## Refraction Investigation

## Instructions:

1. Place the medium (glass, acrylic, or gelatin) in the middle of a piece of white paper.
2. Trace the outline of the medium and then remove it from the paper.
3. Draw a line perpendicular (normal line) to the new medium along one of the longer sides a little off from center.
4. Measure a $30^{\circ}$ angle from the normal line and draw a line with a colored pencil.


Image by WestEd [CC BY-NC-SA 4.0] of the tracing) and shine the laser along the $30^{\circ}$ line that you drew. Trace the laser light that comes out the other side.
6. Connect the inside ray to the outside rays.
7. Make a new normal line on the other side of the medium that is perpendicular to the surface.
8. Measure all of the angles that the rays make with the normal lines.
9. Using different colored pencils, repeat this process for $45^{\circ}$ and $60^{\circ}$.

| Initial Angle | Angle 1 | Angle 2 | Angle 3 |
| :---: | :--- | :--- | :--- |
| $30^{\circ}$ |  |  |  |
| $45^{\circ}$ |  |  |  |
| $60^{\circ}$ |  |  |  |



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## Questions:

1. What patterns do you find between the angles for a given situation (i.e., for only the $30^{\circ}$ initial angle situation)?
2. What patterns do you find as you increase the first angle?
3. What do you attribute to these patterns?
4. Make a prediction for the angles you think would take place if the first angle were $10^{\circ}$. What evidence helps you make this prediction?
5. Make a prediction for how you think your angles would change if we replaced the medium with one that was denser than the one you used.
