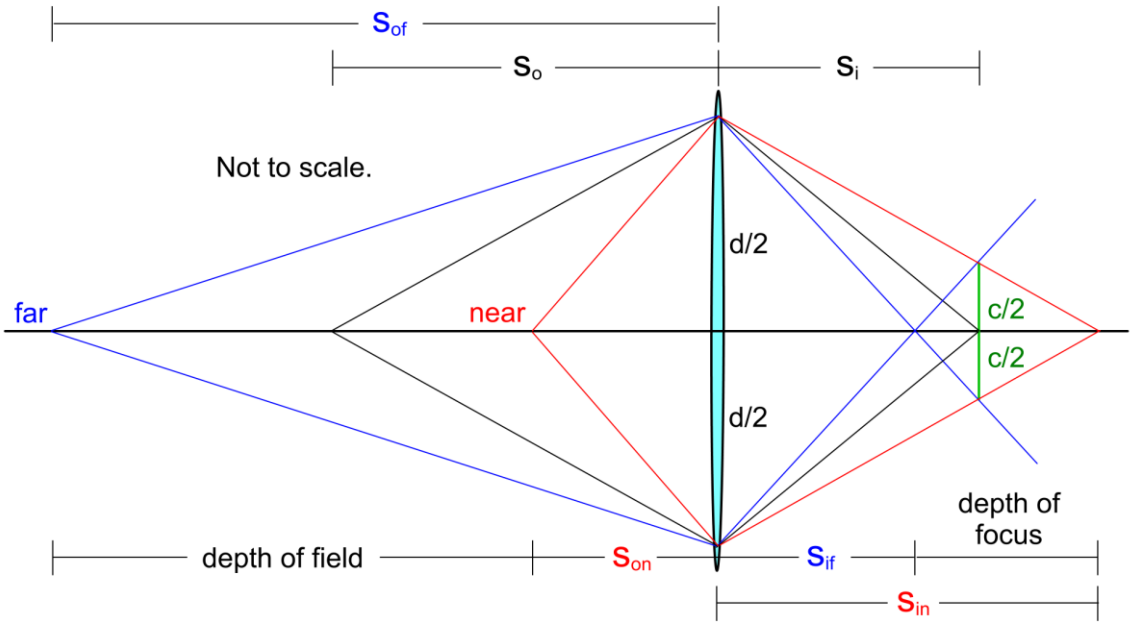
HW-G1. Depth of Focus.



In class we found the formula for the depth of field to be the following.

$$DoF = \frac{2fs_o dc(s_o - f)}{(fd)^2 - c^2(s_o - f)^2}$$

You are to find the formula for the depth of focus: $DoFocus$. Then give the specific depth of focus in mm from your formula to three significant figures for the case where

$$f = 50 \text{ mm}, \; f/\# = f/2, \; s_o = 2 \text{ m}, \; c = 50\mu\text{m}.$$

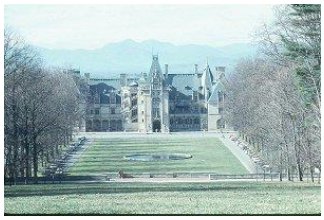
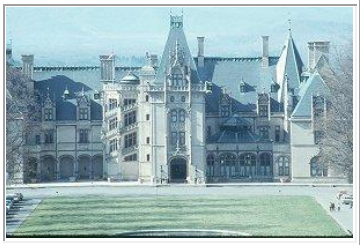
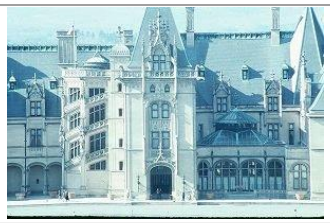
Finally, show that a good approximation to your exact formula is $DoFocus = 2c\#$.

[Grading: 4 pts for progress if neat, 3 points for the exact formula, 1 point for the numerical result correct to 3 significant figures, 2 points for the approximate formula derivation.]

HW-G2. Angle of View. Show that for telephoto focal lengths that the horizontal angle of view for 36 mm by 24 mm film dimension is approximately $\theta = \frac{2000°}{f \text{ (in mm)}}$. Then make a table for the focal lengths below, where you give the exact angle of view (show all work for one case) alongside the results of your approximate formula to two significant figures. Include the super wide-angle case to remind ourselves that the approximate formula is not true for wide-angle focal lengths. The approximate formula is restricted to telephoto lenses.

[Grading: 3 points for clean and neat derivation of the exact formula showing all steps, 3 points for clean and neat derivation of the approximate formula showing all steps, 4 points for the table with correct numerical results to two significant figures.]

The Biltmore House, Asheville, NC with Different Focal Lengths

		
f = 50 mm (40°)	**f = 100 mm (20°)**	**f = 200 mm (10°)**
		
f = 300 mm (7°)	**f = 400 mm (5°)**	**f = 400 mm (Raising the Camera)**
		
f = 500 mm (4°)	**f = 600 mm (3.4°)**	**f = 800 mm (2.6°)**
		
f = 900 mm (2.3°)	**f = 1200 mm (1.7°)**	**f = 1500 mm (1.7°)**
		
f = 1800 mm (1.1°)	**f = 8 mm (132°)**	