



A04-248E-Y11

Geometrical Optics Laser Kit

A. Reflection of light

01. Law of reflection
02. Optical lever principle
03. Reversibility of light
04. Deflection angle of a single mirror
05. Deflection angle of a sided mirror (less than 90°)
06. Deflection angle of a sided mirror (equal to 90°)
07. Deflection angle of a sided mirror (larger than 90°)
08. Field of view of a plane mirror (different eye positions)
09. Field of view of a plane mirror (different mirror sizes)
10. Focus determination of a convex mirror
11. Convex mirror imaging-object at infinity
12. Convex mirror imaging-object in front of the mirror
13. Aberration of a concave mirror
14. Aberration of a concave mirror-2
15. Determination of a concave mirror's focal length
16. Concave mirror imaging-object at infinity
17. Concave mirror imaging-object outside the center C of the sphere
18. Concave mirror imaging-object on the center of the sphere
19. Concave mirror imaging-object between the center C of the sphere and the focal point F
20. Concave mirror imaging-object on the focal point F
21. Concave mirror imaging-object inside the focal point F
22. Focal length measurement of a small-radius of concave mirror
23. Small radius concave mirror imaging-object on the center of the sphere C



B. Refraction of light

24. Refractive index – Refraction of semi-circular lens A
25. Refractive index – Refraction of semi-circular lens B
26. Refractive index – Refraction in a sink
27. Refraction of different mediums
28. Total reflection of light in the sink
29. Parallel glass blocks – parallel beam
30. Parallel glass bricks – divergent beam
31. Prism – parallel beam
32. Prism - divergent beam
33. Light refraction of glass tiles in parallel
34. Deflection angle prism
35. Total reflection prism
36. Determination of concave lens focus
37. Concave lens imaging
38. Determination of the focus lens
39. Convex imaging-object at infinity
40. Convex imaging-object outside the center of the sphere C
41. Convex imaging-object on the center of the sphere C
42. Convex imaging-object between the center C of the sphere and the focal point F
43. Convex imaging-object on the focal point F
44. Convex imaging-object inside the focal point F
45. Aberrations
46. Compound lens set

C. Real-World examples

47. Eye - Normal
48. Eye - Myopia
49. Eye - hyperopia
50. Camera principle
51. Periscope principle



Instrument

Accessory:

1. Normal eye lenses x1
2. Myopia lenses x1
3. Corrective lenses for myopia x1
4. Corrective lenses for hyperopia x1
5. Hyperopia lens x1
6. Convex and concave mirrors x1
7. Chromatic aberration lenses x3
8. Foldable mirrors x1
9. Plane mirror x2
10. Circular lens x1
11. Triangular prism x1
12. Semicircle prism x1
13. Parallel brick prism x1
14. Rectangular prisms x2
15. Laser source x1
16. Magnetic Whiteboard x1
17. Magnetic sink x1

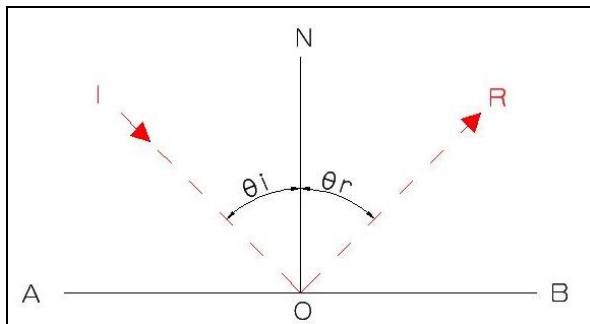
A. Reflection of light

01 · Law of Reflection:

Reflection, absorption and refraction occur when the light reflects to its plane regardless of the object surface.

Law of Reflection:

- (1) Incident ray, reflected ray and normal line all lie in the same plane.
- (2) The angle of reflection is equal to the angle of incidence: $\theta_i = \theta_r$



AB as the surface of mirror

IO as incident ray OR as reflected ray

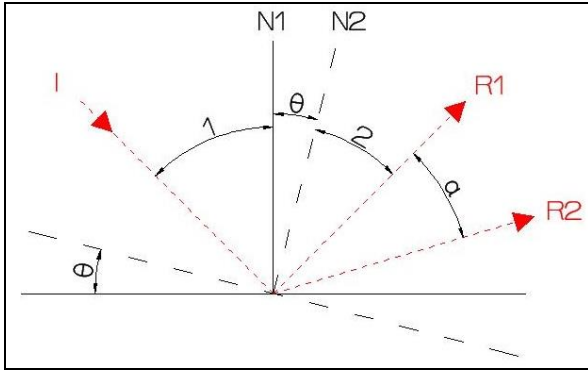
NO as normal line

θ_i as the angle of incidence

θ_r as the angle of reflection

02 · Optical lever principle :

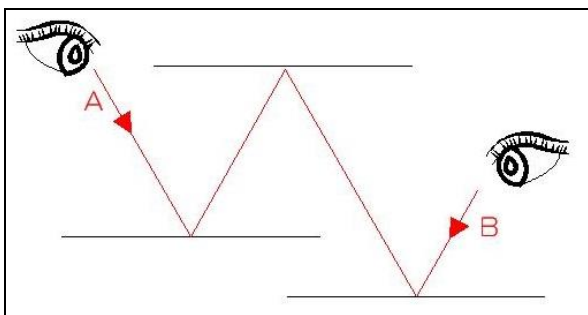
When a mirror rotates through an angle θ a beam of light reflected from it will rotate through an angle of 2θ .



$$\left\{ \begin{array}{l} N1 : \angle 1 = \theta + \angle 2 \\ N2 : \angle 1 + \theta = \angle 2 + \alpha \end{array} \right\} \Rightarrow \alpha = 2\theta$$

03. Reversibility of light :

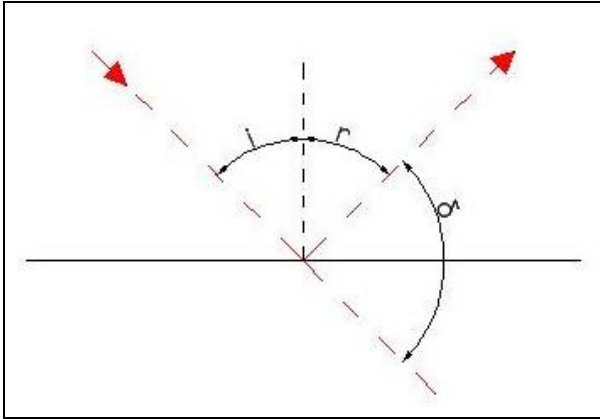
If A can see B through the reflections of mirror and B can see A through the same way, which is the reversibility of light.



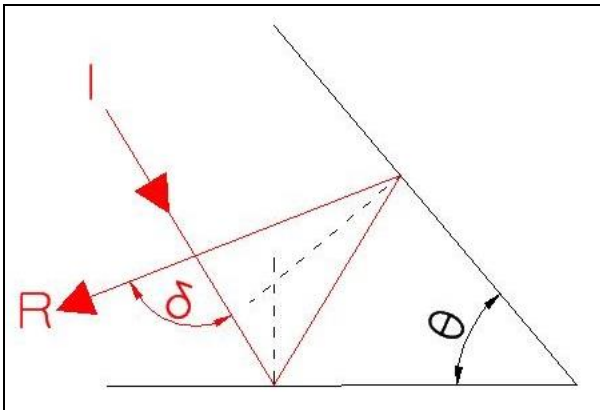
Angle of deflection :

The direction of the reflected light by plane mirror and the angle of the original incidence light.

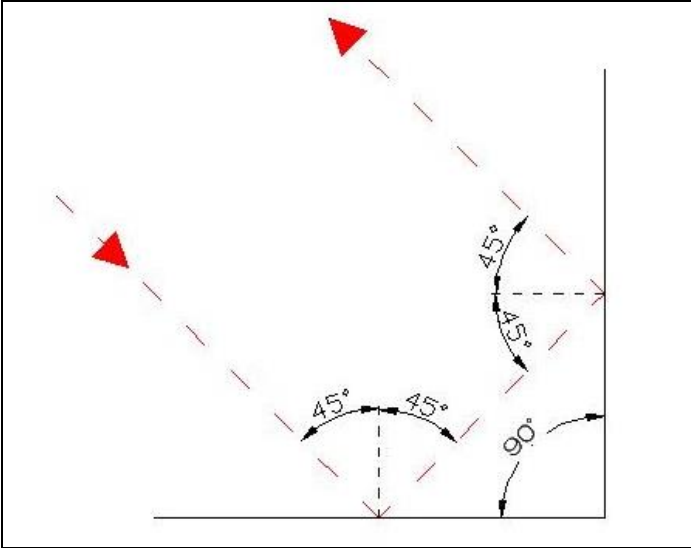
04. Single mirror ($\delta = 180^\circ - 2i$)



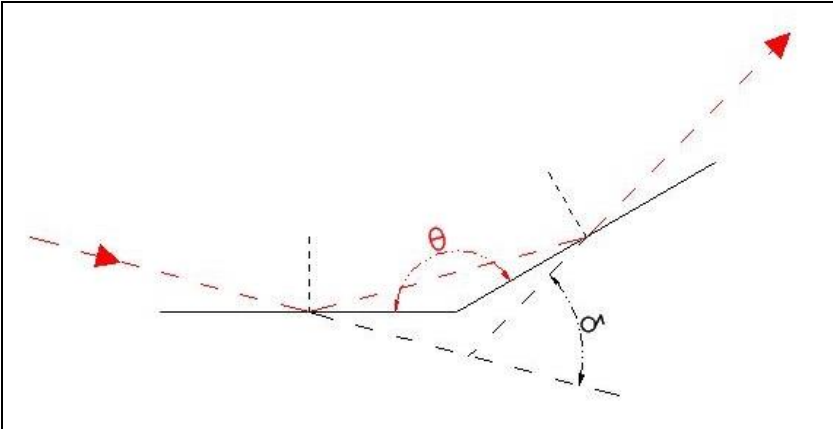
05. Sided mirror - less than 90° ($\delta = 2\theta$)



06. Sided mirror – equal to 90° ($\delta = 180^\circ$)



07. Sided mirror – larger than 90° : ($\delta = 360^\circ - 2\theta$)

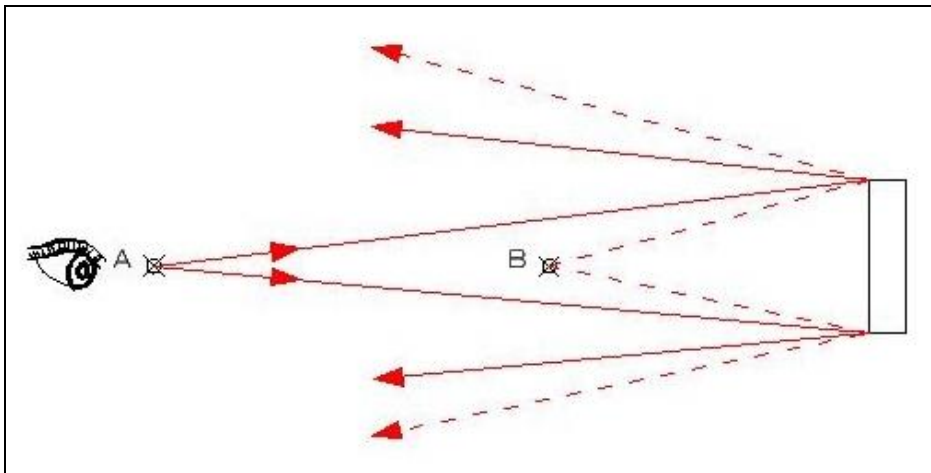


Field of view of a plane mirror :

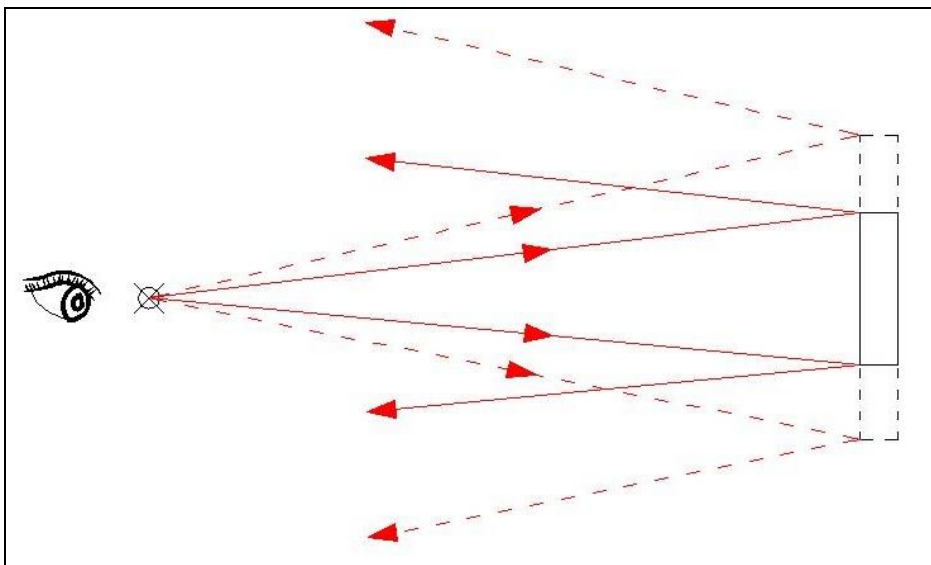
The visible imaging-object area of a plane mirror.

The size of the area is related to the size of the mirror and the eyes position.

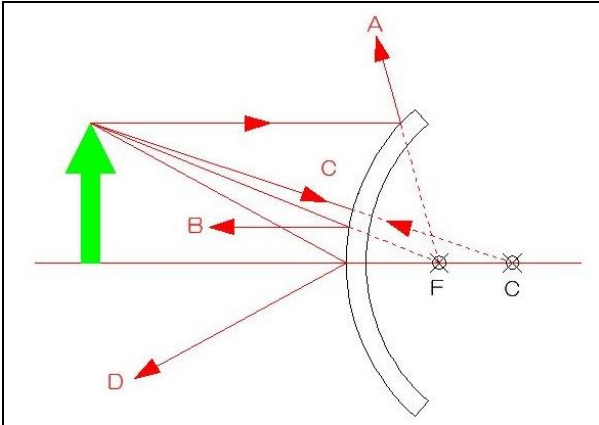
08. Different eye positions



09. Different mirror sizes



Convex mirror imaging-object diagram:



A : The incident light which parallel with the principal axis, after the reflection of the mirror, it's opposite extended line passes through the focal point.

B : The incident light heading to the focal point, after the reflection of the mirror, becomes parallel with the principal axis.

C : The incident light heading to the center of the sphere, after the reflection of mirror, it returns back along with the original path.

D : The incident light heading to the top direction of the mirror, after the reflection of light, the reflected light and the incident light symmetrized with the principal axis.

Focus determination of a spherical mirror :

10. Focus determination of a convex mirror -Projecting the parallel