Optics Bench – Curved Mirror Image Characteristics

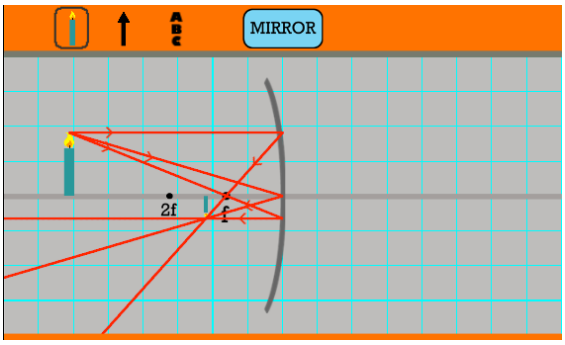
Purpose: To investigate the effect of varying object location upon the characteristics of the images formed by a concave and a convex mirror.

Getting Ready: Navigate to the **Optics Bench** simulation found in the **Physics Interactives** section of **The Physics Classroom**.

http://www.physicsclassroom.com/Physics-Interactives/Reflection-and-Mirrors/Optics-Bench

Navigation:
www.physicsclassroom.com => Physics Interactives => Reflection and Mirrors => Optics Bench

Getting Acquainted:
By default, Optics Bench opens in **Lens** mode. Click on the Lens button to change to **Mirror** mode. You should observe a curved mirror with its principal axis, a candle, and three sets of incident and reflected rays. See diagram. Experiment with the environment in the following ways:



- Tap and drag the candle back and forth along the axis; observe how the image changes.
- Use the **focus** slider to change the focal length. Notice how **f** and **2f** change location. The **2f** point is the **Center of Curvature** location.
- Use the **height** slider to change the image height.
- Notice how the object can be changed into an arrow or a vertical column of letters (A B C).
- Notice how the incident rays can be toggled **ON** and **OFF**.
- Notice how the object can be dragged to the right side of the mirror – the convex side.

Observations:

1. **Concave Mirrors:** Use the sliders to set the focal length to approximately 30 cm and the object height to approximately 20 cm. Then drag the sliders to the various locations described in **Table 1**. For each location, practice the **L•O•S•T** art of image description - that is, describe the image **L**ocation, **O**rientation, **S**ize, and **T**ype. Record your observations using **Table 1** on the reverse side by circling the appropriate descriptor.

2. **Convex Mirrors:** Use same values of focal length and object height. Drag the object to the right side of the mirror and observe the image. The right side of the mirror is the **convex** side. Do the basic characteristics of the image depend upon where on the right side of the mirror that the object is placed? Experiment to find out. Practice the same **L•O•S•T** art of image description for a nearby and distant object position. Record your observations using **Table 2** on the reverse side by circling the appropriate descriptor.

Table 1 - Concave Mirror

	L•O•S•T art of Image Description			
Object Position	**Location**	**Orientation**	**Size**	**Type***
***Beyond* or *Behind* C** (more than 2f from the mirror)	At C (or 2F) *Beyond* or *Behind* C Between C and F *Behind* the mirror	Upright Inverted	Magnified Same Size Reduced	Real Virtual
At C (a.k.a., at 2f)	At C (or 2F) *Beyond* or *Behind* C Between C and F *Behind* the mirror	Upright Inverted	Magnified Same Size Reduced	Real Virtual
Between C and F (more than 1f from the mirror; less than 2f)	At C (or 2F) *Beyond* or *Behind* C Between C and F *Behind* the mirror	Upright Inverted	Magnified Same Size Reduced	Real Virtual
In front of F (less then 1f from the mirror)	At C (or 2F) *Beyond* or *Behind* C Between C and F *Behind* the mirror	Upright Inverted	Magnified Same Size Reduced	Real Virtual

* **Real images** are formed when reflected light rays ***converge*** at the image location. **Virtual images** are formed when light rays ***diverge*** after reflection.

Table 2 - Convex Mirrors

	L•O•S•T art of Image Description			
Object Position	**Location**	**Orientation**	**Size**	**Type**
Nearby Position (more than 2f from the mirror)	At C (or 2F) *Beyond* or *Behind* C Between C and F Between F and mirror	Upright Inverted	Magnified Same Size Reduced	Real Virtual
Distant Position (a.k.a., at 2f)	At C (or 2F) *Beyond* or *Behind* C Between C and F Between F and mirror	Upright Inverted	Magnified Same Size Reduced	Real Virtual