

Announcements

- Project team and abstract due Oct 8, IN CLASS.
- MP2 is due Oct 1.
- MP3 will be out on Oct 6.
- Reading: Chapter 6 by Mather

4D Minecraft

- Ultimate exploration: to a new dimension!
- Build your own 4D living room - with 4D blocks. Start simple - see if you are comfortable inside of the 6 walls, then add on furniture :)
- Contacts: lead student: Julius Chuang <jbchuan2@illinois.edu>, prof. Francis Wang



Global Stock Market Data Visualization

- Meet with Jeff Ludwig, the director of Jump Labs.
- Learn the needs of the cutting edge trading company and bring visualization models to the next (VR) level.



VR Robots Dancing Together

- Consider a set of robots/platforms that have a wildly different number of appendages/actuators and other physical characteristics – how would they dance together? How would they complete similar tasks?
- Make seemingly different creatures dance together using the freedom produced by virtual reality.
- Contacts: prof. Amy Lavers <alavers@illinois.edu> Robotics, Automation, and Dance (RAD) Lab, Mech. Eng. Department, UIUC



<https://www.youtube.com/watch?v=opokUHsDXqI>

Study Human Behavior Through Playing Minecraft

- Learn human behavior through a fun game.
- Develop a plugin that will enable scientists in psychology to monitor player behavior in an online game.
- Collect variable, such as in-game location and reaction time to events, and learn how to vary parameters of the game to control these variables.
- Contact: Cybelle Smith <cmsmit13@illinois.edu> (PhD student in psycholinguistics).

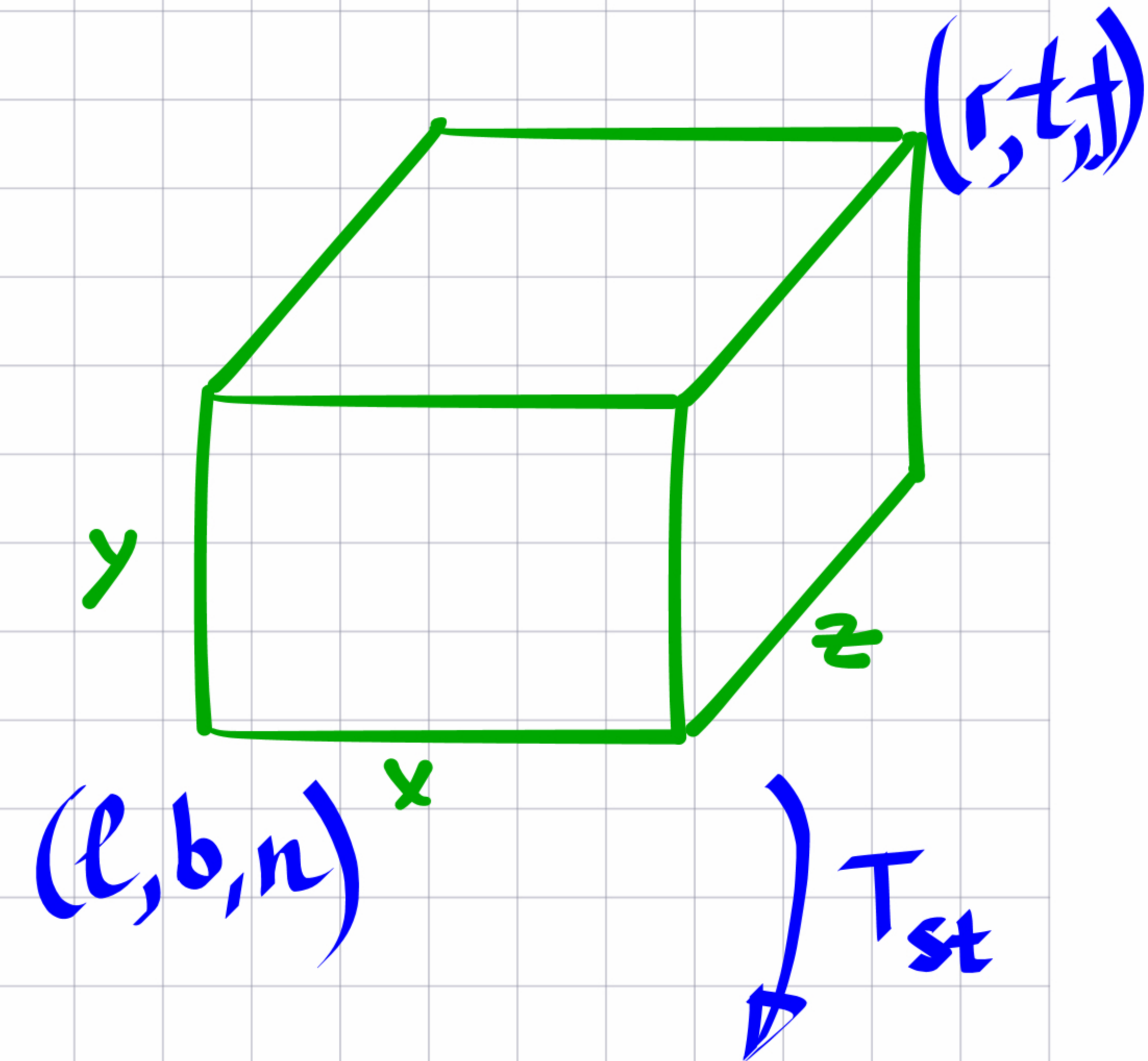


The Caves of Dunhuang

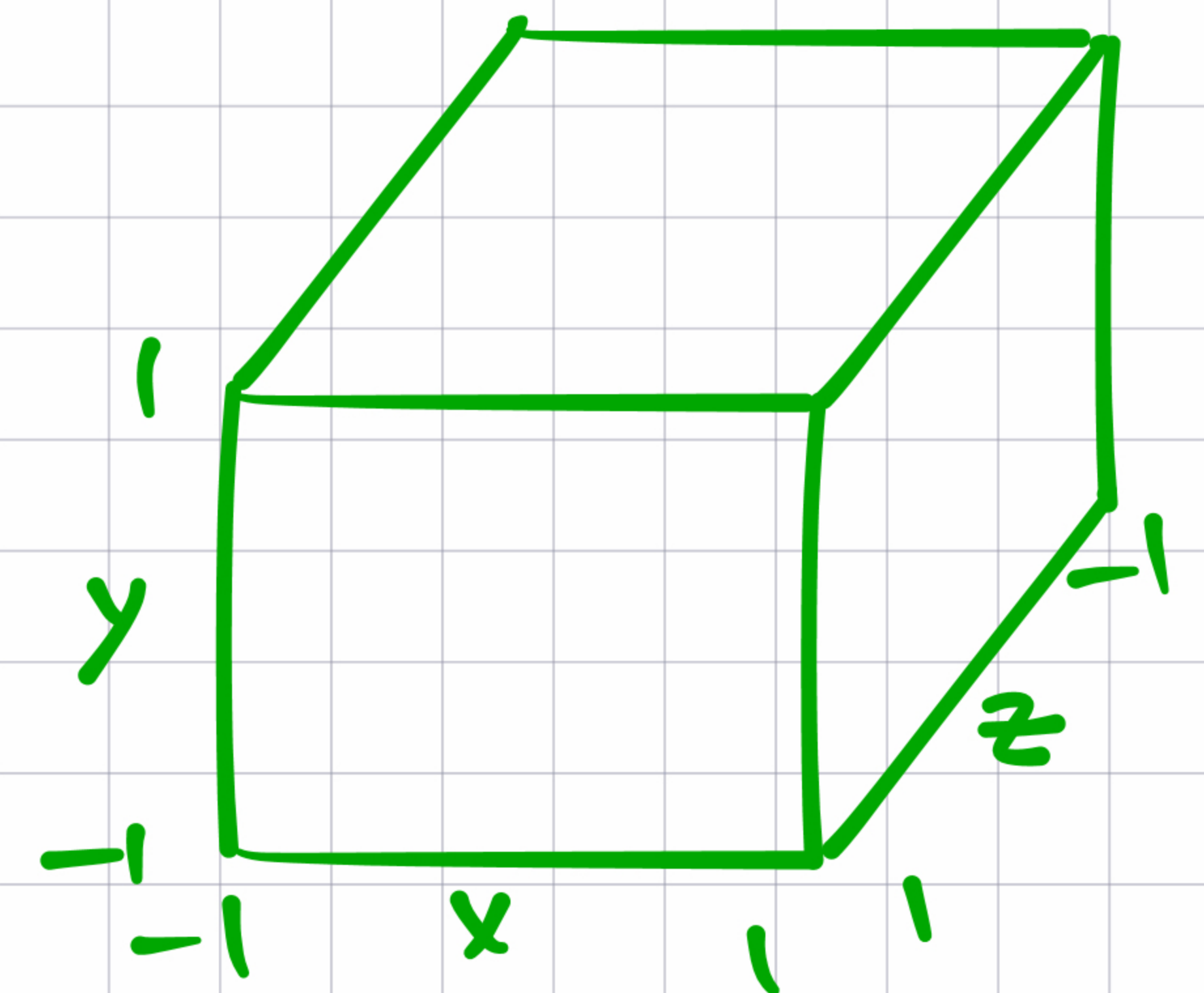
- Preserve one of the wonders of the world, the ancient World Heritage Site from the 4 AD, through VR, augmented with narrative by one of the leading historian on Buddhism and Chinese Arts History.
- Contacts: closed



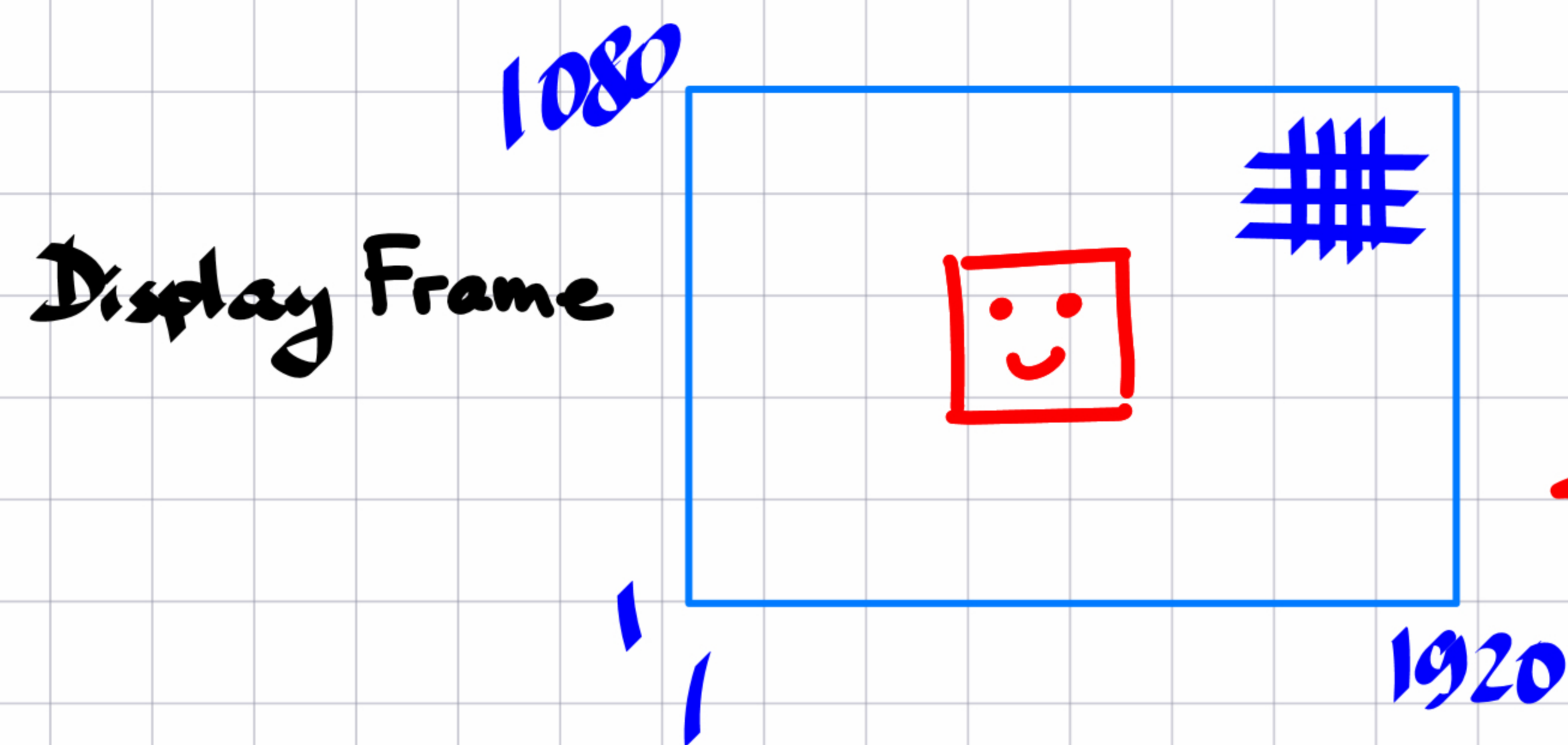
Canonical Transformation



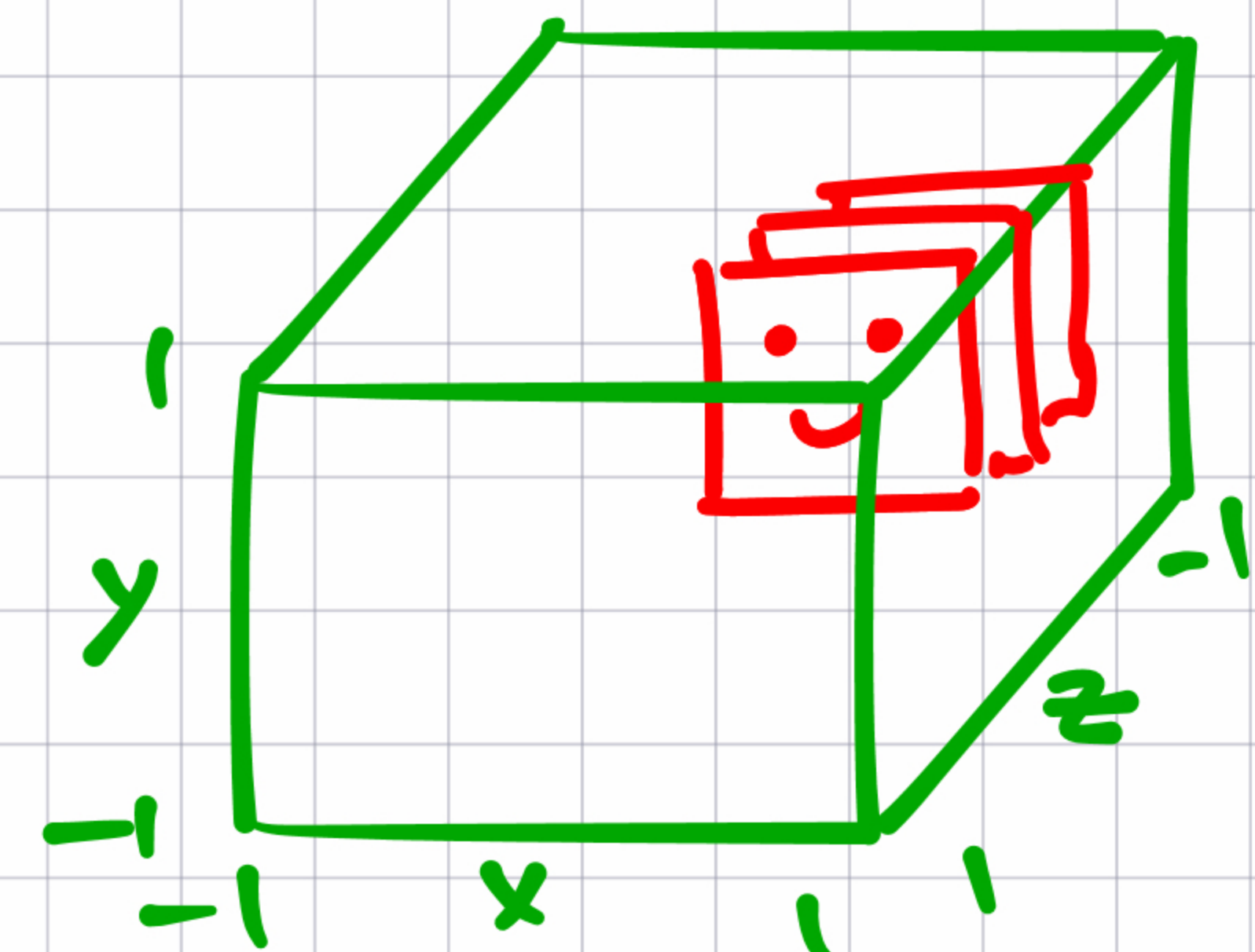
$$T_{st} = \begin{bmatrix} \frac{2}{s-r} & 0 & 0 & -\frac{r+l}{r-l} \\ 0 & \frac{2}{t-b} & 0 & -\frac{t+b}{t-b} \\ 0 & 0 & \frac{2}{n-f} & -\frac{n+f}{n-f} \\ 0 & 0 & 0 & 1 \end{bmatrix}$$



Viewport Transformation



T_{vp}



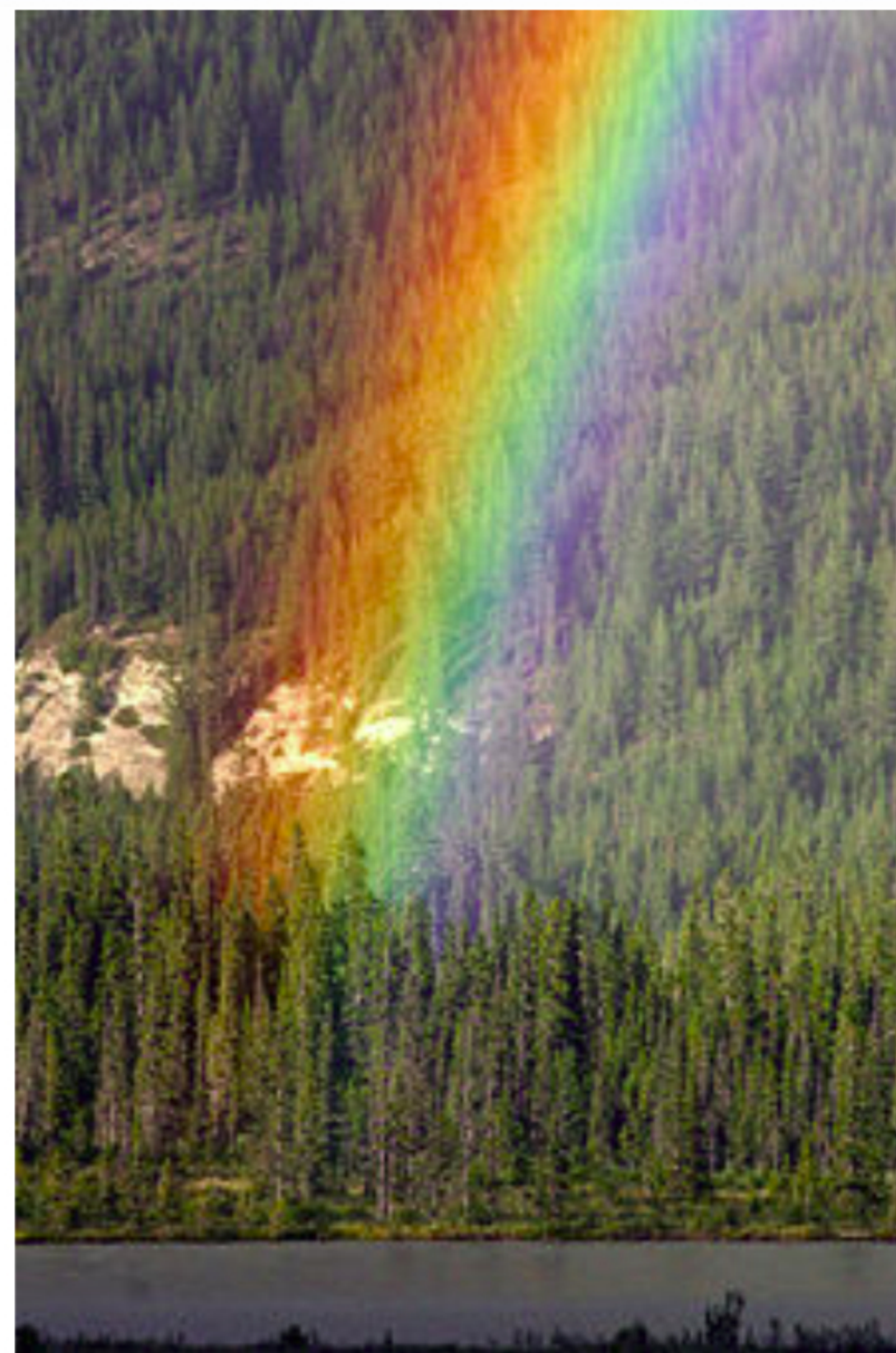
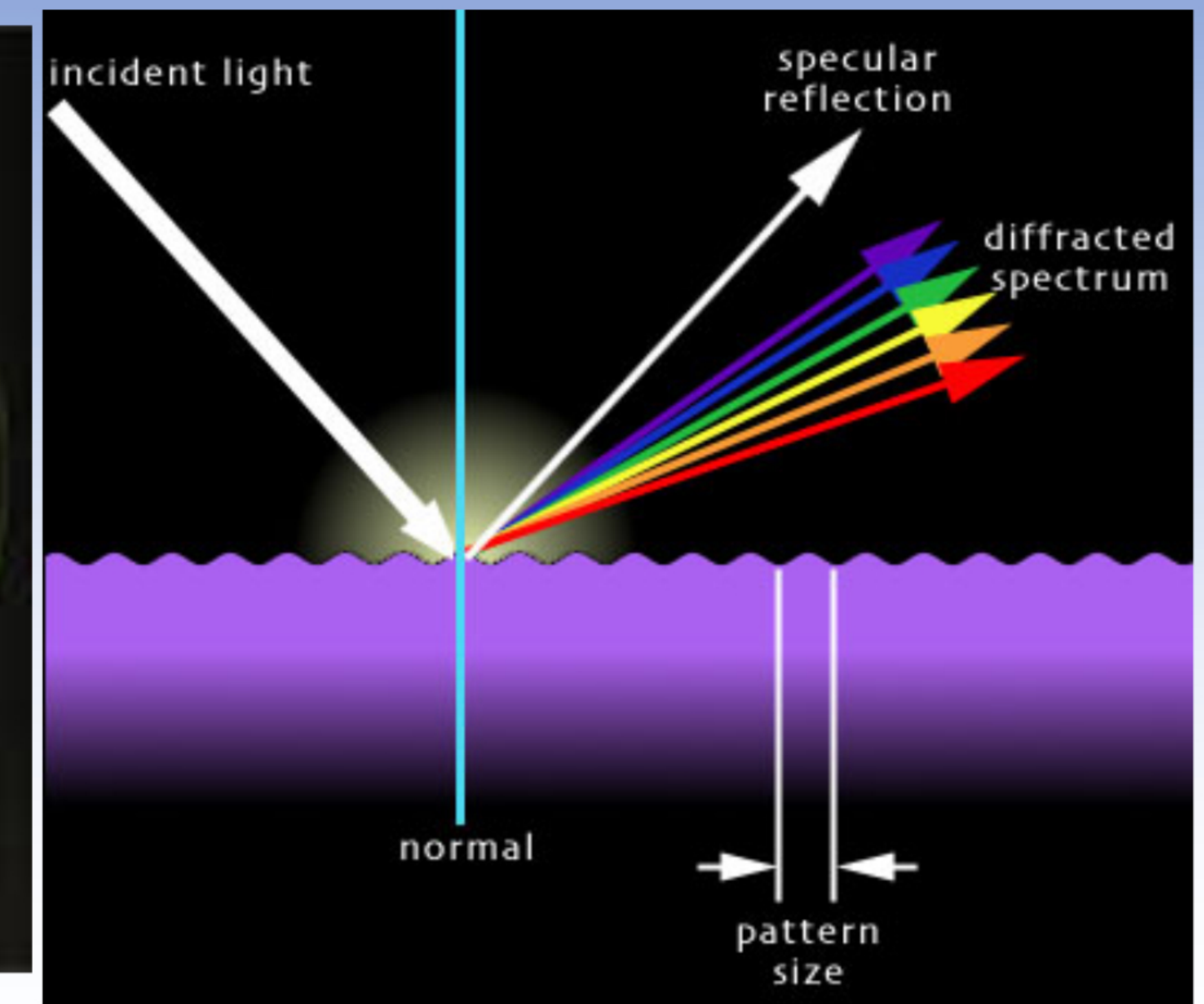
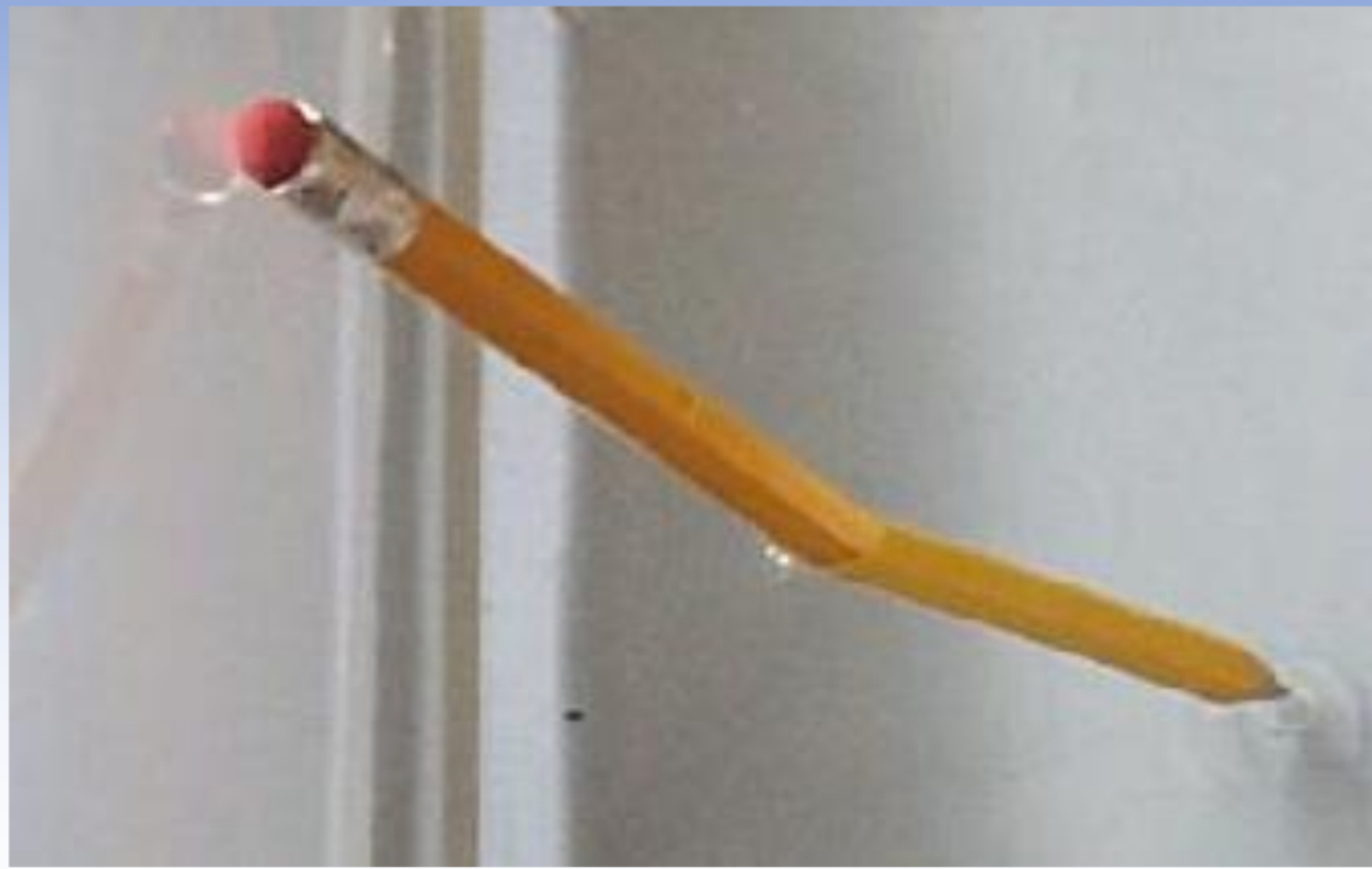
T_{vp} converts $-1,1$ range to pixel coordinates:

$n_x = \#$ horizontal pixels

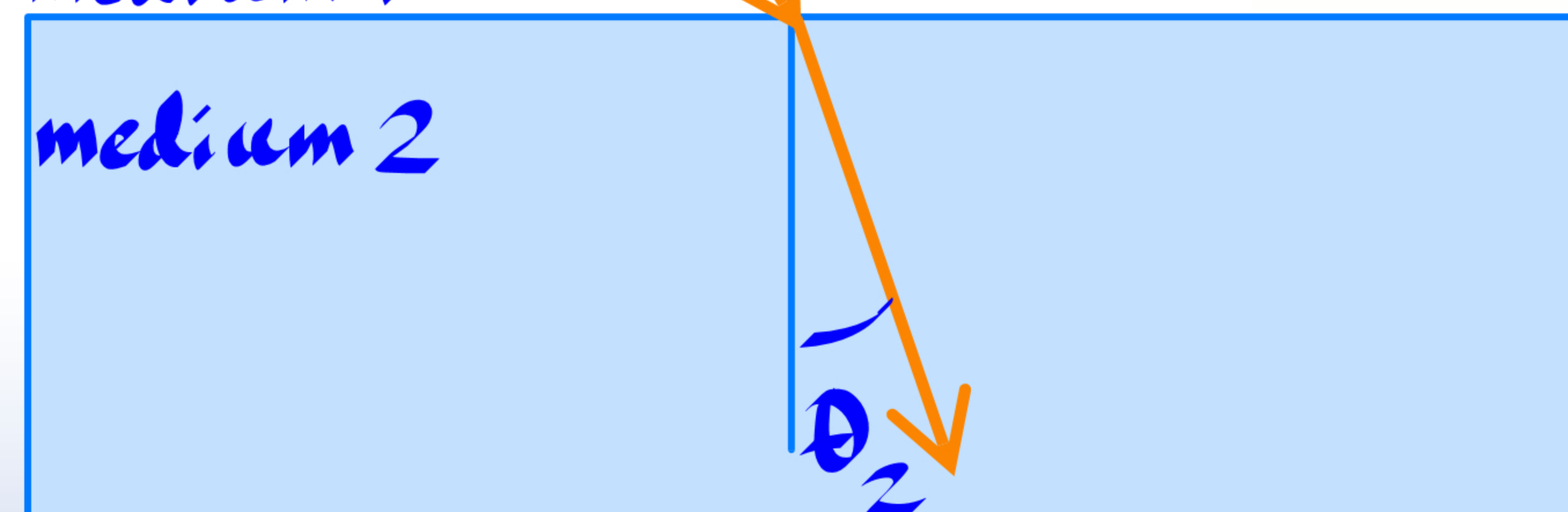
$n_y = \#$ vertical pixels

$$T_{vp} = \begin{bmatrix} \frac{n_x}{2} & 0 & 0 & \frac{n_x-1}{2} \\ 0 & \frac{n_y}{2} & 0 & \frac{n_y-1}{2} \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

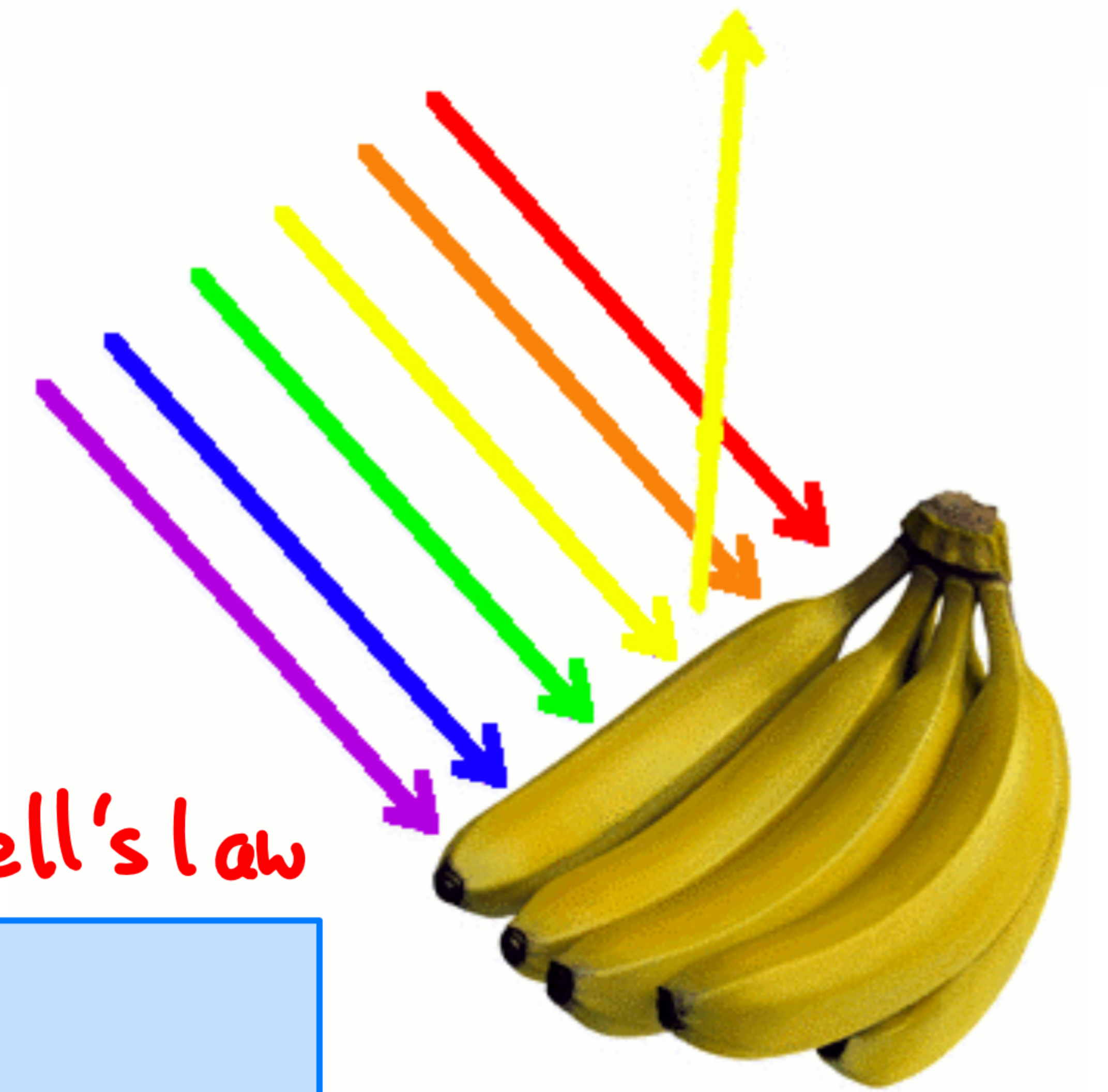
Refraction, Diffraction, Reflection and Absorption



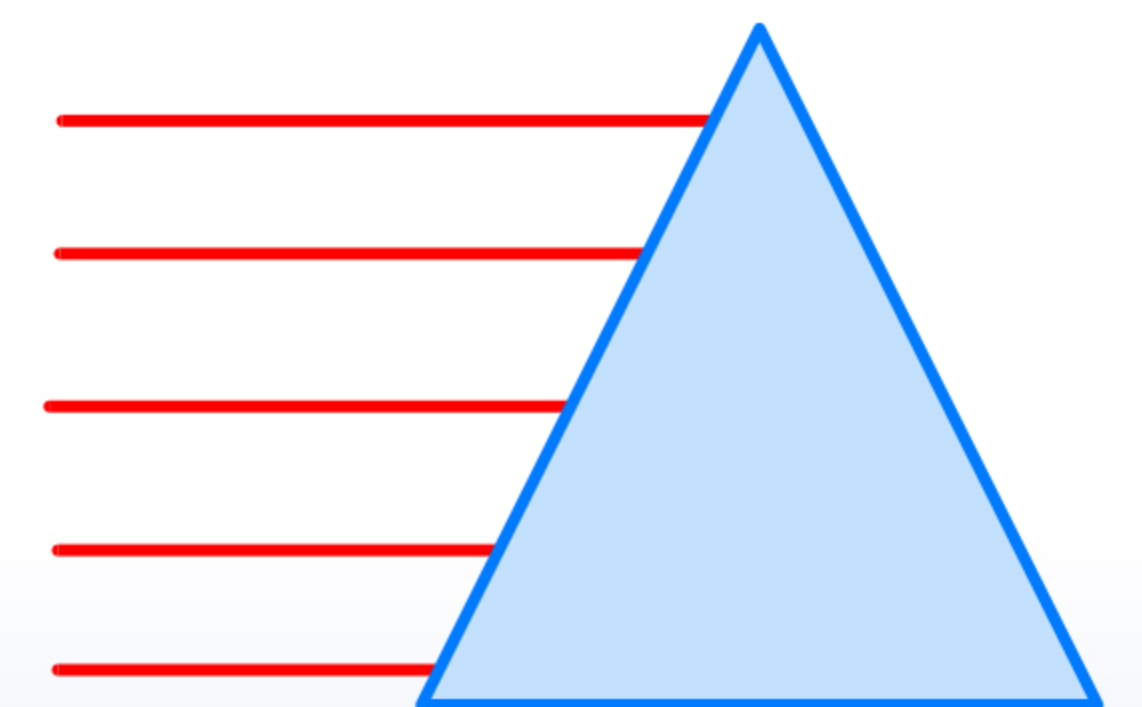
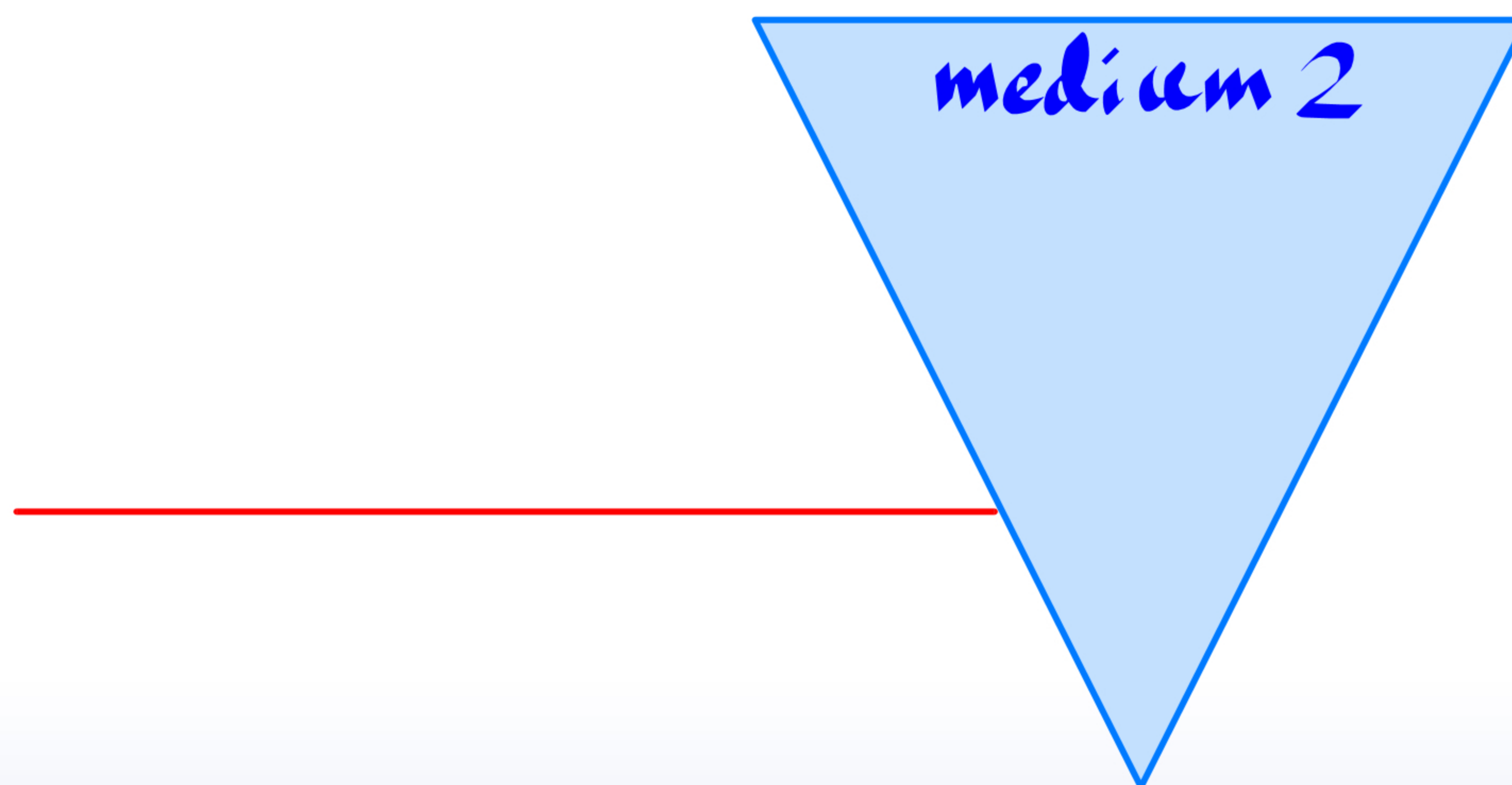
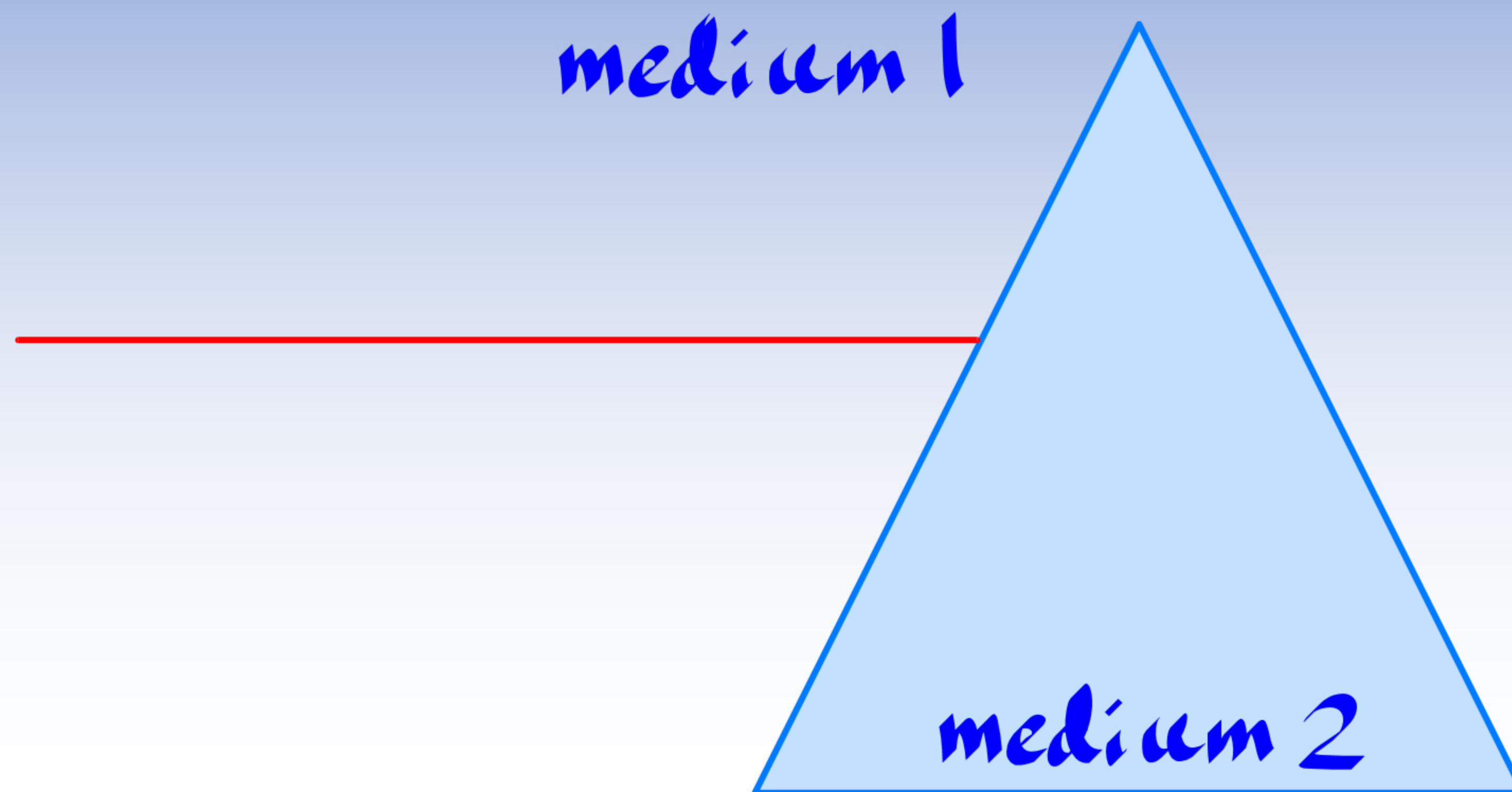
medium 1
medium 2



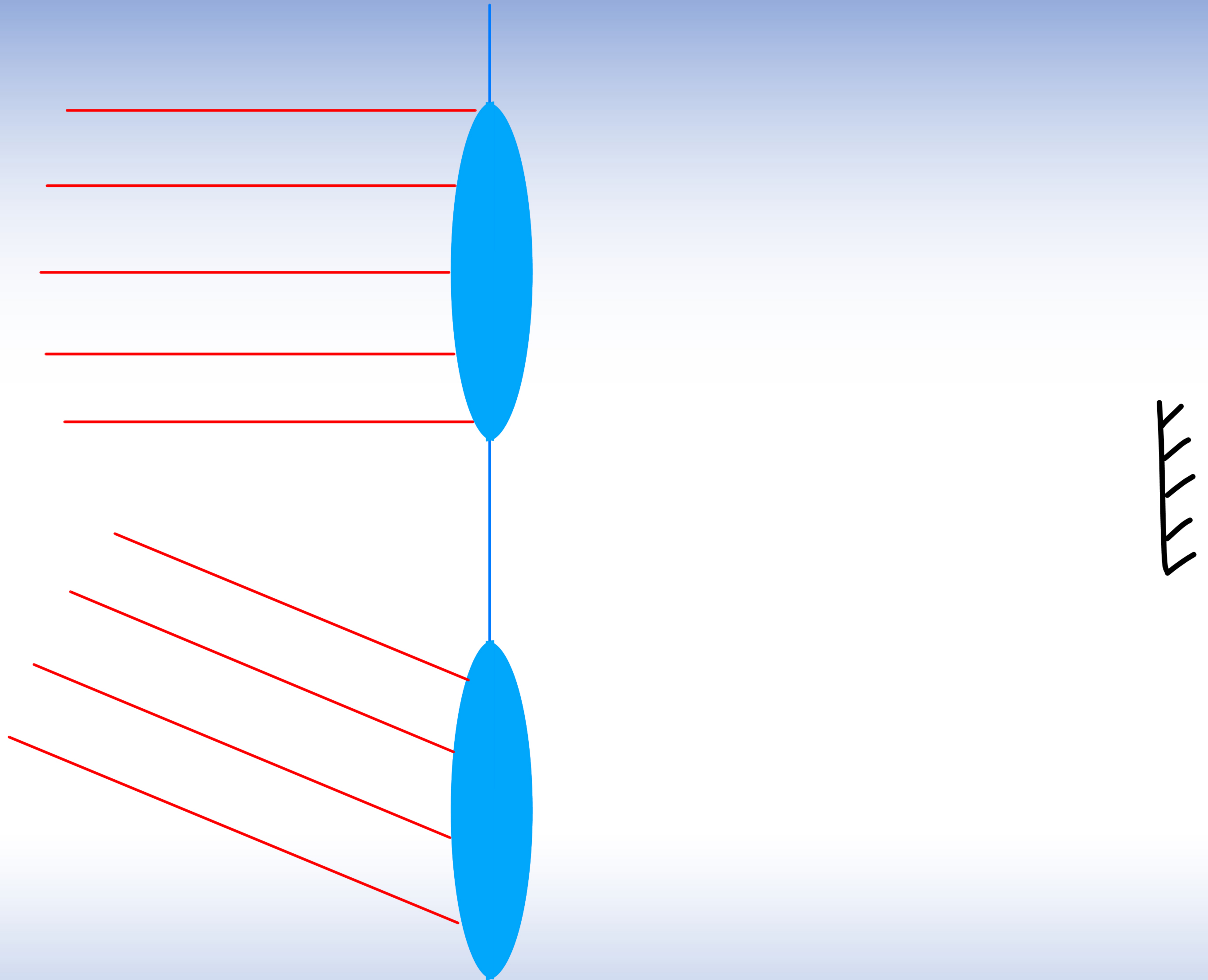
$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$



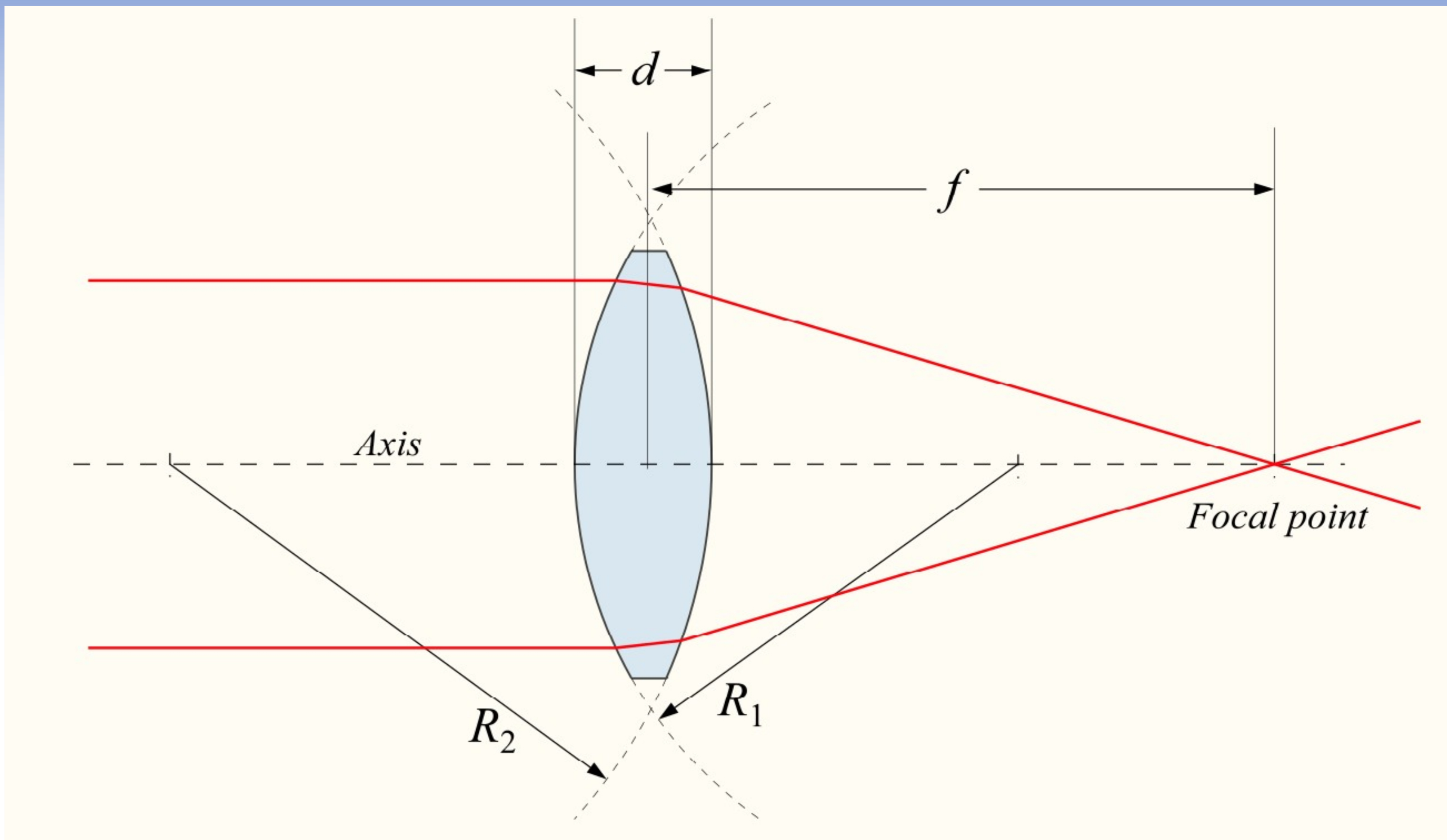
Refraction in a Prism



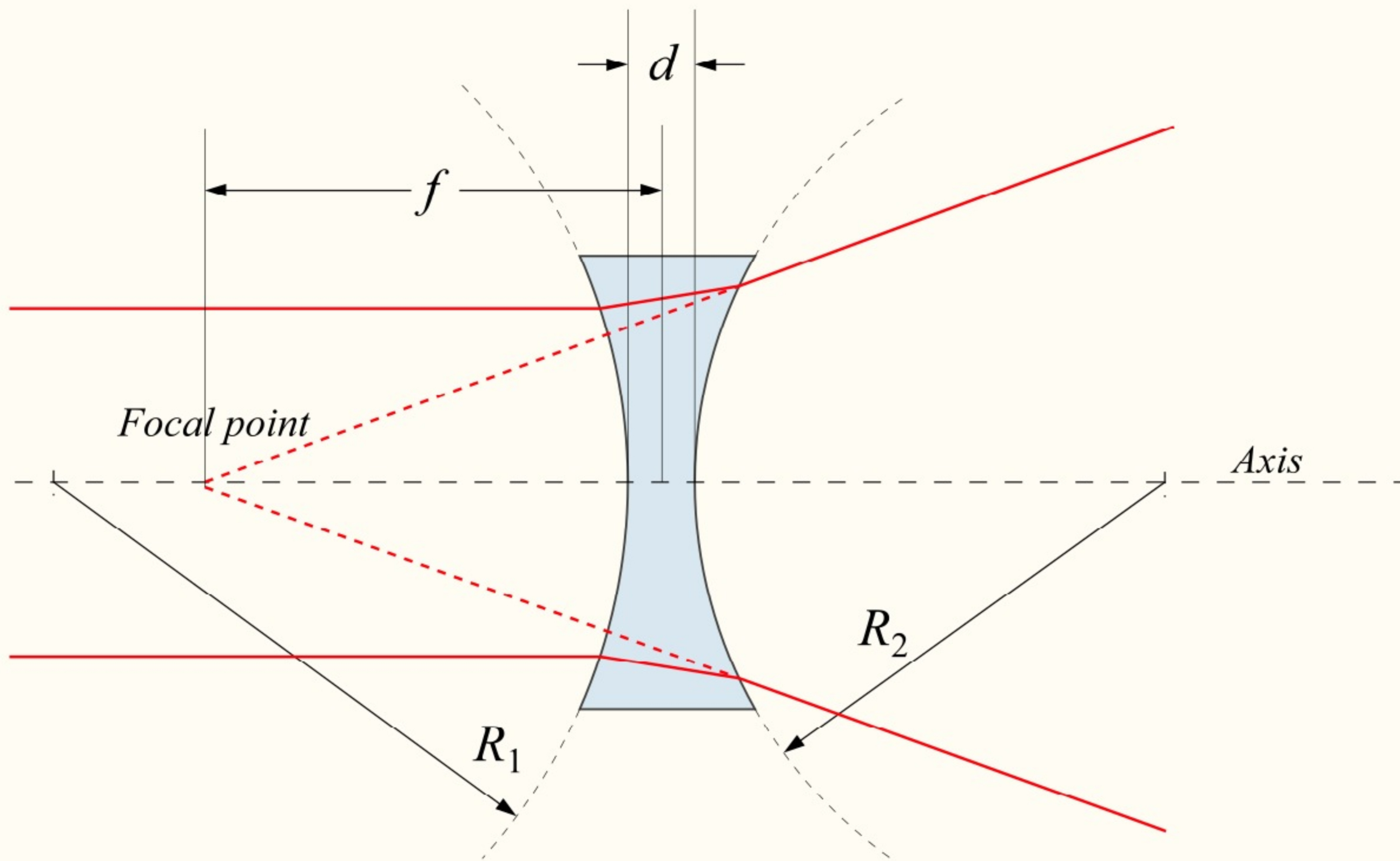
Simple (Spherical) Lens



The Lensmaker's Equation: Converging Lens

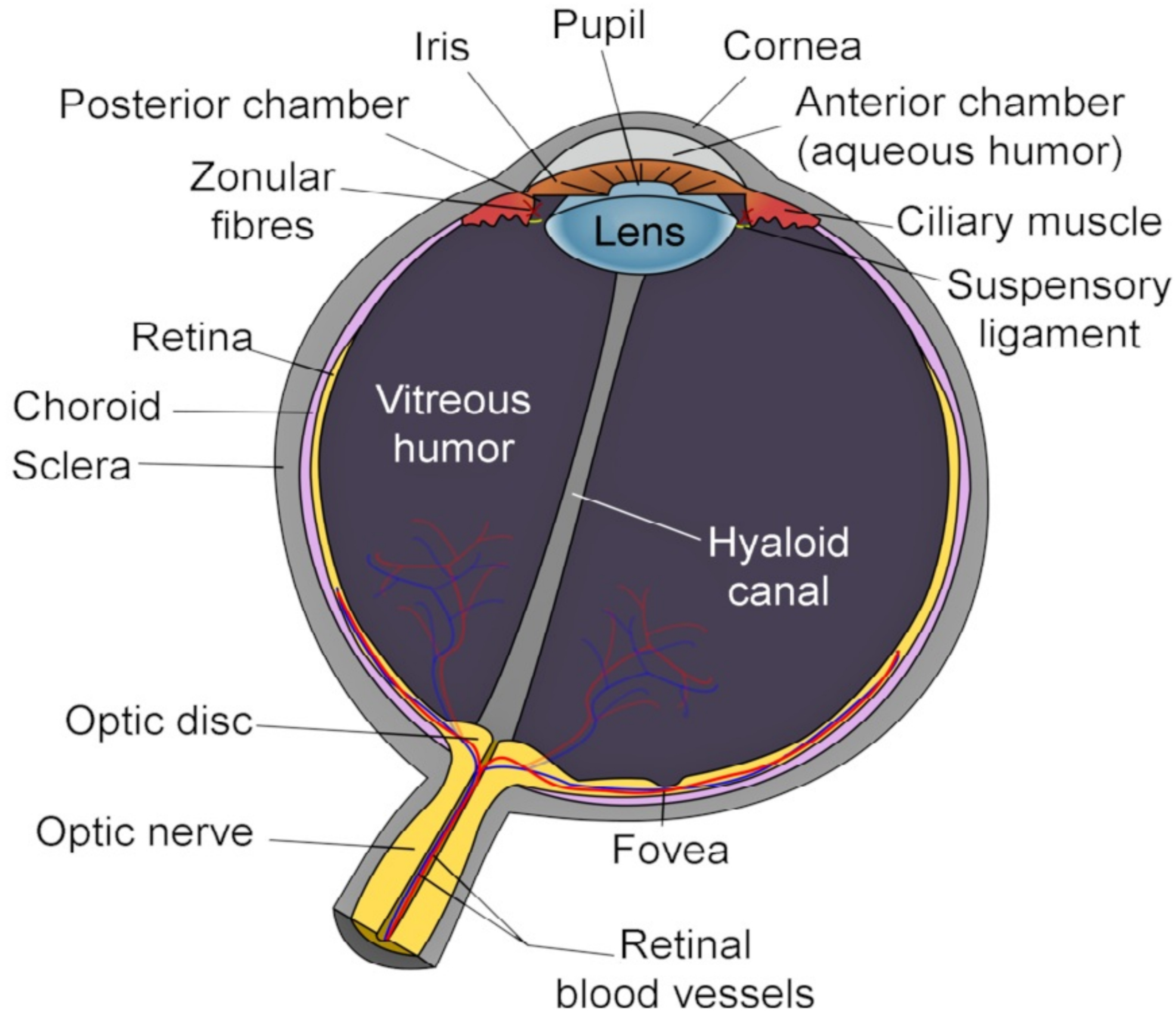


The Lensmaker's Equation: Diverging Lens

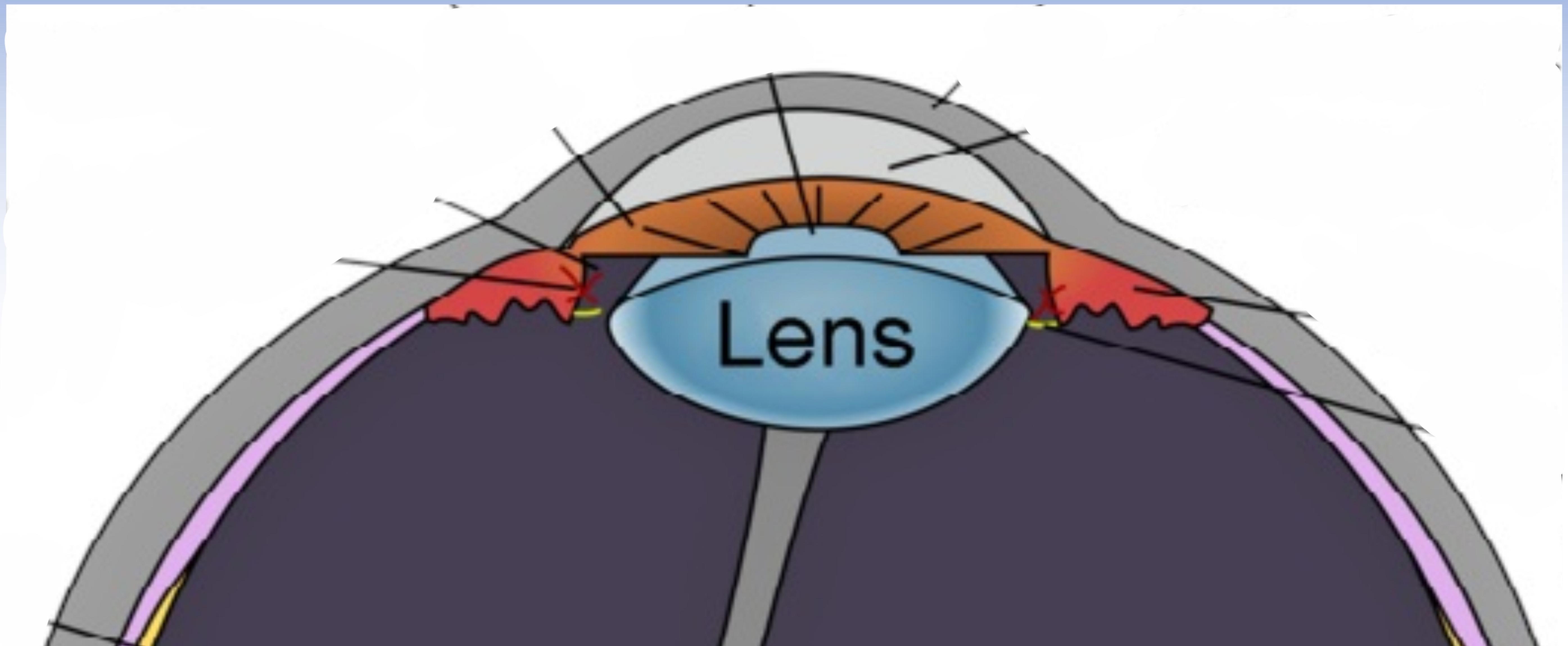


Convenient Unit: Diopter

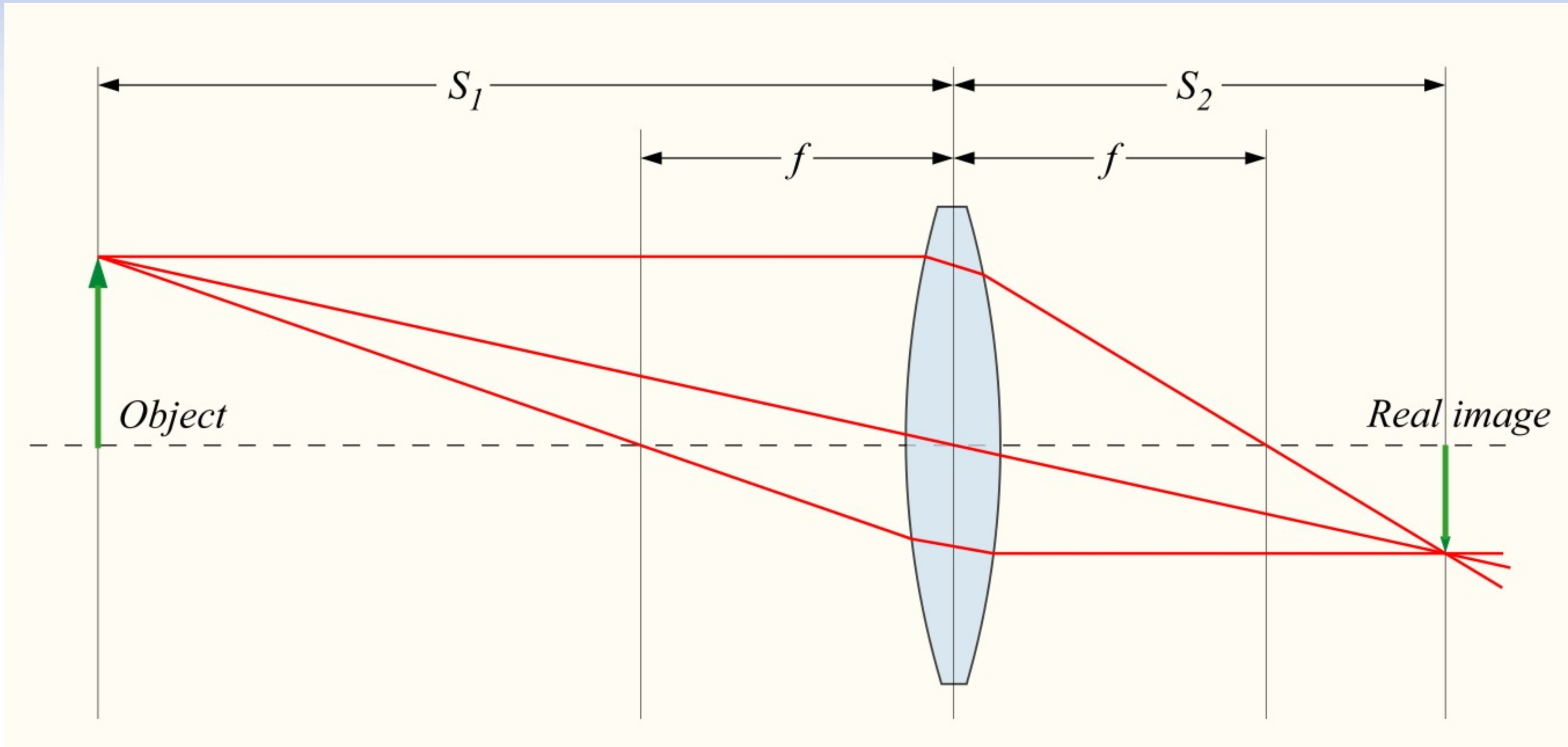
Structure of the Human Eye



Optical Power the Human Eye



Imaging Properties of a Lens



Imaging Properties of a Lens

