

# An Overview of Ophthalmic Optics

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2 hours

## DESCRIPTION

Let's have fun reviewing optical mathematical principles, the metric system as applied in our ophthalmic world. And a deep dive into the electromagnetic spectrum, index of refraction, higher indices, prism information and identifying ophthalmic lens designs. These will be broken down into a format that is simple to understand. This brings to mind theoretical principles that every Optician should remember allowing us to become more competent in our practices.

## LEARNING OBJECTIVES

Upon completing this course, the participant should be able to:

1. Calculate basic algebraic addition, subtraction, multiplication, division.
2. Cite the differences in light waves in our electromagnetic spectrum.
3. Define 3 light behaviors
4. Understand the roll that prisms play in ophthalmic lenses.
5. Calculate focal length based on the power of the lens.
6. Identify properties of lens materials used in today's ophthalmic world.

## OUTLINE: 120 Minutes

### Metric System Measurements (3 minutes)

History 101, Kilo, Hecto, Deca, Base Unit, Deci, Centi, Milli

Base Unit, Bigger and Smaller Units.

### The Meter (3 minutes)

Meter Equivalent, Decimeters, Centimeters, Millimeters

### The Tiny Millimeter (3 minutes)

Today's Measure, Meter Equivalent, 1,000 mm

### Centimeter (3 minutes)

Pupilometer Readings, Meter Equivalent, 100 cm

### Power & Focal Length (3 minutes)

Power of lenses in Diopters (D), Focal Lengths (f) of lenses in Meters, Formula, Calculate

### Algebraic Addition (3 minutes)

Ground Zero, Function of Direction, Minus & Plus Numbers, Just Do The Math

### Basic Math Principles Algebra (3 minutes)

Signs Matter, Rx Considerations, Plus (+), Minus (-),

### Addition and Subtraction (3 minutes)

Pluses Equal Pluses, Minuses Equal Minuses, Plus and Minus Equals Larger Number Sign  
Examples

Practice Problems (3 minutes)

Now it's your turn, Addition and Subtraction problems to solve.

And The Answers Are... (3 minutes)

How Did You Score?

The Electromagnetic Spectrum (5 minutes)

Sun Source, What About the Waves, Measured in Nanometers,  
The impact of longer and shorter waves, From Radios to Gammas

Visual Spectrum (4 minutes)

ROYGBIV, Photoreceptors, The Human Factor, Infrared/UVR

Visual Spectrum (4 minutes)

ROYGBIV (Rainbows), Light Dispersion Through a Cloud

Light Behavior (4 minutes)

Reflecting, Absorbing, Refracting

Index of Refraction (4 minutes)

Light Passing Through Medians, Refracting, Bending, Speed

Index of Refraction (4 minutes)

Speed of Light in a Vacuum, The Formula, Water, Crown Glass, Air

Refraction of Light (4 minutes)

Index of Refraction, Speed of Light in Air, Bending Light in Lenses, The Formula

Index of Refraction (4 minutes)

Today's Lens Materials; CR39®, Trivex™, Polycarbonate, Higher Indices

Index of Refraction & Specific Gravity (2 minutes)

The Weight of a Substance, Thinner vs Lighter Lens examples

Prism 101 (3 minutes)

Defined, Transparent Median, Non-parallel sides, Apex, Base, The Ophthalmic Triangle

Prism 102 (3 minutes)

Deviation & Bending, Image Displacement, Dispersion/Rainbow Affect

Prism 103 (3 minutes)

Displacement Example, Diopter Measurement, The Written Rx,  
Vertical Up/Down, Horizontal In/Up, Combined In/Up In/Down Out/Up Out/Down

The Human Eye Factor (2 minutes)

Emmetrope No Refractive Error, Axial Lengths, Front Cornea Layer to Retina  
Plano on Rx

The Human Eye Factor (3 minutes)

The Retina, 2020 goal, Lengths, Myope Nearsighted, Hyperope Far Sighted, Astigmatic Eye

Minus Lenses (2 minutes)

Myope, Apex to Apex, Divergence, Optical Centers, The Written Rx

Plus Lenses (2 minutes)

Hyperope, Base to Base, Convergence, Optical Centers, The Written Rx

Prismatic Affect (2 minutes)

Minus Lenses OC, Plus Lenses OC, Prescribed, Unwanted

Prismatic Affect (2 minutes)

Diagram in the ppt slide demonstrates "As Worn" OC Prism Affect

Prismatic Affect (2 minutes)

Now it's your turn, Diagram in the ppt slide show examples

Prism Formula (3 minutes)

Induced Prism Formula, Prentis Rule, Example

With & Against Motion (2 minutes)

Image Towards Apex, Minus With, Plus Against,

Asphericity (3 minutes)

Less Bulbous, Less Magnification, Less Demagnification/Minification

Single Vision Lenses (2 minutes)

One Focal Point, The Optical Center (OC)

Segmented Multifocals (3 minutes)

Measurements Matter, Bifocals, Trifocals, The Ledge, The Width, The Thickness The OC Drops

Lenses We Fit Everyday (2 minutes)

An overview of lenses using samples.

Questions (4 minutes)

Questions to Ponder

Cadence Recap (2 minutes)

Attendees stand if they choose) and march in place as I call out an army like cadence with a recap of what we covered in this presentation.

Q&A / Discussion (10 minutes)