

## Plane Mirror Reflection Activity - Laws of Reflection

In this activity you will investigate the relationship between the angle of incidence and the angle of reflection for a plane mirror. The goal is to investigate the first two laws of reflection.

### Problem:

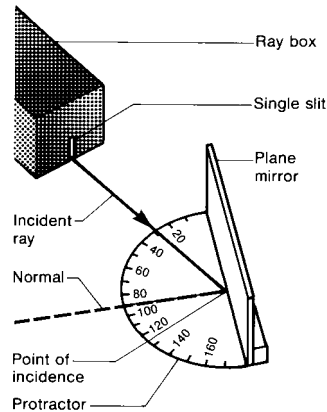
What is the relationship between the angle of incidence and the angle of reflection as measured from the normal (The Second Law of Reflection)? Are the incident ray, reflected ray, and normal in the same plane or different planes (The First Law of Reflection)?

### Materials:

- thin protractor
- ray box
- plane mirror
- mirror stand
- paper
- pencils

### Procedure:

1. Draw a table to record values. Three columns please with the headings "Trial Number", "Angle of Incidence" and "Angle of Reflection". Your table will need five rows in addition to the column headings
2. Stand a plane mirror vertically on a piece of paper using the mirror stand and place a protractor in front of the mirror as shown in the figure.



3. Direct a single ray of light from the ray box to the mirror. Make the ray meet the mirror at the centre of the protractor scale. Draw the normal using a coloured pencil.
4. Record the angle of incidence and the angle of reflection in a table.
5. Move the ray box to get a different angle of incidence. Use the same point of incidence. Record the angle of incidence and the angle of reflection in your table.
6. Repeat step #5 for 3 more angles of incidence (five separate measurements in total). **Appropriate angles of incidence are 15°, 30°, 45°, 60° and 75°.**
7. Draw a scaled diagram for **ONE** of your observations in the above steps. Label as fully as possible. Use a full page!
8. Replace the single slit of the ray box with a multiple slit. Adjust the ray box until the incident rays are parallel.
9. Using a angle of incidence of 45° observe and compare the angle of incidence and the angle of reflection for all of the rays.
10. Draw a full page diagram that matches your observations from step #9. Label fully
11. Using either the single our multiple slit, vary the angle that the ray box makes with the surface of the desk in order to fully appreciate the second law of reflection - see problem section.
12. Place all equipment back exactly as you found it. Be sure that the cord is NEATLY wrapped around the light box!

## Discussion Questions:

1. Include the diagram from procedure step #7 that shows one incident ray and its reflected ray and of course the mirror. Include the normal, the protractor and the angles measured. Label completely.
2. Include the second diagram you have drawn from procedure step #10 to show the simultaneous reflection of five parallel rays. Please include five normals, one to accompany each point of reflection. Label completely (use the label incident rays and reflected rays to group all five rays).
3. State a conclusion that compares the angle of incidence with the angle of reflection. This is the Second Law of Reflection. Does it agree with the law as stated in your note.
4. What must be true before scientists are willing to call something a law?
5. The First Law of Reflection states that the incident ray, reflected ray, and normal all lie in the same plane. Does your experiment support this law? Explain. (Hint: Look up the meaning of the word "plane" if you do not know what it means.)
6. Do the Laws of Reflection hold when many rays strike the mirror at the same time?
7. How could a wave model of light help explain the Laws of Reflection.
8. A ball that bounces from a smooth surface obeys the Laws of Reflection provided it has no spin. Discuss the importance of this fact to a player of one of the following games: basketball, table tennis, tennis, billiards, handball.