

### Ray Diagrams

Read from **Lesson 2** of the **Reflection** chapter at **The Physics Classroom**:

<http://www.physicsclassroom.com/Class/refln/u13l2d.html>

**MOP Connection:** Reflection and Mirrors: sublevel 3

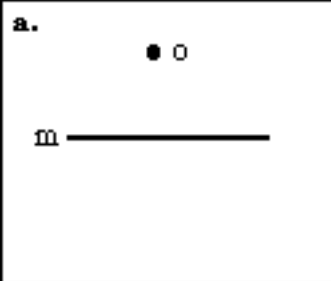
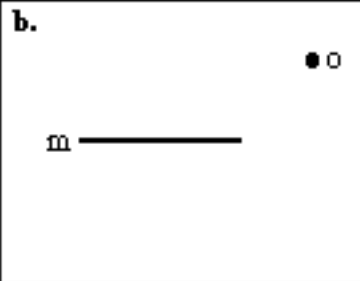
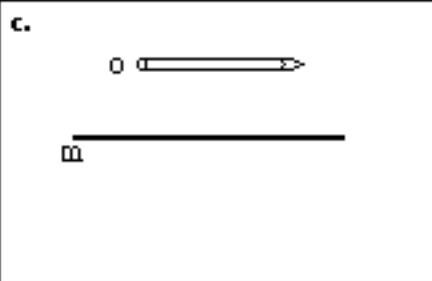
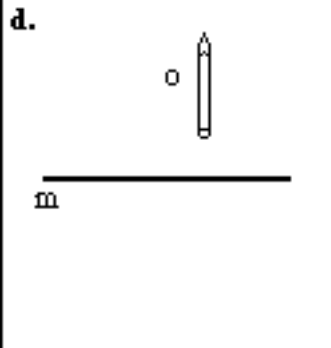
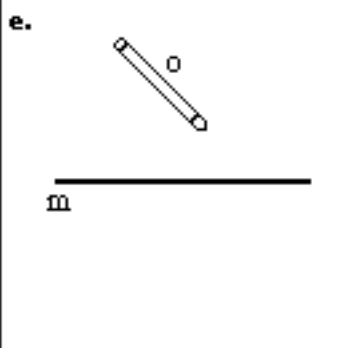
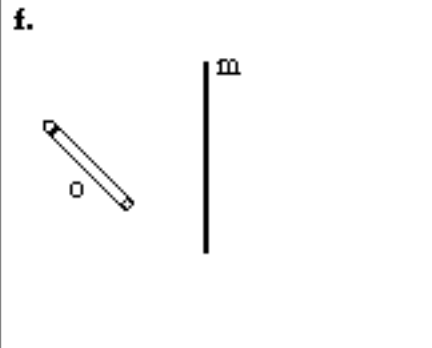
#### Four Steps to Drawing Ray Diagrams

Plane mirror ray diagrams show how light travels from an object to the mirror to an eye in order for the eye to view the image of the object. There are four steps to the construction of a ray diagram.

- i. Draw the image of the object.
- ii. Pick one extreme on the image of the object and draw the reflected ray that will travel to the eye as the eye sights at this point.
- iii. Draw the incident ray for light traveling from the corresponding extreme on the object to the mirror.
- iv. Repeat steps ii and iii for all other extremities on the object.

#### Locating Images

1. Locate all of the images for the following objects (labeled "o") as produced by the mirror (labeled "m"). Consider steps 1 and 2 above.

<p><b>a.</b></p> 	<p><b>b.</b></p> 	<p><b>c.</b></p> 
<p><b>d.</b></p> 	<p><b>e.</b></p> 	<p><b>f.</b></p> 

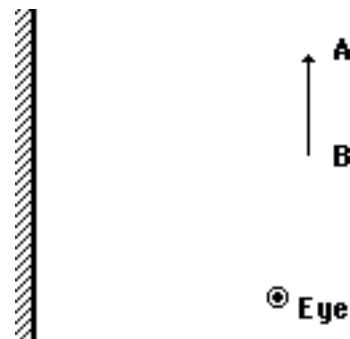
## Light, Reflection and Mirrors

### Drawing Ray Diagrams

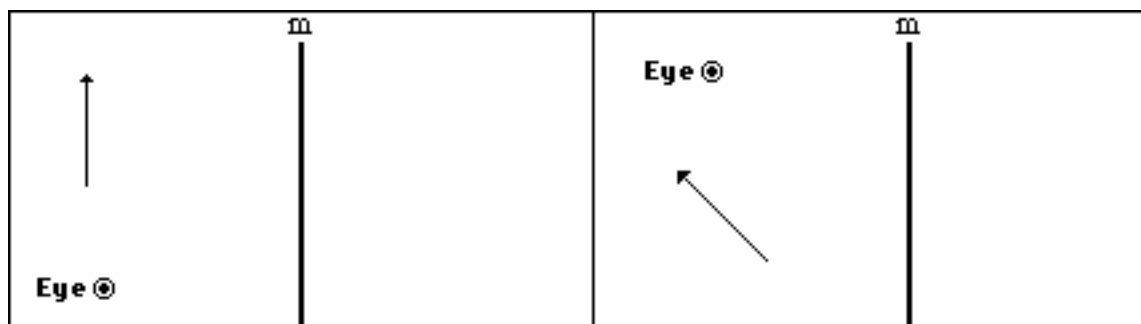
Questions #2 - #11 provide a detailed procedure for the completion of a ray diagram.

The diagram at the right shows an arrow (the object), a plane mirror, and an eye. Use this diagram and a ruler/straight edge to do the following steps.

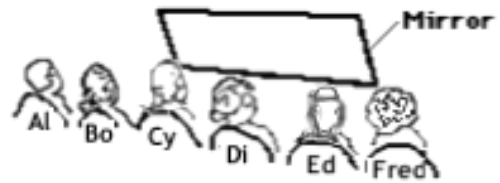
- Locate the image of points A and B. Label these points as A' and B'.
- Draw in the complete image. Compare the size of the image to the size of the object.
- If the eye is to see A by looking in the mirror, then the eye must sight along a line at the image of A (i.e., A'). Draw the reflected ray which reaches the eye as it sights at A'. Use a solid line and an arrowhead.
- Extend this reflected ray beyond the mirror using a dashed line to show that the eye is sighting along a line directly at A'.
- The light that follows the path shown by the reflected ray originated from point A. Show this by accurately drawing the incident ray that starts at point A and approaches the mirror. Be sure to use a solid line and put an arrow upon the ray.
- Repeat steps #4-#6 in order to show how light travels from point B to the mirror and reflects towards the eye as the eye sights along a line at B'.
- On the diagram, label the point on the mirror where the incident ray from A reflects from the mirror with the letter "x".
- On the diagram, label the point on the mirror where the incident ray from B reflects from the mirror with the letter "y".
- Points "x" and "y" represent the points on the mirror which would be needed to view point A and point B on the object. Where will any other ray from the object reflect from the mirror before traveling to the eye?
- What parts of the mirror could be removed without interfering with the eye's ability to see the entire image of the arrow? Circle these sections of the mirror.



- For the following *objects*, (a) draw the corresponding *images*, and (b) draw and label the incident and reflected rays that would allow the eye to view the object in the mirror (labeled "m").

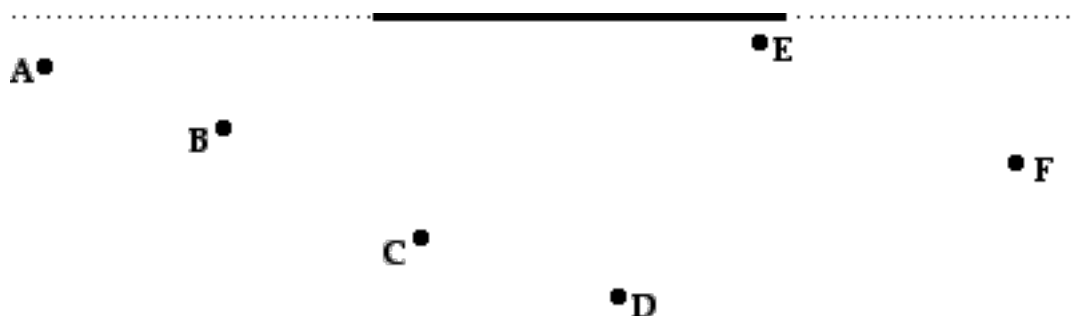


13. Front row students Al, Bo, Cy, Di, Ed and Fred are looking into a 4-foot long mirror that the teacher strategically placed on the demonstration table. Their positions are shown in the diagram below. In the diagram, locate their images and complete the given statements.



- |               |       |                 |       |
|---------------|-------|-----------------|-------|
| Al can see... | _____ | Di can see...   | _____ |
| Bo can see... | _____ | Ed can see...   | _____ |
| Cy can see... | _____ | Fred can see... | _____ |

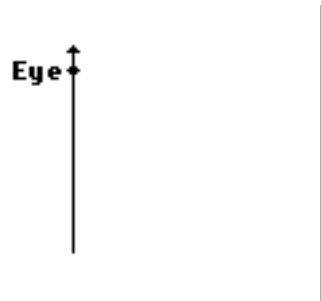
14. The teacher asked the six students to assume different positions in the room. Their positions are shown below. Determine and label the image locations and complete the given statements.



- |               |       |                 |       |
|---------------|-------|-----------------|-------|
| Al can see... | _____ | Di can see...   | _____ |
| Bo can see... | _____ | Ed can see...   | _____ |
| Cy can see... | _____ | Fred can see... | _____ |

## Light, Reflection and Mirrors

15. Consider the mirror and the stick person shown in the two diagrams below. The distance between the mirror and the person is different in the two diagrams. For each diagram, accurately draw and label the image of the stick person in the appropriate position. Finally, draw lines of sight from the eyes of the stick person to the mirror in order to indicate which portion of the mirror is needed to view the image. Use a ruler/straight-edge and be precise.



16. Compare the height of the stick person to the length of mirror needed to view the stick person. Make some measurements (from the diagram above) and record below.
17. Does the distance from the stick person to the mirror seem to affect the amount of mirror that the person needs to view the image? \_\_\_\_\_ Explain and support your answer using numerical values taken from question #15 above.