CSci 5607, Spring 2022 Name _____
Assignment 1d: Transparency and Reflections
Due: Monday March 28th Score (out of 100) _____

____ The program is capable of accurately capturing the effect of recursively-defined mirror reflections. At each relevant ray/surface intersection point, the program accurately calculates the *direction of reflection* ***R***, and recursively traces a ray in that direction. At each step in the recursion, the traced ray returns a correctly-computed intensity contribution, using an extended version of the Phong illumination model with all of the other relevant vectors ***N***, ***L***, and ***H*** accurately defined at each step in the recursion (in particular, remembering that the vector ***V*** always points towards the eye, and not necessarily towards the previous ray origin). The intensity contribution of each recursively reflected ray is appropriately incorporated into the final color computed at each relevant ray/surface intersection point. (30 pts)

____ The program is capable of accurately capturing the effect of view distortion through transparent materials. At each relevant ray/surface intersection point on a transparent surface, the program accurately calculates the *direction of transmission* ***T***, and recursively traces a ray in that direction. At each step in the recursion, the traced ray returns a correctly-computed intensity contribution, using an extended version of the Phong illumination model with all of the other relevant vectors ***N***, ***L***, ***H***, and ***R*** accurately defined at each step in the recursion (in particular, remembering that the vector ***N*** will need to be appropriately reversed when a ray hits the "back-facing" side of a transparent interface while exiting a solid object). (25 pts)

____ Total internal reflection is robustly handled, and the correct index of refraction is used when a ray is leaving versus entering a solid transparent material. (15 pts)

____ The program uses Schlick's approximation of the Fresnel reflectance to determine the relative contributions of the colors returned by the reflected and transmitted rays when computing the illumination at a ray/surface intersection point on a transparent surface. (10 pts)

____ The intensity contributions of the reflected and refracted rays are appropriately incorporated into the final color computed at each relevant ray/surface intersection point. In particular, images provided by the student demonstrate their ability to reasonably approximate the appearance of a transparent or partially transparent material by using an appropriate opacity or absorption parameter α, along with appropriately defined values for the other material property parameters. (5 pts)

____ The program accounts for the fact that transparent objects do not fully block all incoming light by extending the concept of the shadow flag to accommodate fractional values, depending on the opacity of any transparent objects encountered between the ray/surface intersection point and the light source. Shadows become appropriately darker when multiple intervening transparent objects are encountered. (5 pts)

____ The student has submitted at least one creative, original scene file, along with one or more accompanying images that successfully demonstrate all of the capabilities of the program. (10 pts)

____ The program has been extended to enable depth of field effects, and the student has provided an image, created by their program, that highlights this capability. (5 pts extra credit)