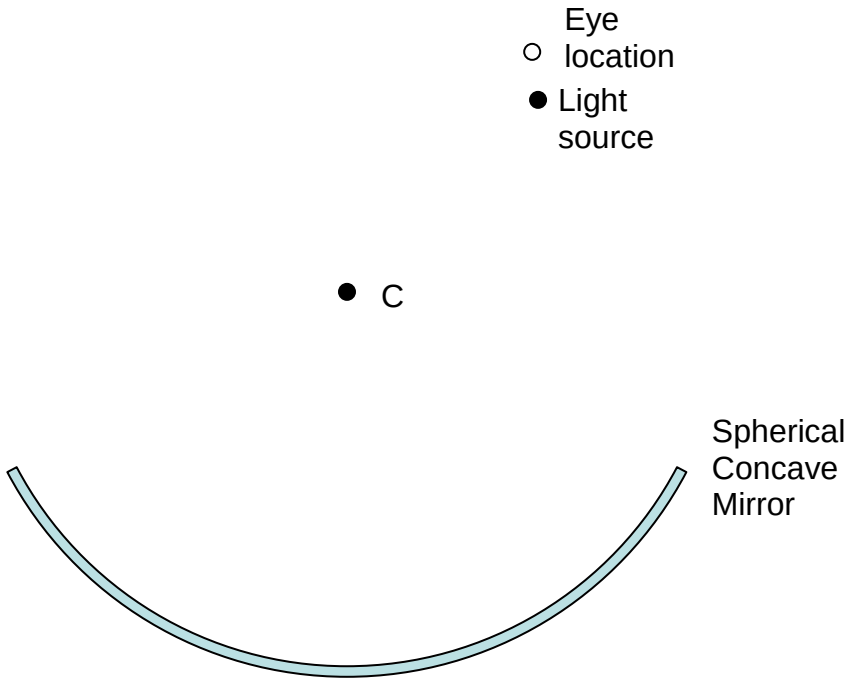
Pre-Lab 8

1) Where does the observer see the image of the cube? Defend your answer.

Plane
Mirror

2) Where does the image form (as seen by an eye at the indicate location) for the scaled diagram shown below? Note: the point labeled C is the center of curvature for the mirror. Make sure you indicate the image location on the diagram, and explain/show your reasoning.

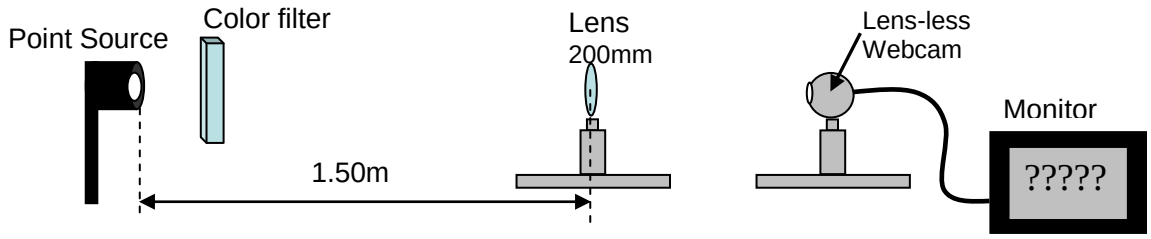


Lab 8

Section 1

You might remember from second semester physics that one can form images with mirrors and lenses. In this section you will explore some issues as to why one might want to use a curved mirror rather than a lens.

Set up the following. Use the Pasco point source with a strip "translucent" tape over the hole. Then attach a pinhole over the "translucent" tape to act as a point source. Use the 50mm diameter, 200mm focal length lens.

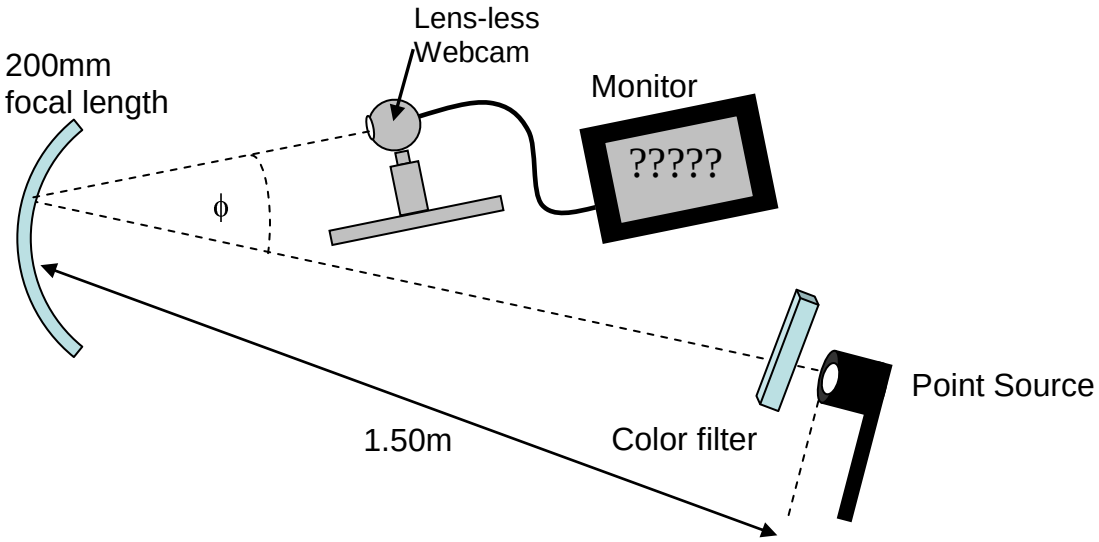


Adjust the lens and record the distance from the lens to the camera for the following circumstances. Make sure you readjust the focus each time. Note: you may have to adjust the shutter speed of the camera so that it doesn't saturate.

Filter	**Image Distance**
Red	
Green	
Blue	
No Filter (white light)	

Are all of the image distances the same? Should they be? Explain.

Now set up the following using a 200mm focal length concave spherical mirror. Try to keep the angle ϕ as small as possible.



Adjust the camera position and record the distance from the mirror to the camera for the following circumstances. Make sure you readjust the focus each time. Note: you may have to adjust the shutter speed of the camera so that it doesn't saturate.

Filter	**Image Distance**
Red	
Green	
Blue	
No Filter (white light)	

Are all of the image distances the same? Should they be? Explain.

Are there any differences between the tables you made for the mirror and the lens? Should there be a difference. EXPLAIN.

Chromatic aberration is an effect that occurs because light of one wavelength experiences a different index of refraction than light of another wavelength. In your results so far, do you have any evidence for chromatic aberration?

SHOW YOUR RESULTS TO YOUR INSTRUCTOR BEFORE CONTINUING.

Section 2

This section examines where an image forms for a plane mirror.

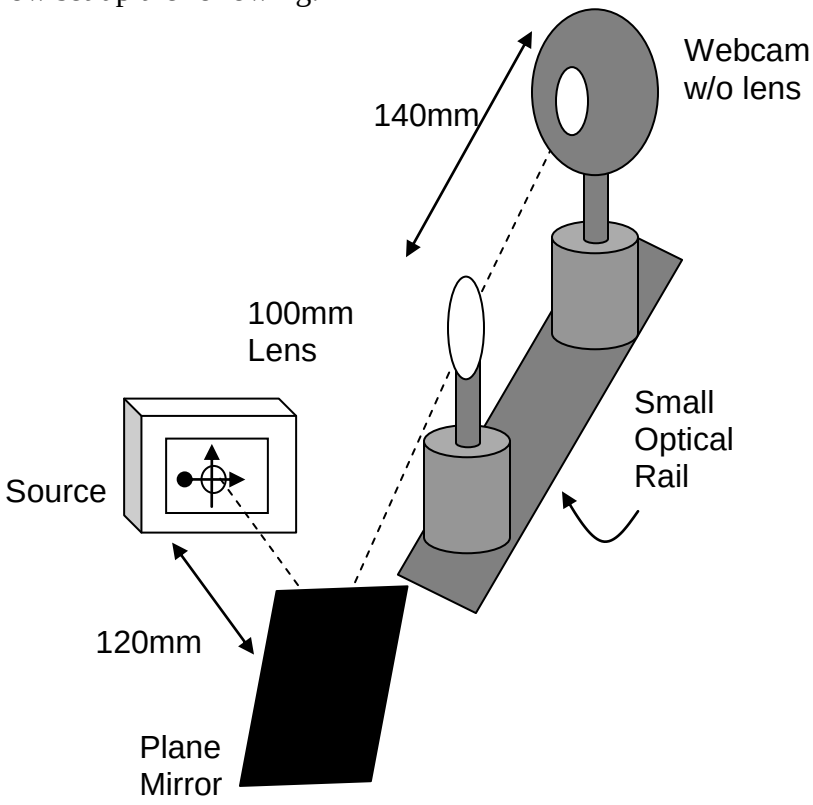
Draw rays and use the law of reflection to determine the image location of the cube.

Plane Mirror

Attach a small optical rail to a large rail cart. Then using rail carts, post holders, and posts, attach a 100mm focal length lens and webcam on the rail. Carefully adjust the lens and camera so that they are separated by 140mm. This is the same distance between the 100mm lens and webcam as you used when they were on the large optical rail in investigation 7.

If a clear image is on the monitor while using the 100mm lens – camera assembly, where is the image located in reference to the 100 mm lens? Hint: You did this in a previous investigation.

Now set up the following.

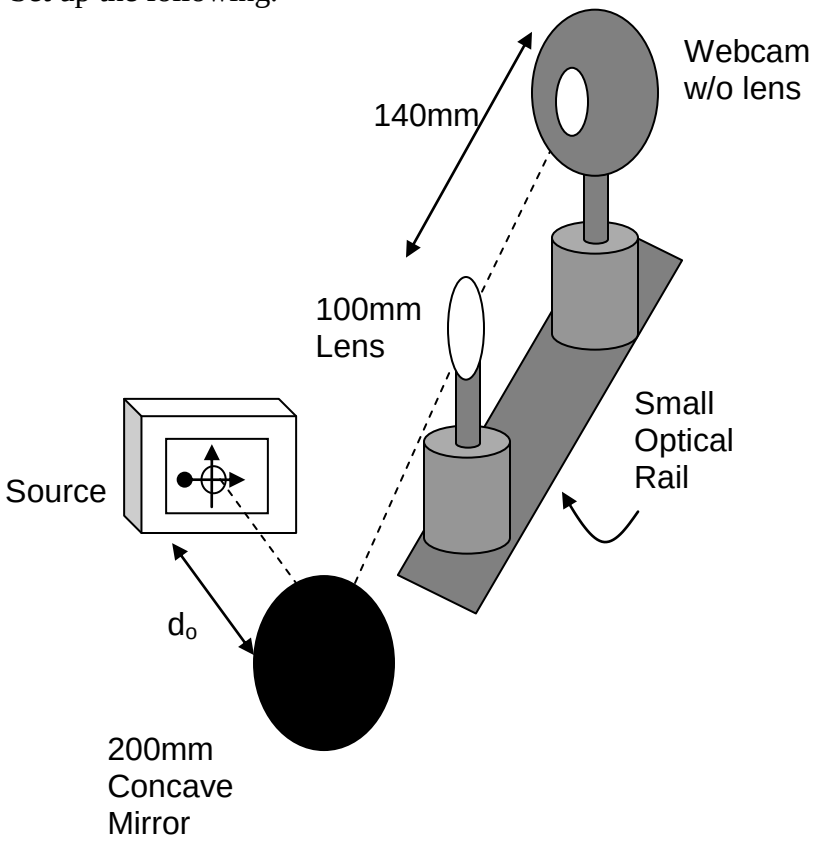


Where is the image from the plane mirror located? How do you know? Explain.

Section 3

This section examines where the image forms for a concave mirror.

. Set up the following.



Fill out the following table and take pictures of the image (printing them) each time. "d_i" is the distance from the concave mirror to where the image forms (as a result of the mirror). "x" is the distance from the 100mm focal length lens to where the image forms. To determine the magnification, find the ratio of the image size from the current set up to the image size from section I.

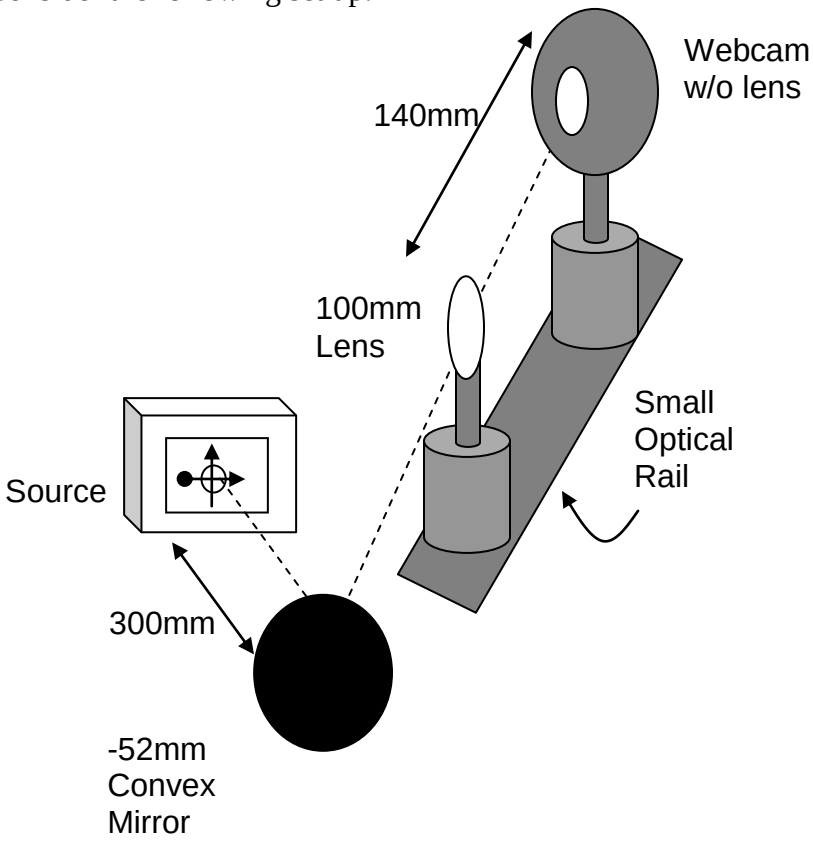
d_o	d_i	x	d_i / d_o	Magnification	Inverted?	Real/virtual
250mm						
350mm						
450mm						

How does the magnification change as d_o is varied? Why might you expect this?

Do d_o and d_i measurements behave differently for mirrors than they did for lenses? Explain.

Task

Consider the following set up.



Predict the location of the 100mm lens assembly relative to the mirror?

What will be the orientation of the image on the monitor (inverted, non-inverted, mirror reversed, or non-existent)?

SHOW YOUR PREDICTIONS TO YOUR INSTRUCTOR

Set up the apparatus and reconcile any discrepancies.