1

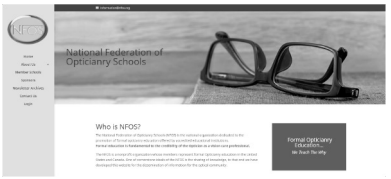
1

Conflict of interest

- The speaker, Thomas Neff LDO ABO-AC NCLE-AC, has not conflicts of interest to disclose.

2

NFOS



3

Review Course Topics

- ABOAC Blueprint
  - Analyze & Interpret Prescription
  - Design, Fit & Dispense Eyewear and Other Ophthalmic Devices
  - Use Ophthalmic Instrumentation

4

Exam Makeup

- 125 Multiple Choice Questions
  - Analyze & Interpret Prescription (38%)
  - Design, Sell, Fit & Dispense (39%)
  - Use Ophthalmic Equipment (23%)
- Three Hours to Complete

5

ABO Masters Program

- The ABO Master in Ophthalmic Optics designation demonstrates to the public and colleagues that an individual has attained a superior level in ophthalmic dispensing.
- Any Optician who is currently Advanced Certified by the American Board of Opticianry for at least one complete three-year renewal cycle, and satisfies one of three additional qualifications is eligible to apply for this designation.

6

ABO Masters Program

- Have written two published ABO-approved Advanced Level III articles

OR

- An ABO-approved speaker with two ABO-approved Advanced Level III Courses, or

OR

- Have one published ABO-approved Advanced Level III article AND one ABO- approved Advanced Level III Course for which you are the ABO-approved Speaker.

7

ABO Advanced Exam Review
Domain II

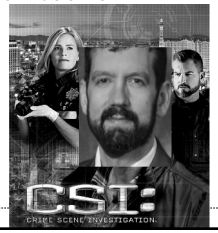
8

Design, Fit and Dispense Eyewear and Other Ophthalmic Devices

9

It takes a Detective to Dispense Exceptional Eyewear

- Heard referred to as "FORENSIC OPTICIANRY"



10

It takes a Detective to Dispense Exceptional Eyewear

- Assess patient's/customer's expectations
- Describe methods of taking accurate facial, ocular and frame measurements.
- Evaluate patient's complaints regarding performance of correction.
- Apply formulae in the design of lenses.
- Describe the advantages and disadvantages of current lens materials.
- Solve problems associated with differences in new and previous eyewear.

11

Domain 2 Tasks

- Evaluate the customer's/patients needs and wants
- Evaluate the parameters of the new and old eyewear
- Design and market ophthalmic instrumentation and eyewear
- Evaluate the results of facial, ocular and frame measurements
- Verify the ordered eyewear in accordance with the specifications on the order form
- Evaluate the eyewear in relation to the customer's/patient's head and face
- Educate customer's on products and performance
- Apply ophthalmic professional and legal guidelines

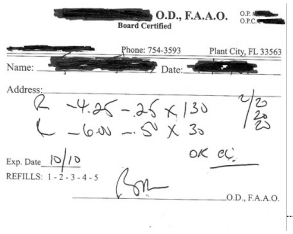
12

Establishing Direction

- Request the prescription
- Analyze the prescription
  - Date
  - Strength
  - Purpose
- Examine patient's present eyewear
- Determine lifestyle and needs

13

Prescription Analysis



14

Prescription Analysis

- Lensometry
- Refractive Error
- Prescription Imbalance
- Vertex Distance & Compensation
- Prescription Use: Occupational & Rec.
- Lens Type: Tints and Coatings

15

Initial Frame Selection

- Select five or six frames based on patient's prescription, objectives, facial features, and color.
- Select a variety of plastic and metal frames
- Do not prejudge!
- Ask patient to judge the appearance, not the fit.

16

Features and Benefits

- Features vs Benefits:
  - Patients don't want features, they want to know how they will benefit them.
  - **A feature** is something you can touch.
    - Example: Titanium, Spring Temple, Polo Design, Silicone Nose Pad.
  - **A benefit** is how it helps the patient.
    - Example: Lightweight, fewer adjustments, save time, more fashionable, safer, sharper vision.

17

Lens Options and Additional Pairs

- Discuss during frame selection, not at the closing.
  - Better yet, in exam chair with Doc…
- Explain features and benefits.
- Relate to their needs.
- Demonstrate!
- Include when pricing eyewear early in the frame selection process, avoid sticker shock.

18

Lens Options

- Anti-Reflection treatment/thin film:
  - Driving/less glare
  - Appearance
  - indoor reading.
- Polarized lenses:
  - Glare protection,
  - Driving reflected glare
  - Water sports, fishing , boating.
- Photochromic:
  - Ocular health
  - cataracts,
  - pinguecula
  - outdoor occupations/recreation
- Scratch coating:
  - Better vision
  - longer lens life.

19

Lens Options

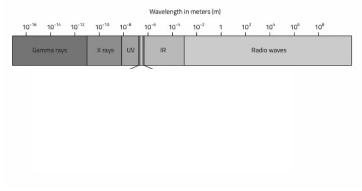
- High Index lenses:
  - Improved appearance (thinner)
  - comfort (lighter)
- Aspheric lenses:
  - Improved appearance (thinner, less magnification)
  - better vision (less peripheral aberrations)
  - comfort (lighter)
- Digitally Surfaced: High definition optics
  - Better Vision
  - Customized optics/PALs

20

Optical Theory

- Metric System
- Light
- Lens Material Characteristics
- Lens Design
  - Plus Lenses
  - Minus Lenses
  - Compound Lenses
  - Lens Power

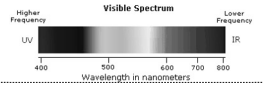
21



22

Electromagnetic Radiation

- Ultraviolet
  - UVC: 200-275 nm Ozone Layer
  - UVB: 275-330 nm Sunburn
  - UVA: 330-400 nm Ocular Hazard
- Visible Light
  - 400-750 nm ROY G BIV
- Infrared - Heat
  - 750-1,000,000 nm



23

The Metric System

- **1 meter = 39.37 inches**
- 1 meter = 10 decimeters
- **1 meter = 100 centimeters**
- **1 meter = 1000 millimeters**
- **1 meter = 1,000,000 micrometers/microns**
- **1 meter = 1 billion nanometers (nm)**

24

Light

- Dual nature of light
  - Particles (photons)
  - Waves
- For our purposes easiest and most clinically relevant to deal with Waves

25

Light

- Light diverges from a source in waves.

26

Light

- Light diverges from a source in waves
- Light striking a different medium is:
  - reflected
  - refracted
  - absorbed

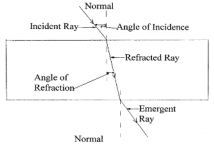
27

Light

$$N = \frac{Speed\ of\ light\ in\ air\ (186{,}000mps)}{speed\ of\ light\ in\ medium}$$

28

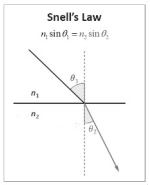
Law of Refraction: A light ray passing obliquely from a medium of lesser density to one of greater density will be bent toward the normal



29

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

n_1 = incident index
n_2 = refracted index
θ_1 = incident angle
θ_2 = refracted angle



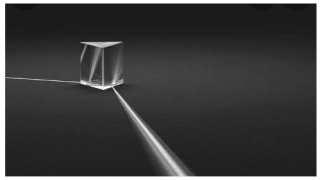
30

Lens Material Characteristics

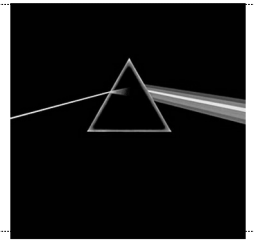
- When light strikes a new medium at an angle, the change in speed causes it to change direction.
  - Index of Refraction(n): higher index = slows light more = greater/more effective change in direction
  - Abbe Value: The higher the value = LESS chromatic aberration present in a lens.
    - Higher is better
  - Specific Gravity:
    - The ratio of the weight of a substance:weight of water with the same volume.
    - OR grams/cm³
      - Higher = heavier per cm³
      - Lower = lighter per cm³

31

Lens Material Characteristics



32



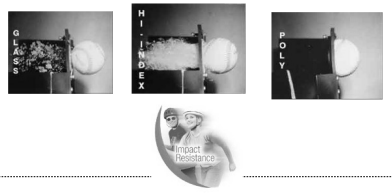
33

Lens Materials

MATERIAL	INDEX	SPEC. GR.	ABBE
Crown	1.52	2.54	59
CR-39	1.498	1.32	58
Trivex	1.53	1.11	45
Thin&Lite	1.60	1.34	36
Polycarbonate	1.59	1.20	31
Glass (crown)	1.70	2.99	32

34

Impact Resistance: Polycarbonate & Trivex



35

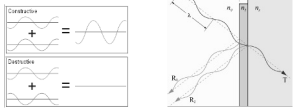
Tints and Coatings

- Ultraviolet coating: Block UV light to 400nm.
- Tints: Glass - Metal oxides added for color
  Plastic - Lenses dyed to color
- Photosensitive: UV darkens, IR lightens
- A/R coating / treatment:
  - 1/4 wave length thick (for a given wavelength)
  - material n= equal to square root of lens (magnesium fluoride)
  - Destructive interference

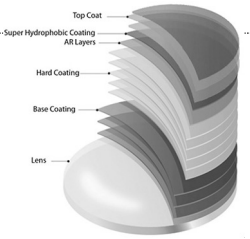
36

Tints and Coatings

- A/R coating: 1/4 wave length thick, material equal to square root of lens (magnesium fluoride)



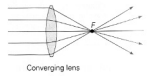
37

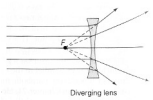


https://www.eyecarebusiness.com/issues/2015/february-2015/understanding-ar

38

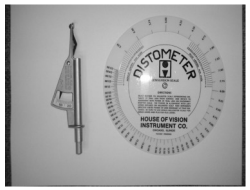
Lens Designs





39

Distometer



40

41

Problem Solving

42

Analysis of Vision Errors:

- Subjective Analysis
- Verify and Analyze the New Prescription
- Compare to Previous Pair of Glasses and Observe
- Check Fit of New Glasses
- Observe Fitting Characteristics of Previous Pair
- Vision Problems: Solutions

43

SOAP format

- Subjective
- Objective
- Assessment
- Plan

44

Vision Errors: Subjective Analysis

- When did you receive your glasses?
- How many hours per day have you worn your glasses?
- Did you experience this problem with your previous glasses?
- When does the problem occur?

45

Subjective Analysis

- Does the problem subside or become worse as the glasses are worn?
- Where does it occur? (Occupational or recreational setting)
- Have you found a way to solve the problem?

46

Vision: Subjective Analysis

- Blurred vision
- Double vision
- Perception/Discomfort
- Reflections

47

Vision Problems: Solutions

ADJUST FRAME:

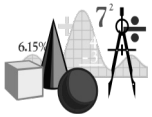
- Pantoscopic tilt
- Vertex distance
- Wrap

48

Vision Problems: Solutions

CHANGE LENS FORM

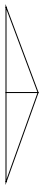
- Multifocal style
- Frame size
- Base curve
- Aspherics



49

Plus Lens Characteristics

- Can visualize as "base to base" prisms increasing in power from the center to the edge.
- Thicker at the center.
- Magnify
- Exhibit "Against Motion"
- Designs:
  - Equiconvex, Biconvex
  - Flat Convex
  - Meniscus



50

Minus Lens Characteristics

- Series of apex to apex prisms increasing in power from the center to the edge.
- Thinnest at the center.
- Minify
- Exhibits "With Motion"
- Designs:
  - Equiconcave, Biconcave
  - Flat Concave
  - Meniscus

51

Compound Lens Characteristics

- Combine a spherical surface with a toric or cylindrical surface.
- Strongest and weakest curves are 90 degrees apart.
  - Plus cylinder form has cylinder on the front
  - Minus cylinder form has cylinder on the back.

52

Compound Lens Characteristics

- SPH is throughout ENTIRE lens
- Cyl based upon meridian:
  - Meridian that corresponds with rx Axis represents 0% cylinder power.
  - 90 degrees away = Full Cyl
- Remember LENS CROSS!!!

53

Lens Power

- The power of a lens in diopters is equal to the reciprocal of it's focal length in meters

$$D = 1/f$$

$$f = 1/D$$

D = dioptric power of lens (in D)
F = focal length of lens (in M)

54

Lens Power: Examples

1D = 1M

2D = .5M

0 .25D = 4M

55

Additional Pairs

- Sunglasses
- Safety Glasses
- Occupational / Recreational lens designs
- Different appearance for different settings.
- Convenience
- SHOEs analogy

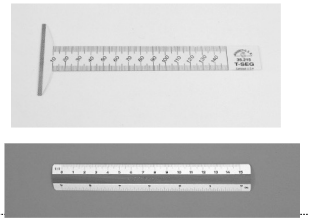
56

Measurements Facial and Frame

- Interpupillary Distance
  - MM Rule
  - Pupilometer
  - Electronic
- Vertex Distance
  - Distometer
  - Electronic
- Pantoscopic Tilt
  - Manual
  - Electronic
- Wrap
  - Manual
  - Electronic

57

Millimeter Rule



58

Pupilometer

CRP, or Corneal Reflex Pupilometer

59

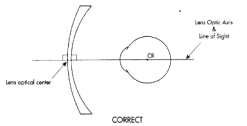
Electronic

60

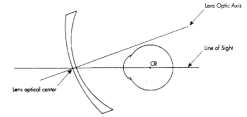
Optical Center Placement

- Optical Center: Those points on the front and back surface of a lens where the curves are parallel
- Optical Axis: A line which connects those two points.
- Horizontal placement determined by monocular P.D.
- Vertical effects prism and aberrations

61



CORRECT



INCORRECT

62

Martins Lens Tilt Formula

6-1. A +10.00D lens made of CR-39 (n = 1.498) is tilted 15°. What is the effective power of this lens on the combined eye/lens system?

$S' = S[1 + (\sin \alpha)^2/2n]$
$= (+10.00)(1 + [\sin 15]^2/2[1.498])$
$= (+10.00)(1 + 0.06699/2.996)$
$= (+10.00)(1.02235)$
$= \mathbf{+10.22D}$

$C' = S' (\tan \alpha)^2$
$= (+10.22)(\tan 15)^2$
$= (+10.22)(0.0718)$
$= \mathbf{+0.73 \times 180}$

Effective Rx +10.22 +0.73 ×180

63

VERTEX COMPENSATION

Effective Power
It is what is felt if the lens when moved farther or closer to the eye

$$Dc = \frac{dD^2}{1000}$$

Vertex Compensation
Is what is needed to change the RX to compensate for the movement to and from the eye.

- **When the lens sit a different distance from where the doctor refracted the patient.**

+ MOVED AWAY GETS MORE PLUS
+ MOVED CLOSER GETS MORE MINUS
− MINUS MOVED AWAY GETS MORE PLUS
− MINUS MOVED CLOSER GETS MORE MINUS

Use the sign it is moving in
Away from eye = add plus / subtract minus
Towards the eye = subtract plus / add minus

64

Vertex Compensation

- Closer? Farther?
- Plus Lenses? Minus Lenses?

(CAP)
Closer Add Plus

(FAM)
Further Add Minus

65

Vertex Compensation

- A Distometer or other Compensation device is used to measure vertex distance.
- If the power in any meridian is > 7.00D, an adjustment to power if the frame is fit at a distance different than the Rx vertex distance

66

VERTEX COMPENSATION

Effective Power
Vertex Compensation

$$Dc = \frac{dD^2}{1000}$$

Given the Rx of -14.00 OU is fitted in front of the eye at 9 mm what would be the compensation needed?

67

VERTEX COMPENSATION

Effective Power
Vertex Compensation

$$Dc = \frac{dD^2}{1000}$$

Given the Rx of _____OU is fitted in front of the eye at 9 mm what would be the compensation needed?

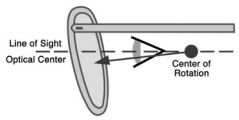
68

Fitting Single Vision Aspherics:

- Pre-adjust the frame.
- Dot centers of pupils, measure height and subtract 1mm for every 2 degrees of tilt or tilt head until pantoscopic tilt is eliminated before dotting pupils.
- Use pupilometer for mono P.D.

69

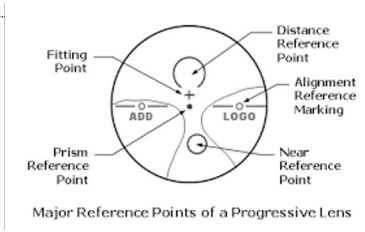
Fitting Aspheric Lenses: O.C. Height



70

Fitting Aspheric Lenses: O.C. Height


71



Major Reference Points of a Progressive Lens

72

Fitting Aspheric Lenses: P.D. Measurements

73

Analysis of Spectacle Errors:

- Comfort
  - Nose, Ears
  - Glasses Slip, Touch Cheeks, Lashes
- Repair
- Vision

74

Comfort Errors

- Frame Selection
- Lens Selection
- Adjustment
- Analysis of Systems and Processes
- Identify Possible Underlying Systemic Factors (Enablers)
- Potential Improvements

75

Repairs

- Patient History
  - Occupational Factors
  - Recreational Factors
- Frame Selection
- Lens Selection
  - Impact Resistance
- Laboratory Work
- Dispensing Instructions

76

Vision

- Exam
- Prescription
- Prescription Interpretation
- Frame Selection
- Lens Selection
- Facial Measurements
- Laboratory Work
- Verification
- Adjustments
- Dispensing Instructions
- Adaptation
- Follow Up Care

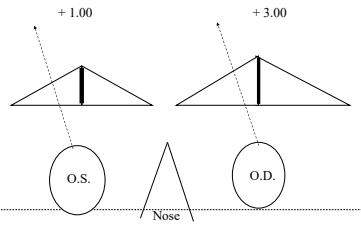
77

Prism

- Measurement
- Patient Problems
  - Base Down
  - Base Up
  - Base In or Out
- Decentration
- Slab Off
- Image Jump

78

SINGLE VISION DISPLACEMENT



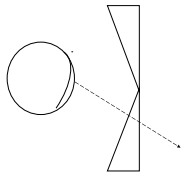
79

Vertical Prism (Imbalance)

- Determine the power in the vertical meridian.
- Determine the power difference between each lens.
- Determine prism at the reading level (usually 10mm) ^ = P x dcm
- If the imbalance is greater than 1.50^ consider slab off, base up least plus or highest minus. Reverse for reverse slab.

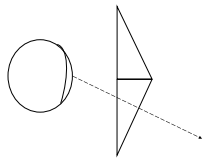
80

Base Direction - Minus Lens



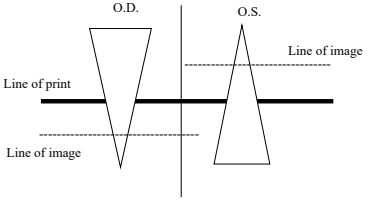
81

Base Directions - Plus Lens



82

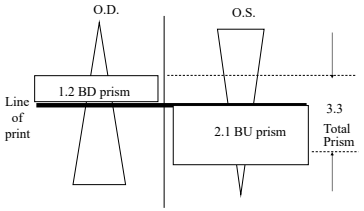
Vertical Imbalance



RESULT: DIFFICULTY READING SPLIT LINE OF PRINT

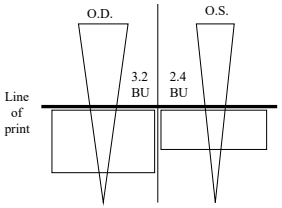
83

Opposite Prisms Compound

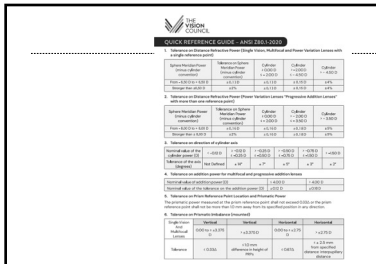


84

Similar Prisms Cancel



85



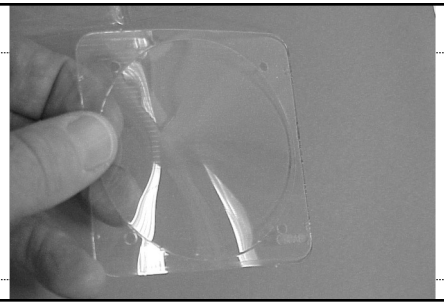
https://thevisioncouncil.org/sites/default/files/ANSI%20Z80%201-2015_Quick%20Reference%20V2.pdf

86

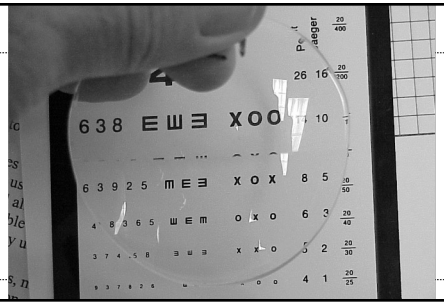
Methods of Correcting Vertical Imbalance

- Contact Lenses
- Two Pairs of Glasses
- Adjusting the MRP or Seg Height
- Fresnel Press-On Prism
- Dissimilar Segs
- Compensated "R" Segs
- Slab-Off

87



88



89

Slab-Off Verification

- Place lens clock contact points parallel to the slab line on the distance portion and note reading.
- Place lens clock with one point on the distance portion, one on slab line, and one on lower prism portion.
- Difference in readings indicates the amount of slab-off prism.

90

Evaluating the Need for Correction

- Age
- Amount of Imbalance
- Cause of Imbalance - Onset
- Reading Position

91

92

93

Case Study # 1

30 year old female six months after refractive surgery.

O.D. +3.00 -0.50 x 135 O.S. +2.00 -1.00 x 30

SPH	+3.00	SPH	+2.00
50% CYL	-0.25	75% CYL	-0.75
Total	+2.75	Total	+1.25

Optical Difference = 1.50

Reading Level = 10mm

Vertical Imbalance = P x dcm or 1.50^

94

95

Case Study # 2

45 year old male with an add power prescription for the first time.

O.D. -3.00 -2.00 x 180 O.S. -2.00 -1.00 x 120

ADD: +1.25 O.U.

SPH	-3.00	SPH	-2.00
+100% CYL	-2.00	+ 25% CYL	-0.25
Total	-5.00	Total	-2.25

Difference @90 = 2.75

Reading Level = 10mm

Vertical Imbalance = 2.75Δ

96

Vertical Prism

Determine the amount of Slab Off needed to correct vertical imbalance at a reading level of 10mm for the following prescription.

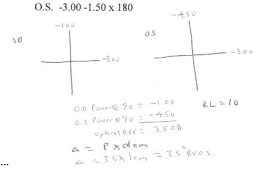
O. D. -1.00 -2.00 x 90
O.S. -3.00 -1.50 x 180

97

Vertical Prism

Determine the amount of Slab Off needed to correct vertical imbalance at a reading level of 10mm for the following prescription.

O. D. -1.00 -2.00 x 90
O.S. -3.00 -1.50 x 180



98