

61. (a) Parallel rays are bent by positive- f lenses to their focal points F_1 , and rays that come from the focal point positions F_2 in front of positive- f lenses are made to emerge parallel. The key, then, to this type of beam expander is to have the rear focal point F_1 of the first lens coincide with the front focal point F_2 of the second lens. Since the triangles that meet at the coincident focal point are similar (they share the same angle; they are vertex angles), then $W_2/f_2 = W_1/f_1$ follows immediately.
- (b) The previous argument can be adapted to the first lens in the expanding pair being of the diverging type, by ensuring that the front focal point of the first lens coincides with the front focal point of the second lens. The distance between the lenses in this case is $f_2 - |f_1|$ (where we assume $f_2 > |f_1|$), which we can write as $f_2 + f_1$ just as in part (a).