

Week 3 Challenge Homework

Ray Optics

Submission Details | Submit a digital copy (PDF, jpg, etc.) to Canvas. Include solutions to the metacognitive exercise and each question. Please use the interface to associate each page of your submission with the assignment. It makes grading much easier. Please clearly indicate which question is being solved. If data is needed to complete a problem, be sure to cite the source you've acquired your data from. Typed work will not receive credit. See the course website for further details.

Group Submissions | You may submit a group collaboration to Canvas. Add each group member to the submission. Each group member should contribute to the work. Clearly indicate which part of the submission is written by each member (color or labels are preferable).

Sensemaking | You will be asked to apply sensemaking in some problems. More information about sensemaking can be found on the BoxSand [Sensemaking](#) page, which is linked on the Canvas homepage.

Metacognitive Exercise

Each week will feature a metacognitive exercise, followed by one or two challenge problems to solve. The metacognitive exercise will usually ask you to reflect on your solution to the previous week's challenge problems.

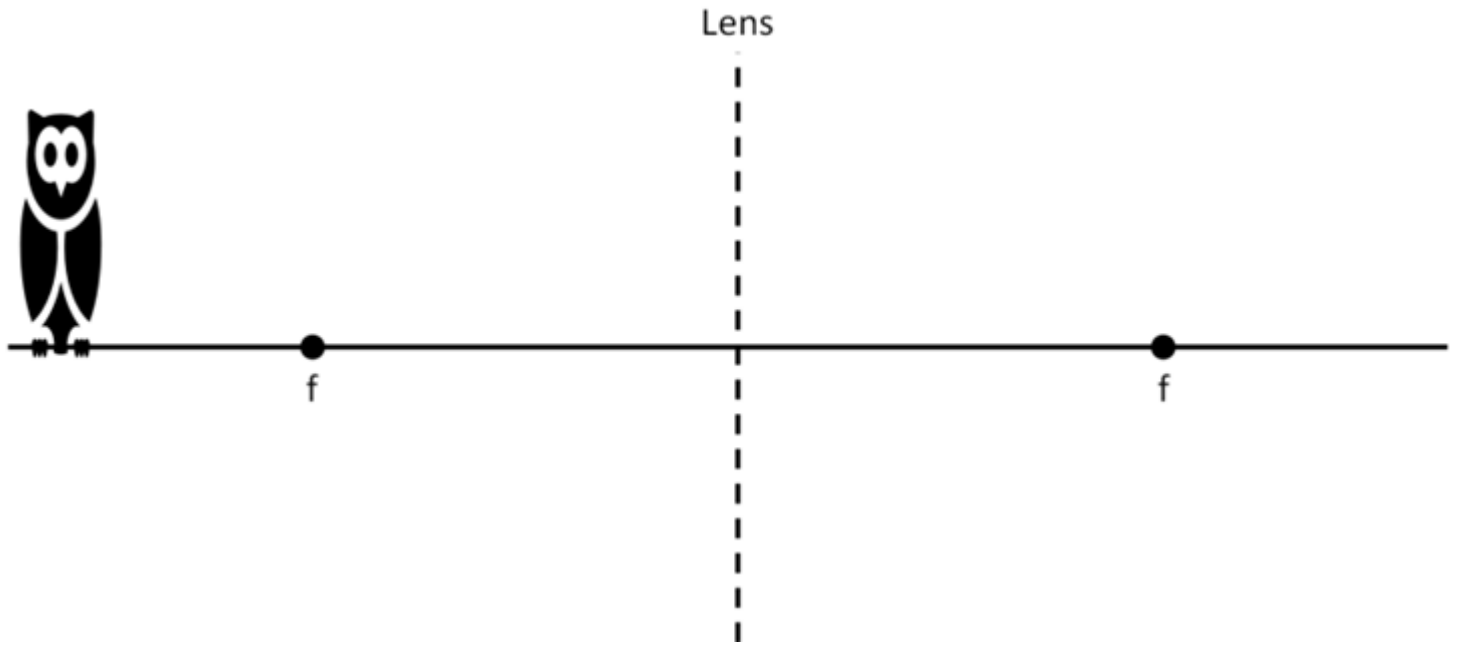
Review your solution to the Week 2 Challenge Homework. If you do not have a copy of it anymore, you can find it on Canvas or Gradescope, under the Week 2 Challenge Homework assignment. Also, review the solution which has been posted to the BoxSand solutions archive ([click here for a link](#)). Solutions are posted a few days after the assignment is due.

- (a) Think back through the exams you have taken in this sequence. Are there exams for which you felt more well prepared? What were the study methods you used for that(those) exam(s)? Did you study with others? How can you recreate those study methods for this coming exam?

Question 1

Owliver the barn owl is sitting, as shown, in front of a diverging lens with the pictured focal points.

(a) Using the provided optical axis (or a good copy), carefully and precisely draw a ray diagram to find the location of Owliver's image. Use a straight edge! Indicate where the image appears.



(b) Is the image real, or virtual? Explain how you determined this.

(c) Estimate the magnification of the image.

Question 2

Owliver the barn owl is sitting, as shown, in front of a diverging lens with the pictured focal points.

- (a) Owliver is sitting 80 cm from the lens, which has a focal length of 50 cm. Using the math representation, find the location of the image.
- (b) Using the math representation find the magnification of his image.
- (c) Use the related quantities sensemaking technique to compare your answers to Question 2 parts (a) and (b) with those found when studying the same problem with ray tracing in Question 1. Do this by answering the following prompts:
- Make a prediction for whether or not your answers should agree.
 - Explain your prediction. What made you think your answers should or should not agree?
 - Finally, compare your answers from parts (a) and (b) with the related answers in Question 1. Are the answers of the same order of magnitude? Does this support your prediction?

