

1. What is the mirror image of a point? In more mathematical terms this corresponds to asking what is the *reflection* of the point about a plane (the mirror). The following problem is actually this in disguise and is crucial for working with lighting graphics.

Given a reflective plane specified by its normal,  $\mathbf{N}$ , and a point  $p$  that we bounce light off, if we know  $s$ , the location of a light source, what will be the direction vector of the reflected light?

2. In a First Person Shooter (FPS) game one of the most basic operations in our game will be the need to find what object gets hit when we fire the gun. If we have a gun at some location, firing in some direction, develop a test that detects whether the bullet fired from the gun will pierce a polygon. The polygon will be given as an array of points that lie on some plane and we will also be given the direction the normal points in.

First, develop a quick test to eliminate back facing polygons. Then, if a polygon is front-facing, proceed with the main test. The main test will involve finding the point where the bullet pierces the plane that the polygon lies on and then testing if that point lies inside the polygon. (Some interesting discussions of this last part of the problem can be found [here](#).)

In the next few lectures we will see the importance of “ray tracing” for implementing realistic scene lighting. The idea will be the same as what we have considered here.