Name _____ Date _____

SI Physics Lab #39 (60 pts)

Period _____ Mrs. Nadworny

Due Date _____

Reflection of Light

NO Lab Write-Up Required

Research Problem

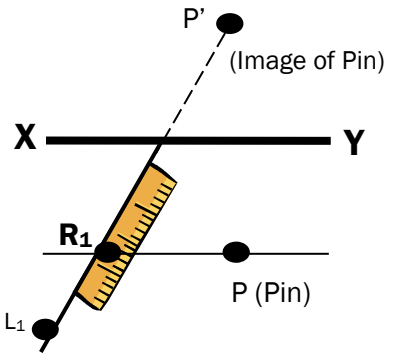
How does the law of reflection enable us to construct the image of an object in a plane mirror? You see an object when rays of light from the object enter your eye. If the rays of light from the object are reflected from a mirror before they enter your eye, you see an image of the object behind the mirror. The position of the image is determined by the law of reflection.

Materials

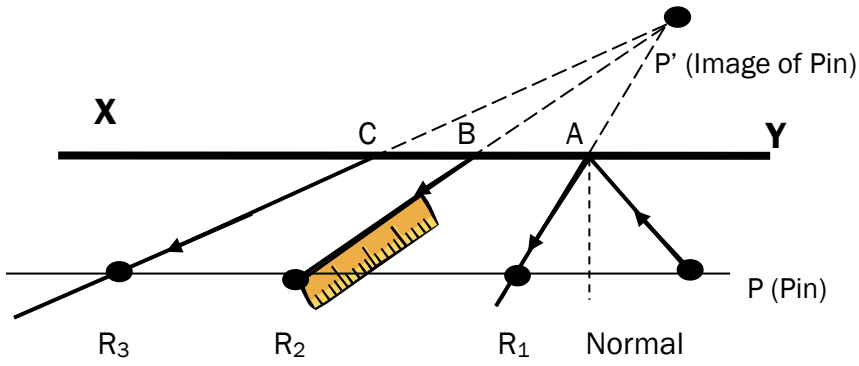
- Plane mirror
- Mirror Support
- Protractor
- Ruler
- Small piece of tape
- PENCIL
- Cardboard
- 3 Pins

Procedure

1. Carefully remove the last page of this lab. Write your name on it.
2. Support a plane mirror vertically by inserting it into a stand. Place the mirror on the paper so that the silvered surface coincides with the line XY. Use a small piece of tape to hold it in place.
3. Put a vertical pin at point P, on the line in front of the mirror.
4. Place a second pin at location R_1. Getting down on eye level, line up pins R_1 and P' (the image in the mirror of pin P). Place an additional pin (L_1) in the space between you and R_1 so that it is in line with R_1 and P'. (This should be along the pre-drawn line).

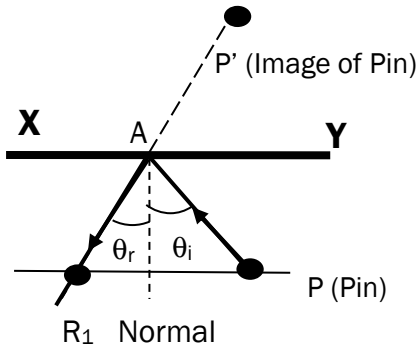


   - The line on which you are sighting is the direction of the reflected ray which seems to come from the image of P.
   - Pins R_1 and L_1 should already be connected by the pre-drawn line.
5. Move the pin from R_1 to location R_2. Getting down on eye level, line up pins R_2 and P'. Place pin L_2 in the space between you and R_2 in line with R_2 and P'. (If you are unsure if you have correctly lined it up, ask for help before proceeding)
   - Use a ruler to connect pins R_2 and L_2.
   - DO NOT HIT THE MIRROR WITH THE RULER!



6. Move the pin from R_2 to location R_3. Getting down on eye level, line up pins R_3 and P'. Place pin L_3 close to the mirror in line with R_3 and P'. Remove pins R_3 and L_3. Use a ruler to connect the holes left by the pins.

7. Remove the mirror and pins from the paper.
8. Extend each of the lines representing the reflected rays to the line XY and then beyond until they intersect. If all three rays intersect at a point then they were drawn accurately. If they do not intersect, you will need to start over.
    - Verify with your teacher whether your diagram is acceptable or not.
9. Label the points where the reflected rays cross the line XY as A, B and C. (See diagram on page 1 for help.)
10. Draw lines PA, PB, and PC. (Connect point P to points A, B and C.) These are the paths of the incident rays corresponding to the three reflected rays.
11. At A, B and C, draw the normals to XY as dotted lines that extend in front of the "mirror", not behind. (Remember normal lines are drawn perpendicularly.)
12. Now, measure the angle of incidence and reflection to the nearest tenth of a degree. Record your data in the table below.
13. Calculate the difference between the two angles.
14. Attach your diagram to this lab. (20 pts)



Data Collection (10 pts)

Incident Ray	Incident Angle (deg)	Reflected Angle (deg)	Difference in Angles (deg)
	± _____	± _____	
PA			
PB			
PC			

Post-Lab Questions Answer the following questions in the space below. If you need more room use a separate piece of paper. Show all work!

1. Look at the difference in angles in the data table. Does your data verify the law of reflection within the limits of experimental error (± 3°)? Explain. (3 pts)

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2. Identify a possible source of error. State what the error was. Explain how it occurred. Explain how it affected your data/diagram (angles). Explain how it affected your final result (difference in angles). (4 pts)

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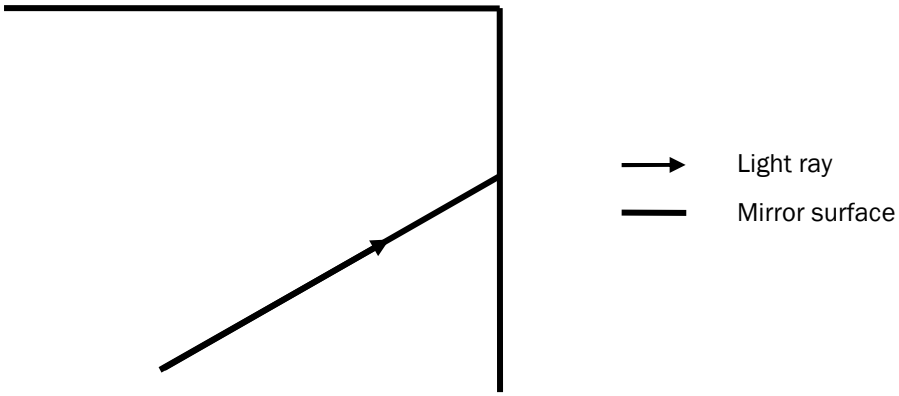
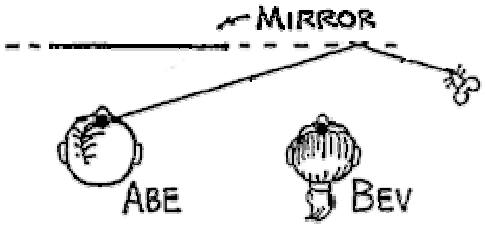
3. Two vertical mirrors are hinged so they form a right angle. Use the diagram below to show that the horizontal ray of light which is incident upon the first mirror will then reflect and fall upon the second mirror where it is reflected back out in a path parallel to the incident ray. Label the value of each incident and reflected angle for both boundaries. (6 pts)



Abe and Bev both look in a plane mirror directly in front of Abe (left). Abe can see himself while Bev cannot see herself - but can Abe see Bev, and can Bev see Abe? To find the answer we construct a ray diagram. If a light ray drawn from Abe to Bev with $\theta_i = \theta_r$ meets the mirror, then they can see each other.



4. Can Abe see the mouse? Explain. (2 pts)

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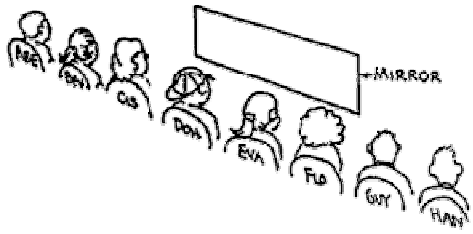
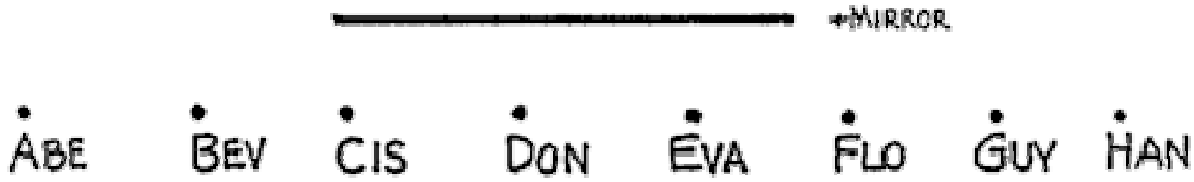
Refer to the following information for the next three questions. (15 pts)

Here we have eight students in front of a small plane mirror.



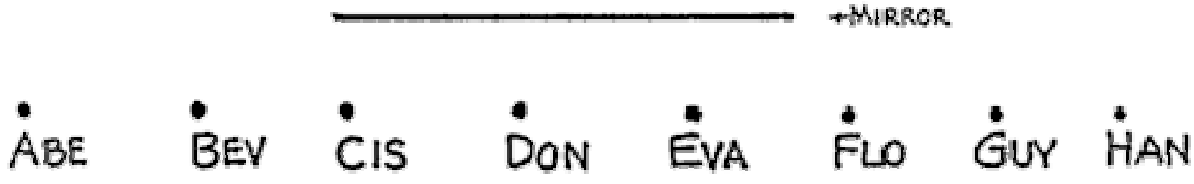
Their positions are shown in the accompanying diagram. On the diagrams below draw a line from the person *looking* to the far *left* side of the mirror. Draw the reflected ray using $\theta_i = \theta_r$. Then draw a line from the person *looking* to the far *right* side of the mirror. Draw the reflected ray using $\theta_i = \theta_r$. Everyone between those two reflected rays can be seen by the person looking.

5. Who can **Abe** see? (select all that apply)



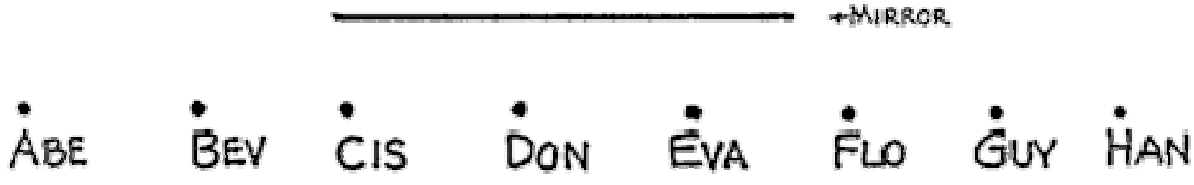
A) Abe B) Bev C) Cis D) Don E) Eva F) Flo G) Guy H) Han

6. Who can **Don** see? (select all that apply)



A) Abe B) Bev C) Cis D) Don E) Eva F) Flo G) Guy H) Han

7. Who can **Guy** see? (select all that apply)



A) Abe B) Bev C) Cis D) Don E) Eva F) Flo G) Guy H) Han

Name _____