A. Bending Light using plexiglass shapes: In each of the following diagrams, imagine that the arrow represents a single ray of light hitting a thick piece of plexiglass.

In the above diagram, a plexiglass rectangle is placed at different angles compared to the incoming ray of light. Notice that the outgoing ray of light is parallel to the incoming ray of light in each case. Light passing through two parallel surfaces will get shifted, but still travel in the same direction. We cannot use a rectangular piece of plexiglass to focus light rays, because they would all get shifted by the same amount.

Now, the outgoing ray of light is going in a different direction from the incoming ray of light. This is because the incoming surface and the outgoing surface are not parallel to each other. However, we still cannot focus light this way. To make several rays of light come together, we need a curved surface, such as a lens. Each ray of light that hits the lens will get bent by a different amount, so that they all come together at a point known as the “focus” of the lens.
B. Reflecting Light using mirrors

In the case of flat mirrors, the incoming ray of light will get reflected at the same angle that it hit the mirror with. Just as with flat surfaces of plexiglass, flat mirrors cannot focus light, only change its direction.

This diagram shows what happens when several rays of light hit a spherical mirror. Notice that the two outermost rays of light come to a point at one location, and the innermost rays of light come to a point at a different location. There is not one single focus point, as we saw with the plexiglass lens. This effect is called “spherical aberration”, and results in blurry images. It is typical with spherical mirrors, so most research-grade telescopes use a parabolic mirror instead of a spherical mirror.

In the above diagram, we showed multiple rays of light traveling parallel to one another and hitting the surface of the mirror. This accurately represents how light travels when it is coming from a source of light that is very far away from the observer, such as a star. Rays of light from a nearby source spread out from each other (diverge), as shown on the left. Rays of light from more distant source of will appear less spread out, or more nearly parallel (they diverge less), as shown in the center. If we are looking at an extremely distant source of light, the rays of light will appear perfectly parallel (they do not diverge at all), as shown on the right.