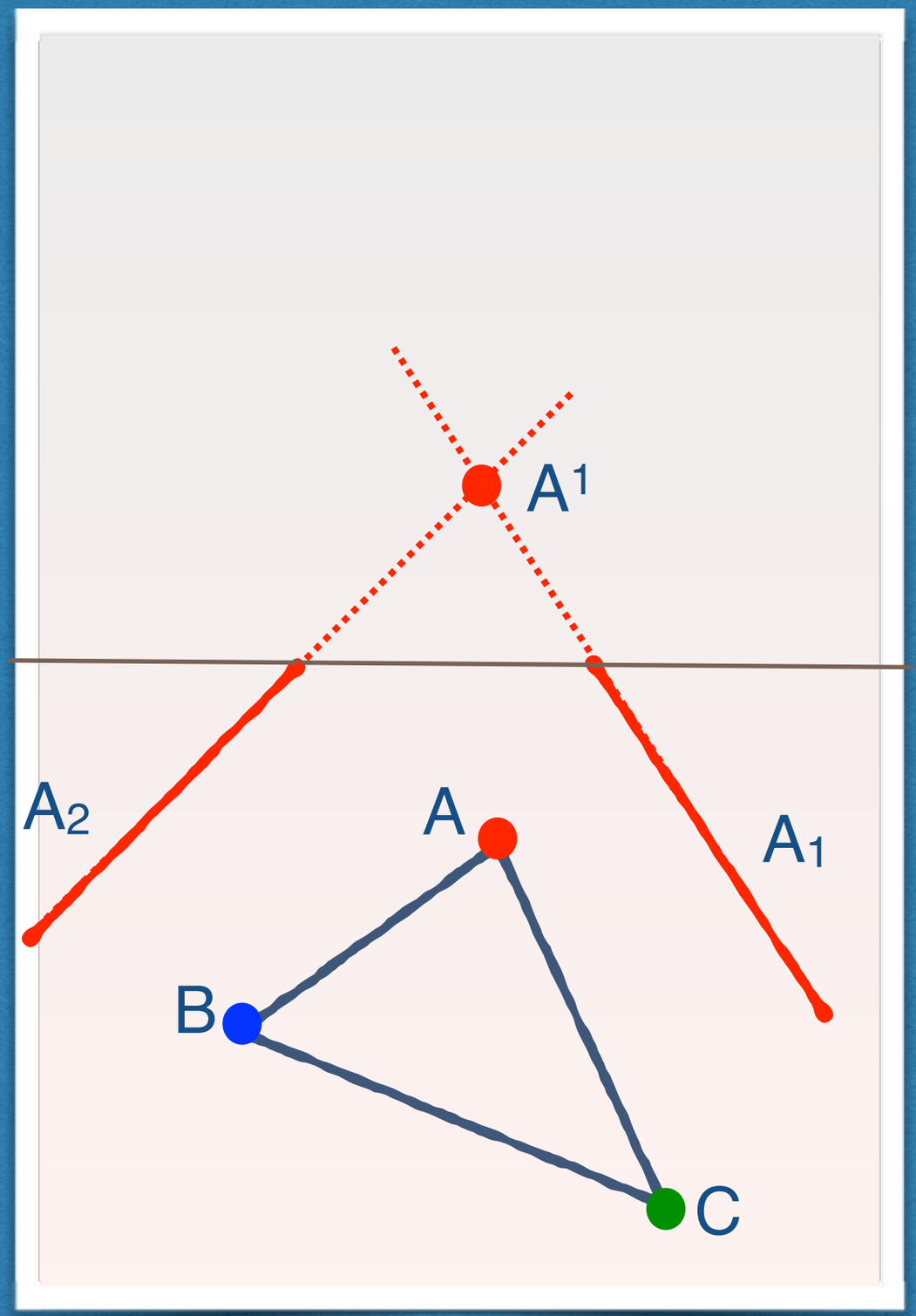


Stand up the mirror on the center line

You may slide the mirror left or right to correctly see the image

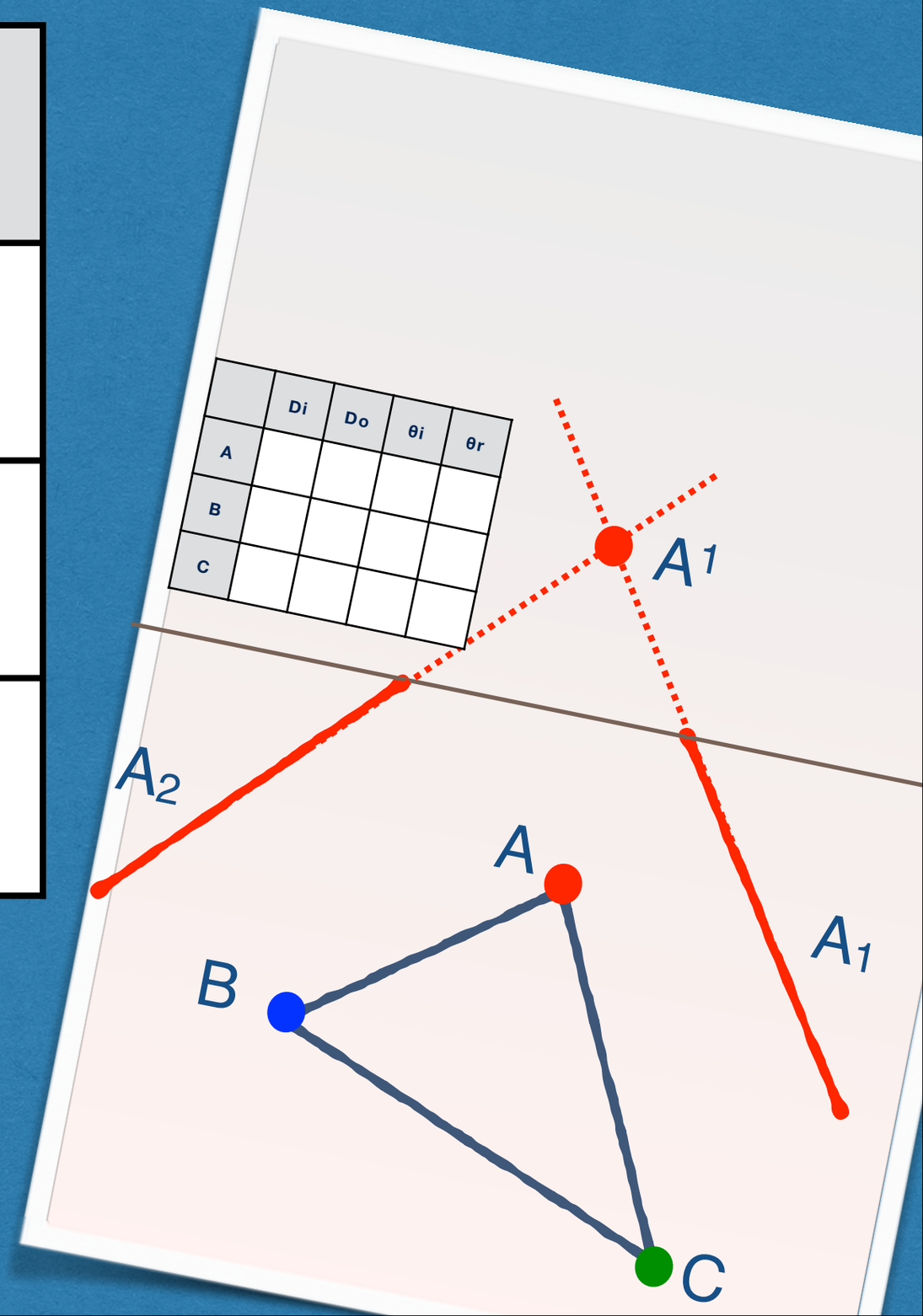


Move away the mirror
Extend your sight lines through to find their intersection point



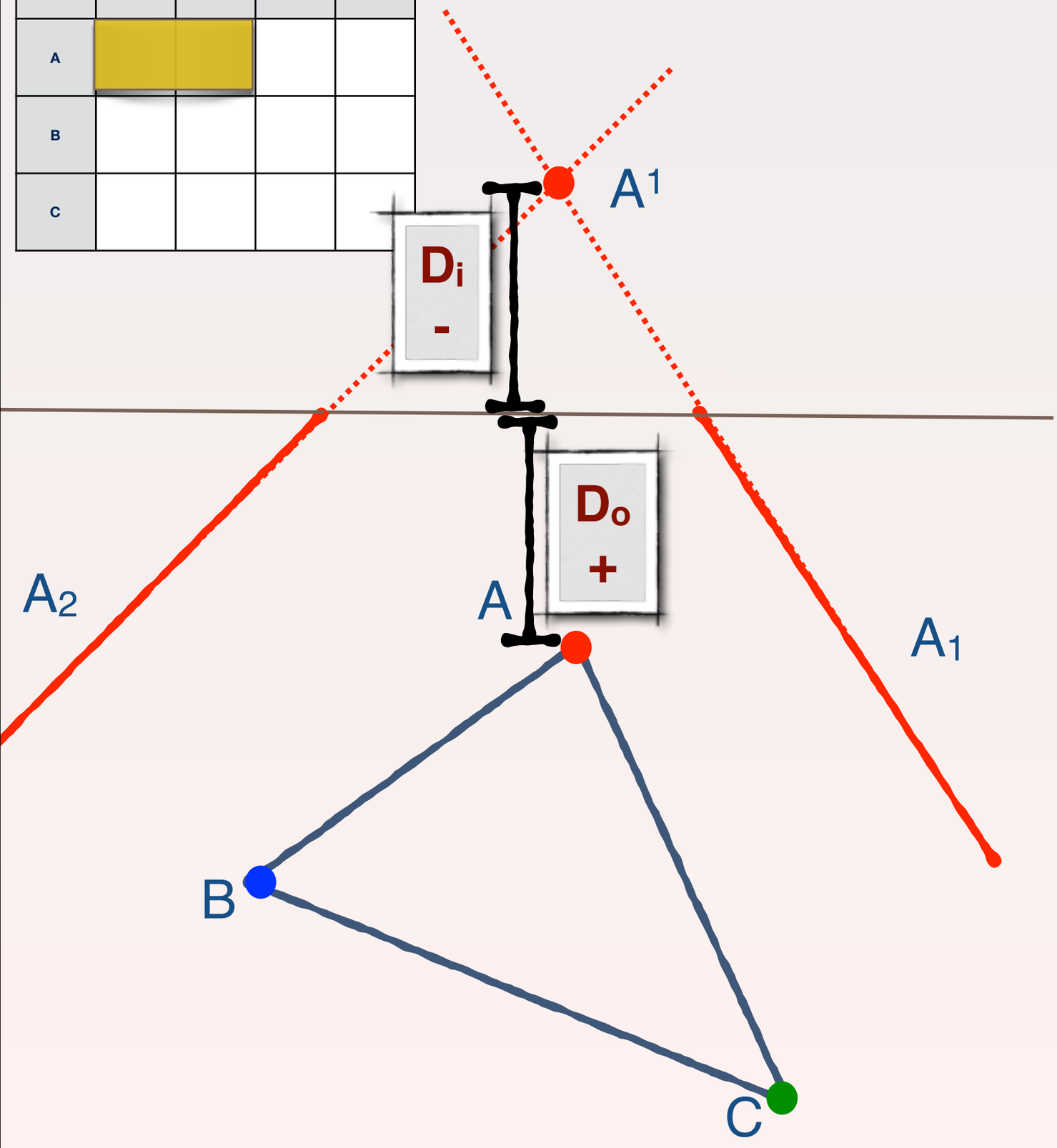
Measurements

	D	D	θ	θ
A				
B				
C				



Distances - from the mirror line
Angles - From a perpendicular line to the mirror

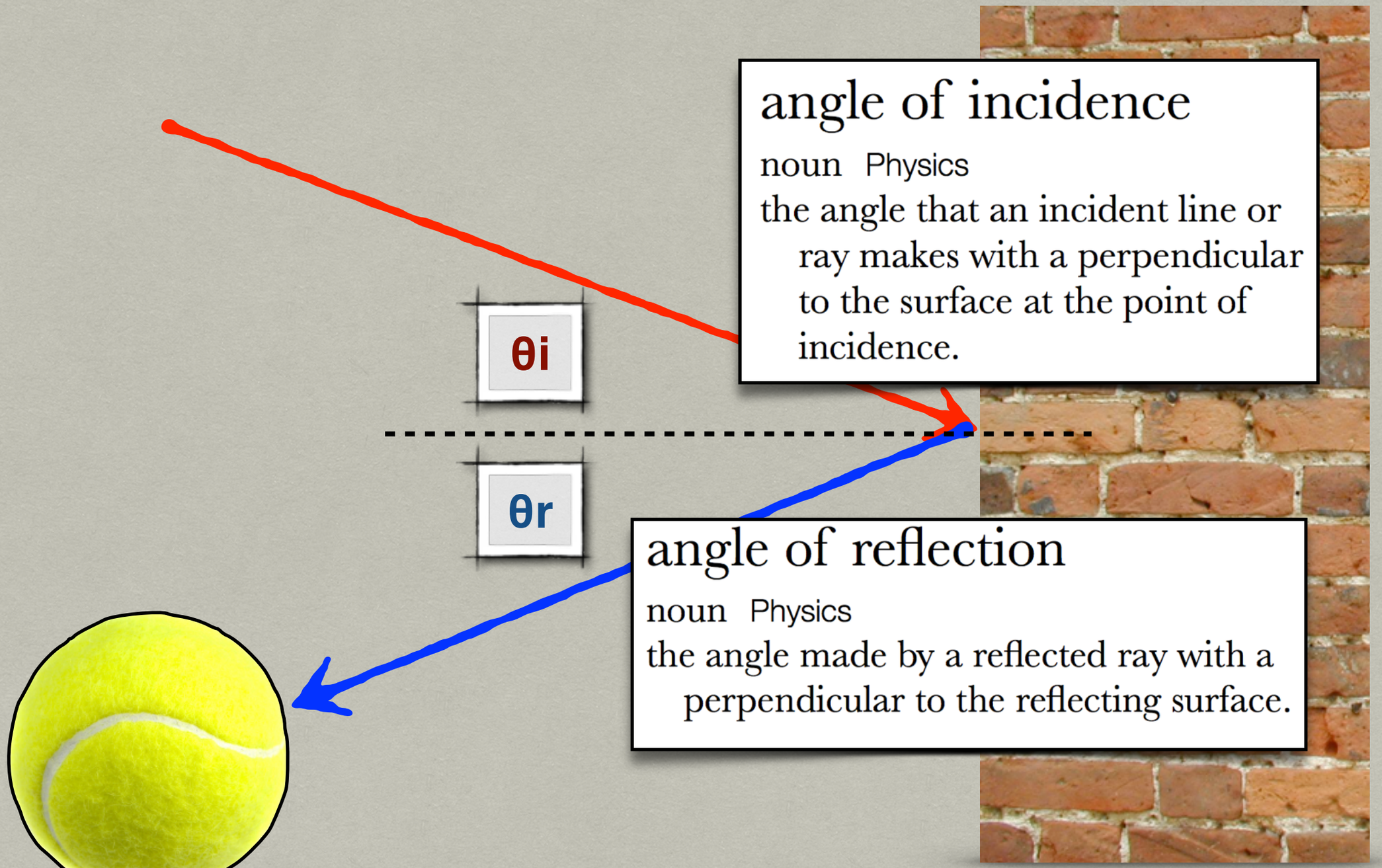
	Di	Do	θi	θr
A				
B				
C				



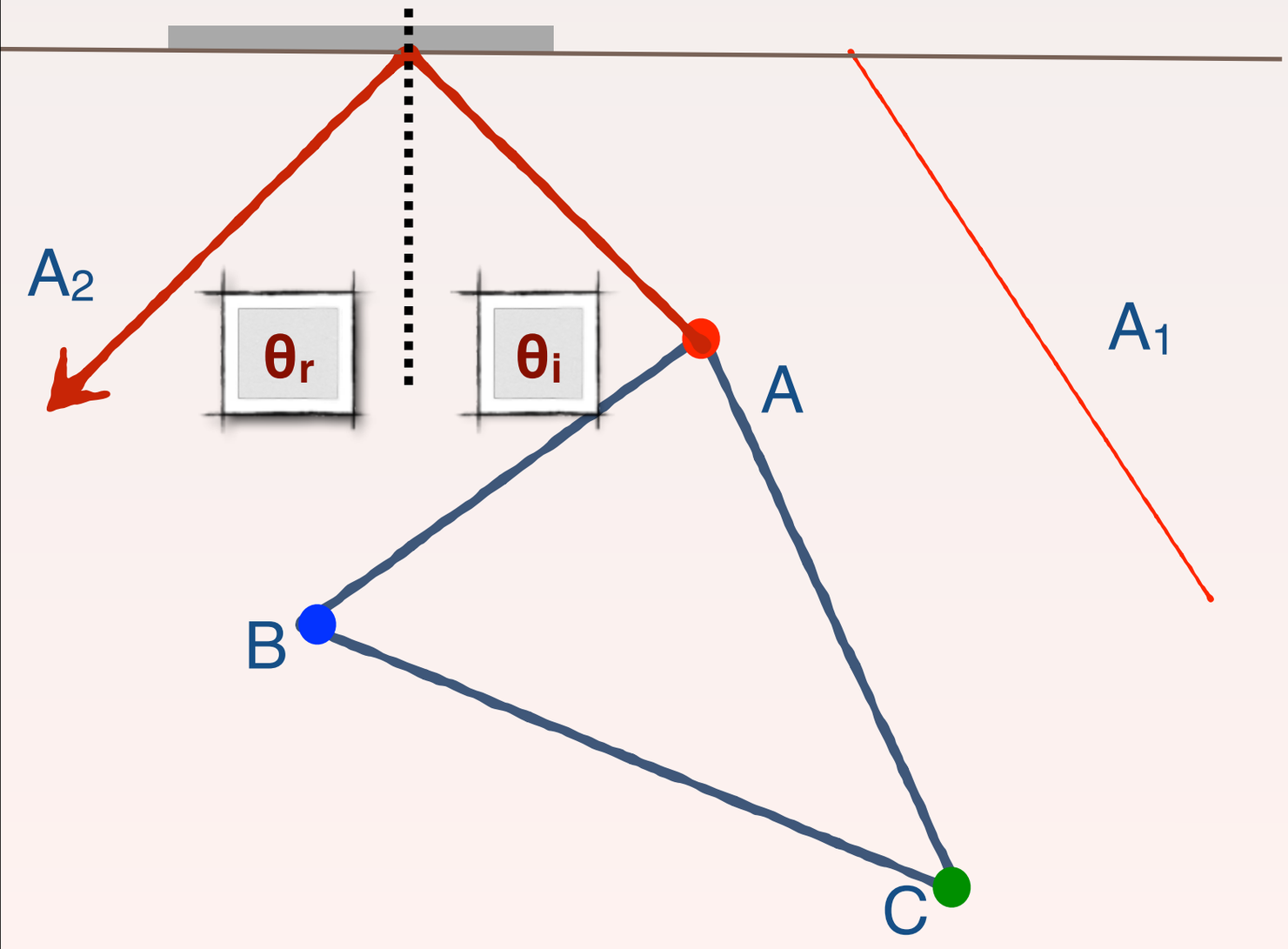
Measure Carefully

Real Images are positive
Virtual Images are negative distances

Angles of Reflection



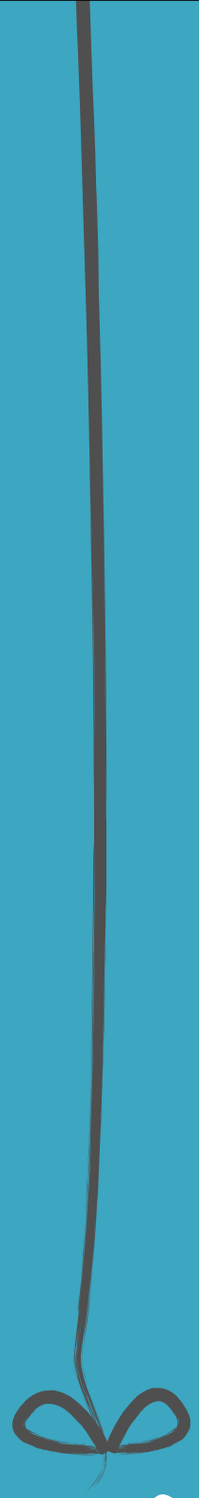
	Di	Do	θi	θr
A				
B				
C				



Additional construction

Angles are measured from the normal line at the mirror

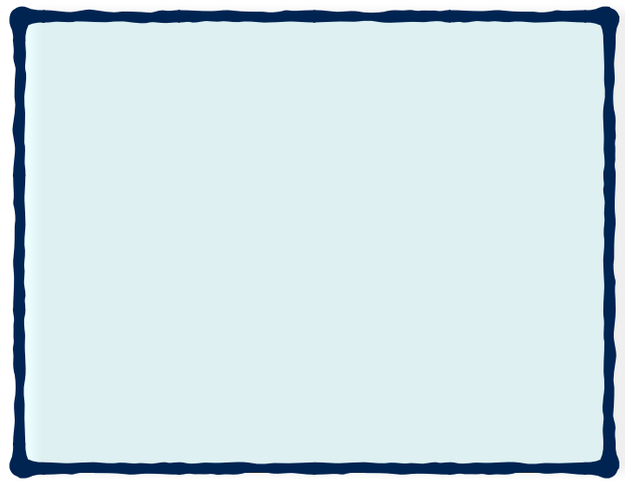
Snell's Law Lab



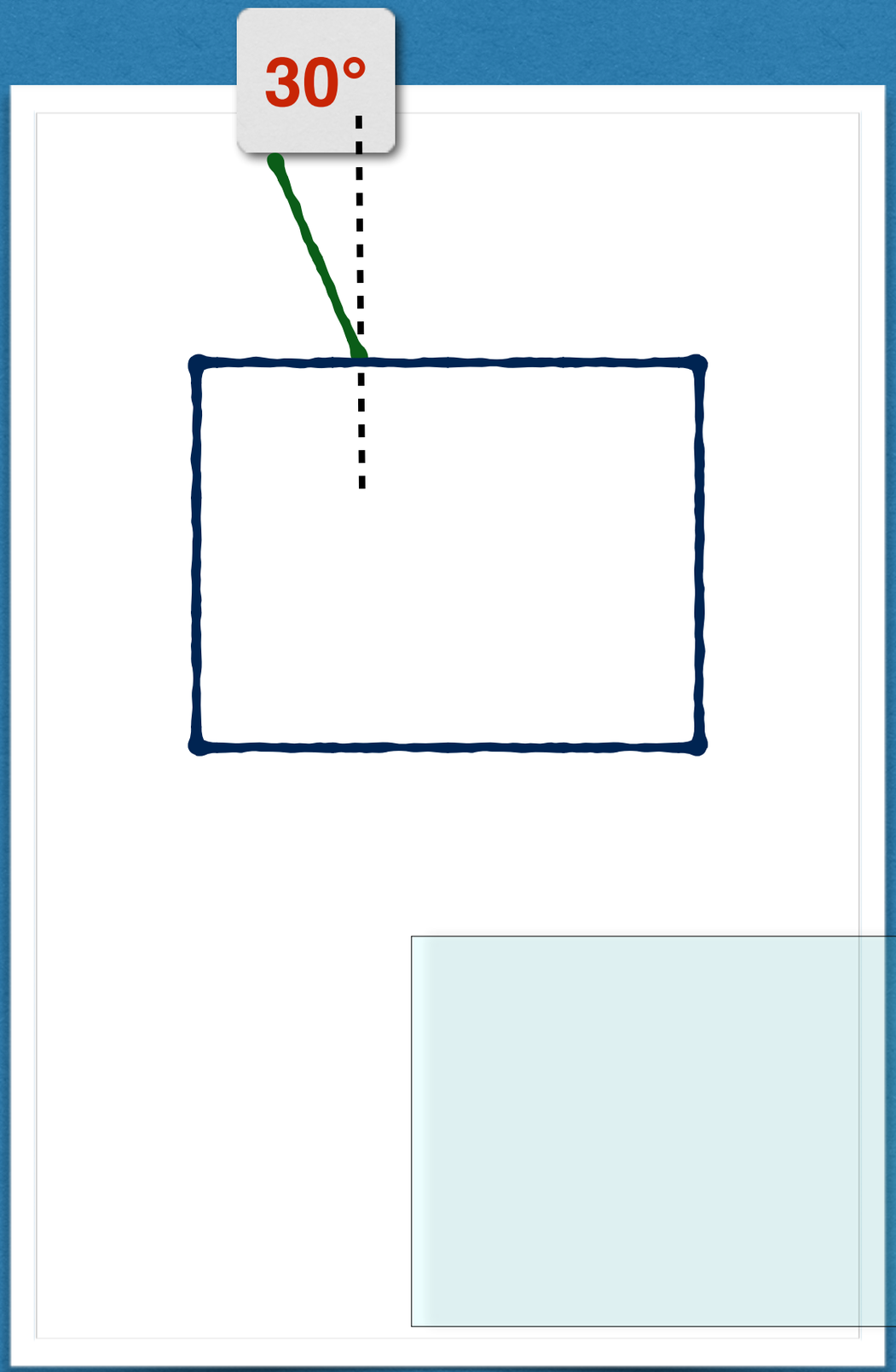
Set Up

you'll need…
(get from the front table)

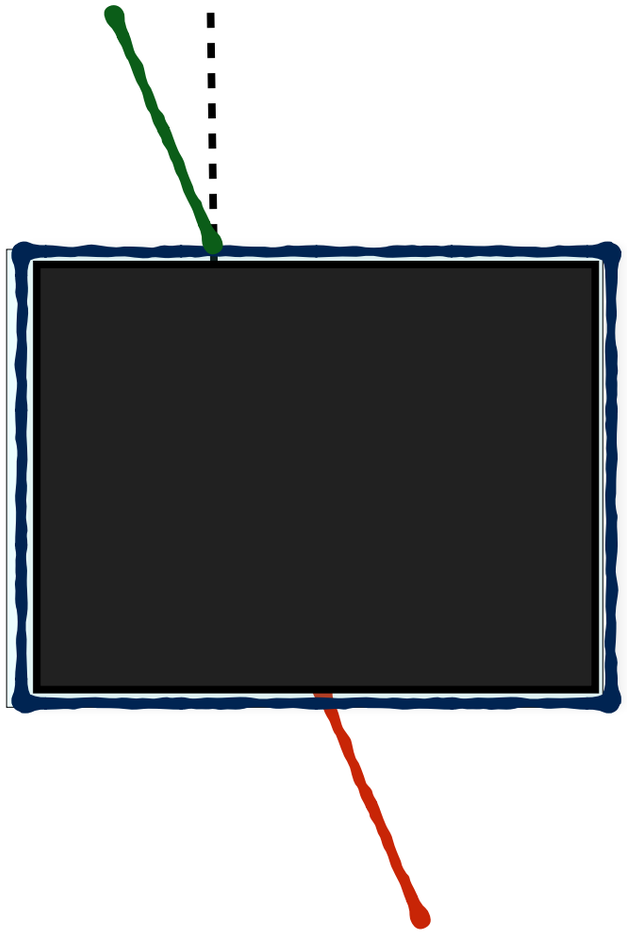
paper,
glass,
a ruler,
and a protractor



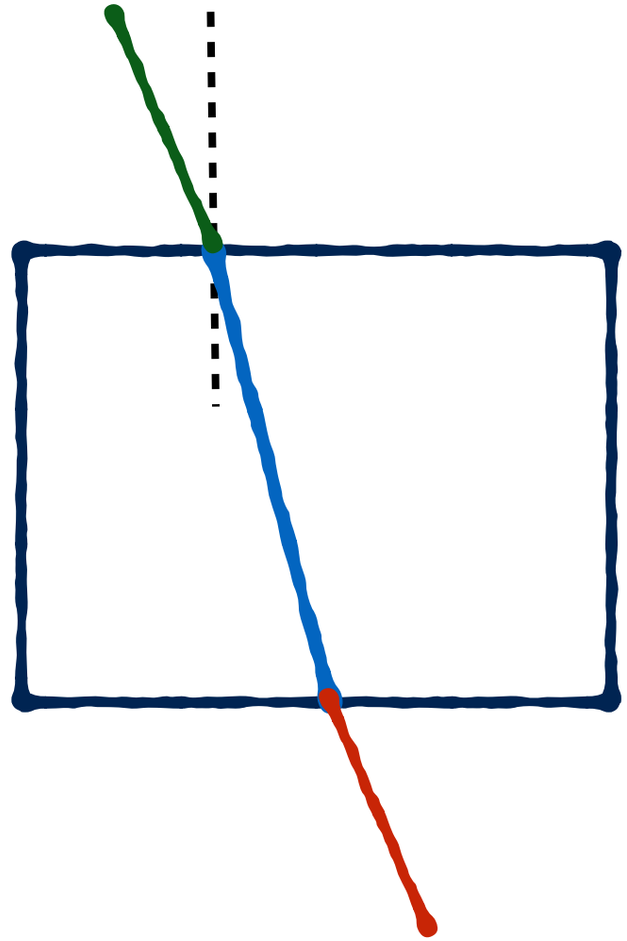
Angle of Incidence



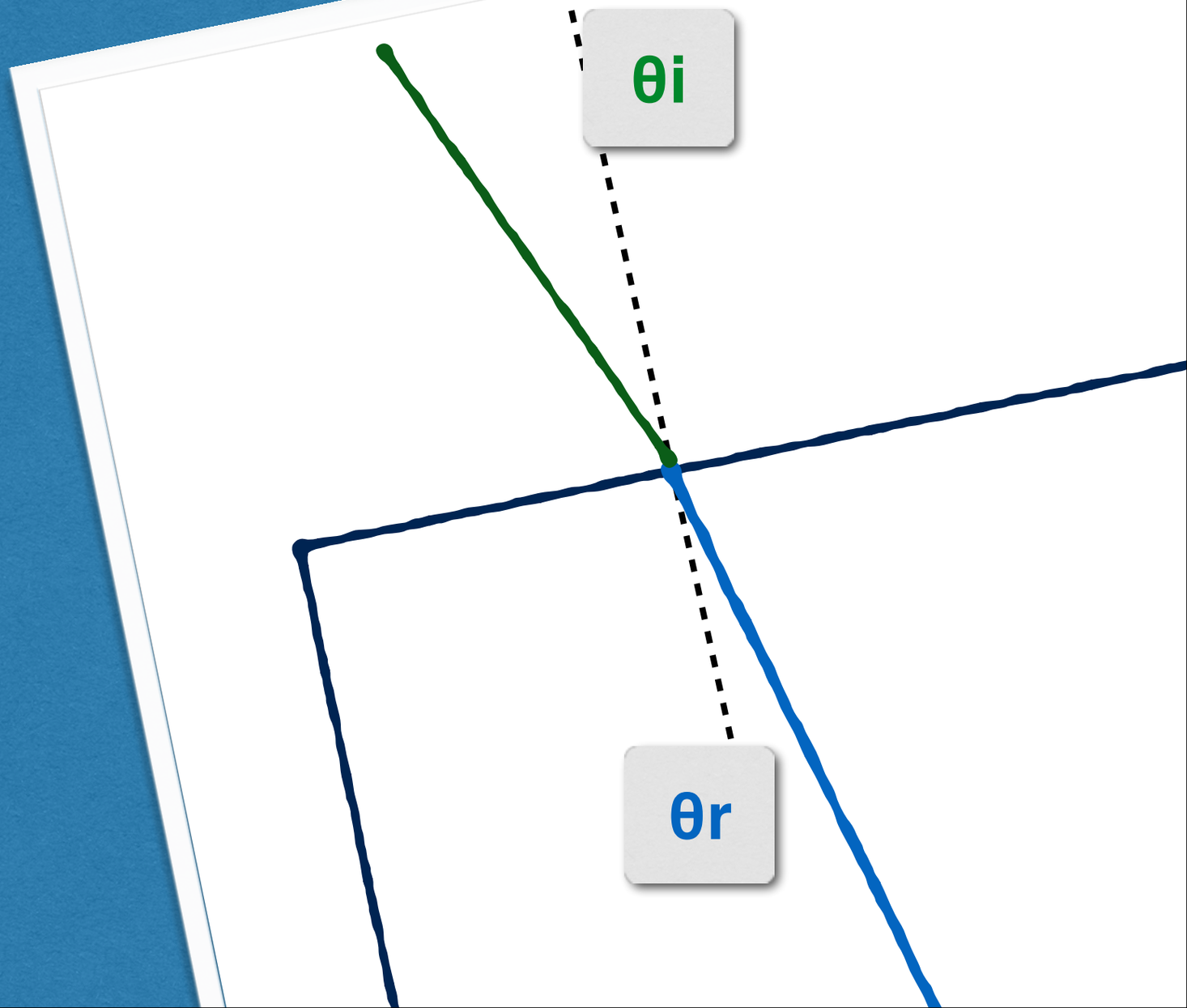
Find the image



Angle of Refraction



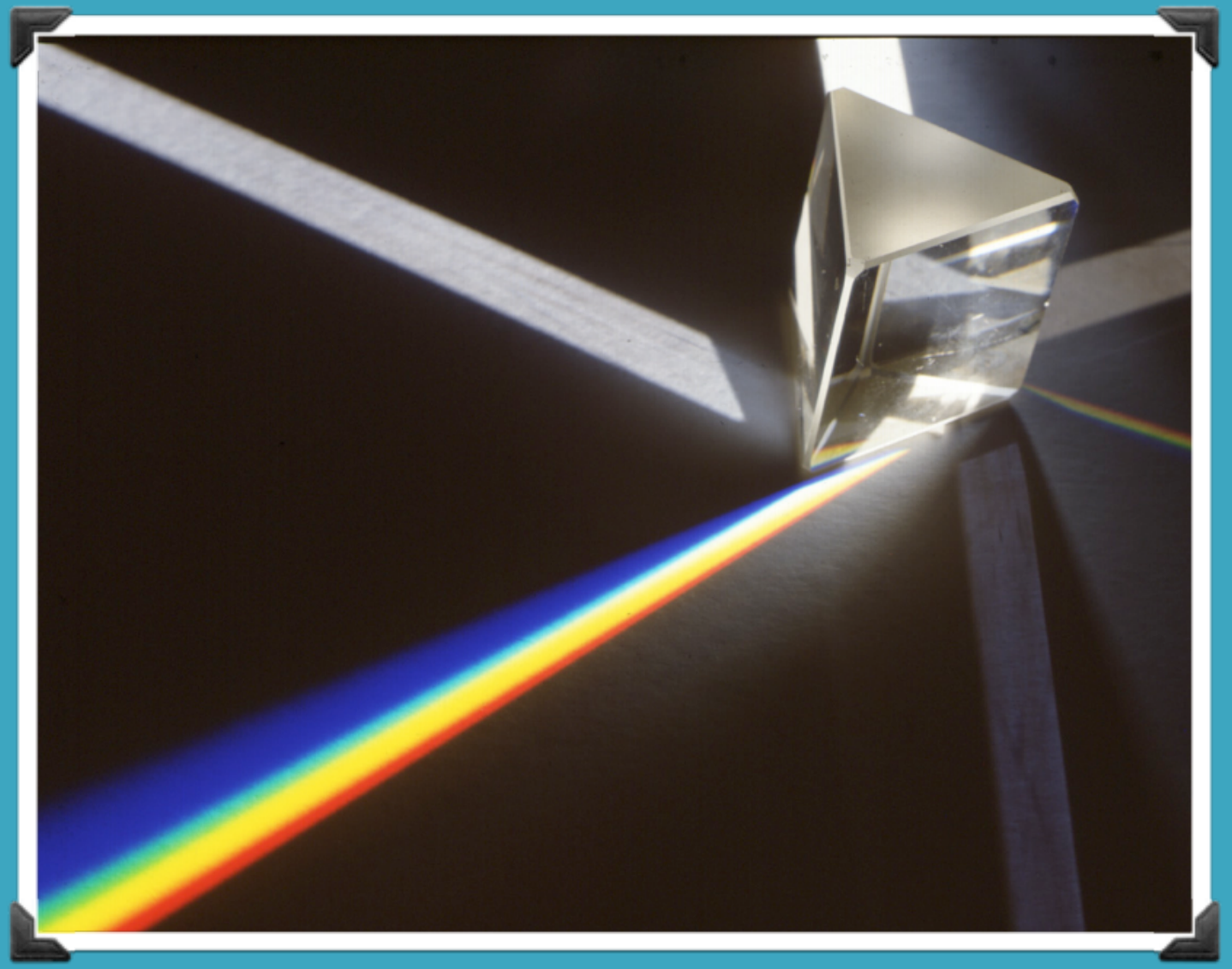
Observe
The smaller angle is in the material that is more optically dense



Data/ Calculations

θi	θr	$\sin\theta_i / \sin\theta_r$
30°		
40°		
50°		

Index of Refraction



Questions?

Snell's Law

Willebrord Snell
1591-1626

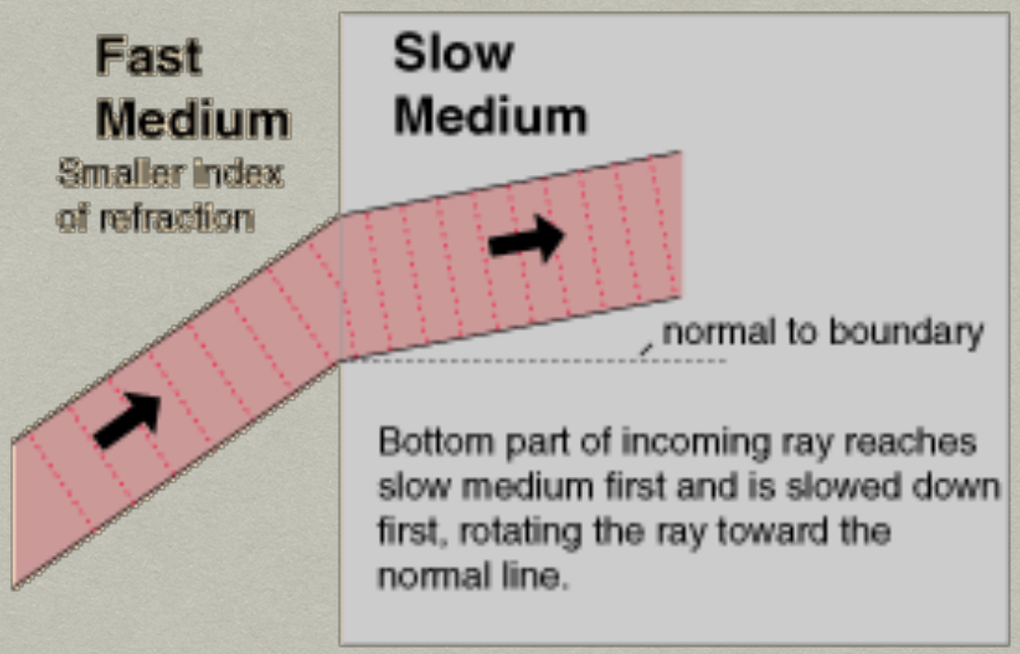
Index of Refraction:
a ratio of the speed of light in a vacuum to the speed of light in a medium

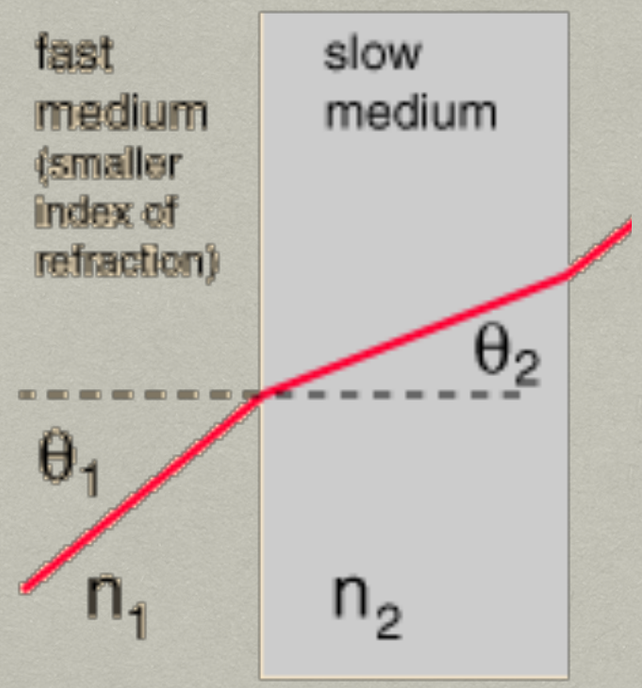
$$n = c / v$$

vacuum	n = 1.0
air	n = 1.0003
water	n = 1.33
glass	n = 1.5

Where the waves bend

$$n_g \sin\theta_g = n_a \sin\theta_a$$

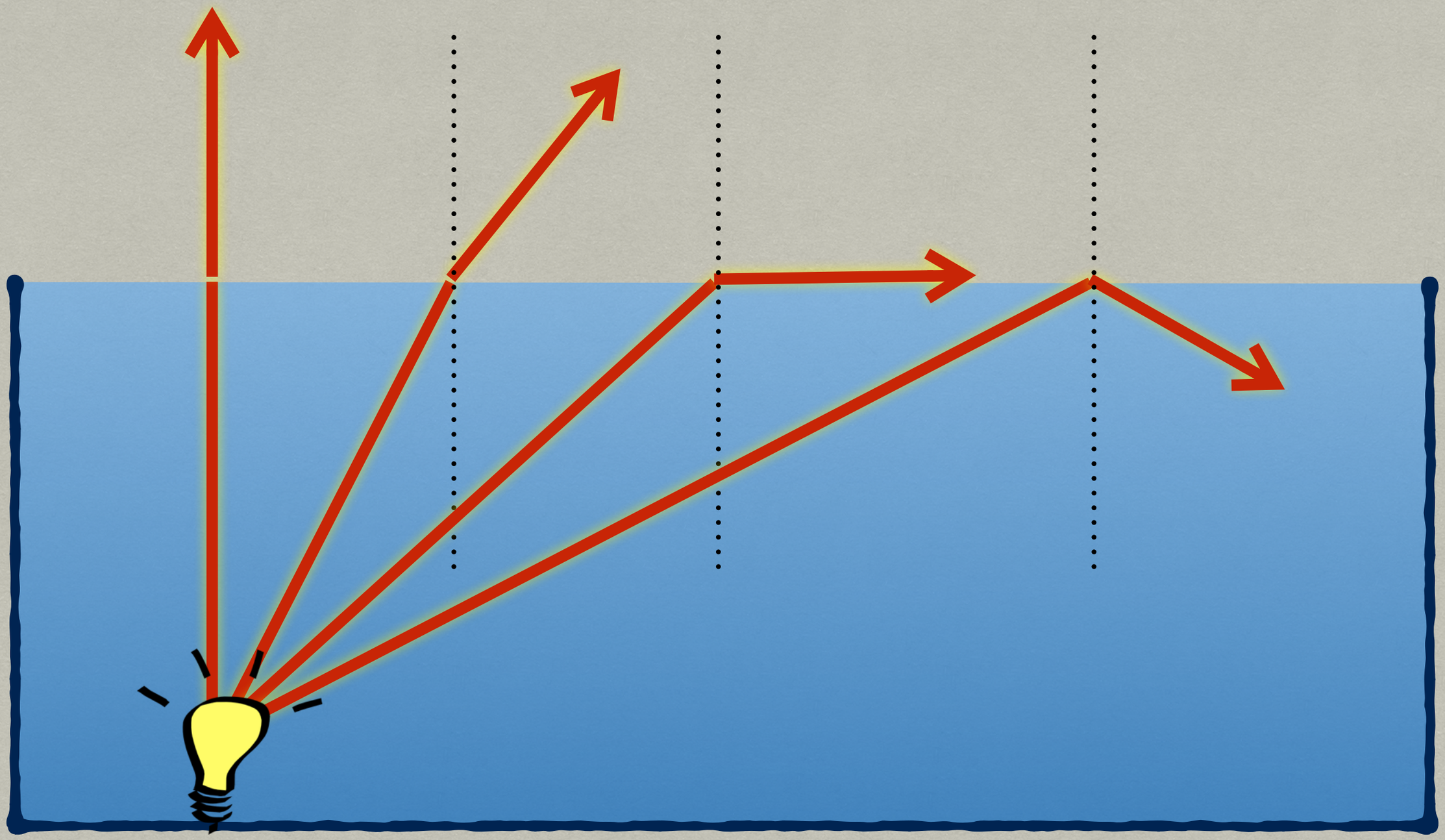




How do you skip a rock?

Think about it

Internal Reflection



The critical angle of incidence creates a 90° angle of refraction

Internal Reflection

Only occurs when light passes from a more dense into a less dense medium.

Occurs when the angle of incidence is greater than the critical angle