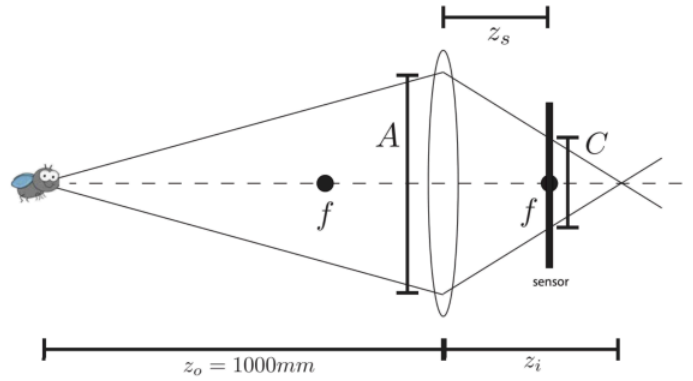


6. (Total : 12 points) Cameras, Lenses, Imaging

(6a) Consider the following diagram, which you may remember from discussion section. This diagram is not drawn to scale!



In this variant of that problem, assume that:

- $A = 25\text{mm}$
- $C = 2.5\text{mm}$

6a.i. [6 points] Calculate focal length f of this lens. Show your thinking and work for full or partial credit.

$f =$

- 6a.ii. [3 points] There is another sensor plane, call it z'_s , where the circle of confusion would be exactly the same size as shown here for z_s . What is that depth z'_s ? You can assume f is given. Show your work and you can round your answer to the nearest tenth of a millimeter.

$$z'_s =$$

- 6a.iii. [3 points] What are the main visual differences between the photographs obtained at the two depths?

(3c) Focus and Field of View.

In this problem, assume a thin lens model.

- 3c.i. [2 points] You want to take a photo of your friend. You intend to compose the photo as a portrait that shows exactly 1 meter of your friend's height (from waist to top of the head). You take the picture with a lens that has a focal length of 100mm on a camera with a 25x25mm image sensor. Rounded to the nearest meter, how far away from your friend should you stand to take the photo? Show your work. Hint: for this part of the question you can safely assume that the camera is focused at infinity.

Answer = (meters)

Show your work:

3c.ii. [2 points] Unfortunately your friend is hit by a shrinking ray gun, and ends up exactly 25 mm tall! You resolve to take a photo of your friend to document this tragedy, but now want your friend's full height to exactly fill the photo. How far away from the lens should you place your friend to take the photo? Show your work. Hint: for this part of the question you cannot assume the camera will be focused at infinity.

Answer = (millimeters)

Show your work:
