Master Opticianry: Mastery of Ophthalmic Lens Theory and Math
2 hours

Author and Speaker
Phernell Walker, MBA, ABOM, LDO
Email: phernell@pure-optics.com

Course Description

Master advanced optical formulas; there's more than Prentice! Phernell Walker, Master Optician, covers prism applications, magnification, compensation, image formation, linear, applied, Thompson Cross Cylinders and geometric optics, including the Magic of Optical Math! If you're passionate about optics, this course is for you.

Learning Objectives

Upon completion of this course the student should be able to:

1. Understand how to use common math expressions used in advanced optics; sine, co-sine, tangents, inverse tangents, radians vs. degrees and why
2. Calculate the thick lens maker's equation
3. Calculate the resultant prism and resolving prism. Calculate the Thick Lens Equation vs. Nominal power formula and understand the differences
4. Calculate compensated lens power for frame tilt in the 090th (pantoscopic) and 180th meridian (face form)
5. Calculate Thomson Cross Cylinders
6. Calculate Remole's Prism formulae

Course Outline

I. **Introduction to Advanced Optics** (5 min)

II. **Math Review** (5 min)
   a. Radians vs. degrees
   b. Algebra
      i. Linear Algebra
      ii. Matrix Algebra
   c. Geometry
   d. Trigonometry

III. **Thick Lens equation** (5 min)

IV. **Position of Wear (POW) Optics** (10 min)
   a. Martin's Tilt Formula
   b. Calculate New Sphere power because of lens tilt
   c. Calculate New Cylinder power as a result of lens tilt
   d. Calculate New Compensated power as a result of tilt in 180 & 090th meridian
   e. Calculate simultaneous tilt at 090 and 180 for sphero-cylindrical lenses (i.e., cross cylinder effect)

V. **Resolving and Resultant Prism = 3D space and direction** (10 min)
   a. Prism in degrees – conversion formula
   b. Prism in coordinates – conversion formula
   c. Mechanical vs. non-mechanical prism

VI. **Thompson Cross Cylinder** (10 min)
   a. Define Cross Cylinder
   b. Perform advanced calculations – Cylinder 1 and Cyl 2.
   c. Determine new axis and why

VII. **Remole's** (10 min)
   a. Dynamic Prism
   b. Magnification Prism
   c. Making the Math work

VIII. Final Q & A (5 min)