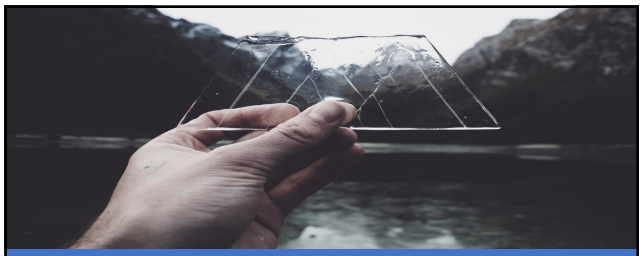


Prism is Not a Four-Letter Word

Phernell Walker, MBA,ABOM, NCLEC, LDO
International Speaker & Author
Chair-elect American Board of Opticianry

1

On behalf of Vision Expo, we sincerely thank you for being with us this year.

Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Education Planning Committee considers content and speakers for future meetings to provide you with the best education possible.

vision expo

2

Financial Disclosure

- **Phernell Walker, MBA, ABOM, LDO, NCLEC:**
  - VP of Optometric Relations, Eyefinity
  - Chair-elect of the American Board of Opticianry (ABO-NCLE)
  - Executive Board of Directors, United Opticians Association (UOA)
  - Chair Education Advisory Board, Vision Expo, Opticon (VEE & VEW)
- Mr. Walker has received honorarium in the past from:
  - Pure Optics LLC
  - Pacific University College of Optometry
  - Silmo (France)
  - Silmo (Singapore)
  - Mitsui Chemicals (Japan)
  - 49 state opticianry and optometric associations (examples: Professional Opticians of Florida, Arkansas Optometric Association, Opticians Association of Kentucky, American Optometric Association, etc....)
  - Walman University
  - Vision Expo

vision expo

3

Phernell Walker, MBA, ABOM, NCLEC, LDO

- Principle | Pure Optics LLC
- Author | Pure Optics
- Chair-elect American Board of Opticianry Board of Directors
- Pacific University College of Optometry | Former Adjunct Professor
- Master in Business Administration (MBA)
- Master in Ophthalmic Optics (ABOM)
- Licensed Dispensing Optician (WA-LDO)
- National Contact Lens Examiners Certified (NCLEC)

vision expo

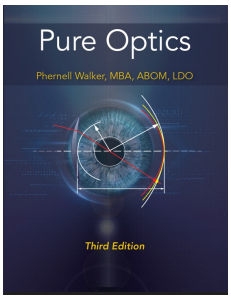
4

Reference Resource

Pure Optics

by

Phernell Walker, MBA, ABOM, LDO



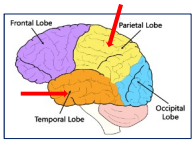
5

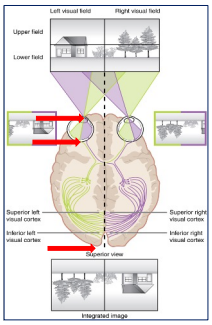
Introduction to Prism Optics

- Transparent wedged-shaped, materials change the direction (refracts) of light
- Lenses are made of interconnecting prisms
- Prisms are afocal
- Prism Refract Light

6

Sight vs. Vision





7

Types of Vision

Monocular
Vision with only one eye

Bi-ocular
Vision with 2 eyes
No coordination

Binocular
Vision with 2 eyes
Coordination

8

Two Eyes Are Better than One

9

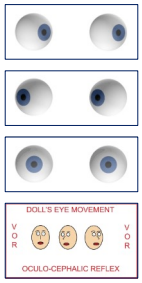
4 Basic Eye Movements

Saccades
- Involuntary rapid movement to change fixations
- Conjugate

Smooth Pursuits
- Voluntary slow tracking movement
- Conjugate

Vergence
- Involuntary/Voluntary slow movement
- Align foveas to target
- Disjunctive

Vestibulo-Ocular
- Reflexive fast stabilizing movements during head movement
- Initiated by semicircular canals



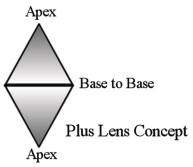
10

Binocular Vision Conditions

Condition	Treatment
Exophoria	Prism, VT
Esophoria	(+) Lenses, Prism
Vertical Phoria	Prism
Divergence Excess	Prism, VT
Convergence Excess	(+) Lenses, Prism

11

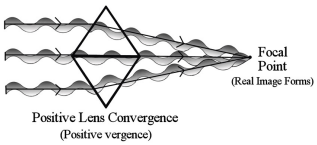
Fundamental Plus Lens Design



- + Plus Lenses - used to correct hyperopia and/or presbyopia
- Two prisms connected base to base

12

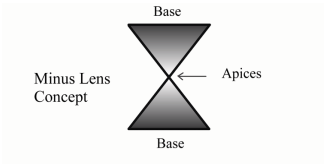
+ Plus Lenses form Real Images



- + Plus Lenses
  - Converge light
  - Prism's base is located at the lens center
  - Create a real image located behind the lens

13

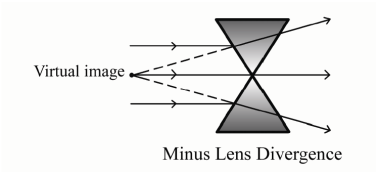
Fundamental Minus Lens Design



- - Minus Lenses - used to correct myopia
- Two prisms connected apex to apex

14

- Minus Lenses form Virtual / Imaginary Images

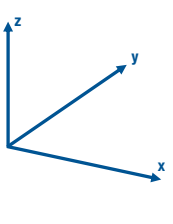


- - Minus Lenses:
  - Diverge light
  - Create virtual images located in front of the lens

15

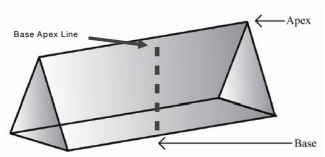
3D Space

- X = Length
- Y = Width
- Z = Height



16

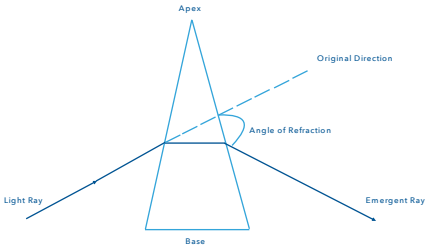
Ophthalmic Prism



- Prism Base - thickest part of the prism
- Prism Apex - thinnest part of the prism

17

Refraction and Deviation



18

Power Cross

OD +1.50 -0.50 x 180

OS -1.00 -0.75 x 180

Add +2.75

PD: 32/34

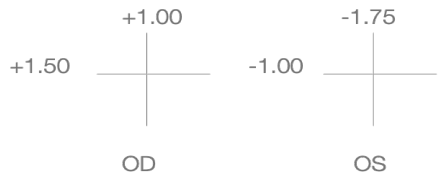
19

OD: +1.50 -0.50 x 180

OS: -1.00 -0.75 x 180

Add: +2.75

PD: 32/34



20

Meridian of Dioptric Power

Degrees from Axis	Percent of CYL
0	0%
5	1%
10	3%
15	7%
20	12%
25	18%
30	25%
35	33%
40	41%
45	50%
50	59%
55	67%
60	75%
65	82%
70	88%
75	93%
80	97%
85	99%
90	100%

21

Prentice Rule

$$P = (h_{cm})\ (D)$$

P = Prism Diopters

h_{cm} = amount off in centimeters

D = lens dioptric power (at axis 180 or 090)

22

Accidental Prism

A new pair of glasses measure PD 60 mm in a focimeter.
Patient's PD is 66 mm

How much prism was induced?

OD -3.75 DS
OS -3.00 – 1.00 x 045

23

Horizontal Prism

P = (h_{cm}) (D @ 180th meridian)

P = (.6 cm) (OD -3.75 & OS -3.50)

P = (.6 / 2) (OD -3.75 & OS -3.50)

OD: (.3) (-3.75) = 1.12 ^ D

OS: (.3) (-3.50) = 1.05 ^ D

Total Combined Prism = 2.18 ^ D

Step 1: find Pwr. @ 180
Step 2: subtract lab vs. Patients PD
Step 3: divide / 2
Step 4: change mm to cm
Step 5: multiply pwr. X cm off
Step 6: add OD and OS same direction

24

The OC of the OD lens was edged at 30 mm and the OS lens was edged at 26 mm.

How much vertical prism was induced with the Rx below?

OD +4.25 – 1.00 x 060

OS +4.25 – 0.75 x 135

OC: 26 mm

25

Meridian of Dioptric Power

Degrees from Axis	Percent of Cyl.
0	0%
5	1%
10	3%
15	7%
20	12%
25	18%
30	25%
35	33%
40	41%
45	50%
50	59%
55	67%
60	75%
65	82%
70	88%
75	93%
80	97%
85	99%
90	100%

26

Vertical Prism

Only calculate prism for the right lens because the OS lens is correct:

P = (h_{cm}) (D @ 090th meridian)

P = (.4 cm) (+4.00)

P = 1.60 ^ D (a little more than 1.50 prism diopters)

27

Base Direction

Both Lenses Edged
(same direction)

Plus Lenses

Edged	Result
Too Wide	Base Out
Too Narrow	Base In

Minus Lenses

Edged	Result
Too Wide	Base In
Too Narrow	Base Out

28

Compounding Prism

Amounting Prism
(O.D. & O.S. Lens)

- Base In & Base In
- Base Out & Base Out
- Base Up & Down

29

Neutralizing Prism

Neutralizing Prism
(O.D. & O.S. Lens)

- Base Down & Down
- Base Out & Base In
- Base Up & Base Up

30

Monocular Prism

The lab edged lenses at 31/35mm PD.

How much prism was induced?

OD +3.00 – 0.50 x 090
OS +3.75 – 1.00 x 060

Patient PD 33/33 mm

31

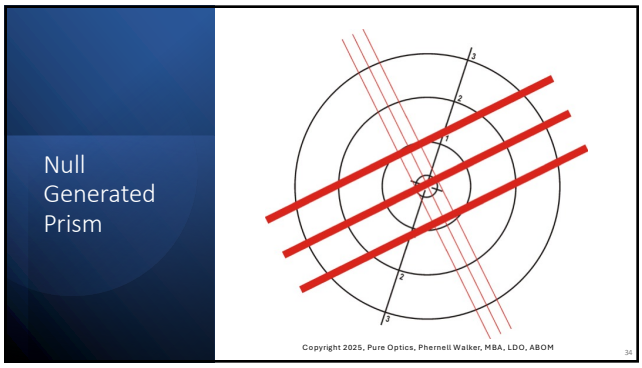
Mid-line Shift

P = (h_{cm}) (D @ 180th meridian)
P = (OD 31 -33 = 2 mm & OS 35 – 33 = 2 mm) (O.D. +2.50 & O.S. +3.00)
P = (OD .2cm & OS .2cm) (OD +2.50 & O.S. +3.00)
OD Prism = (.2 cm too narrow) (+2.50) & O.S. Prism = (.2 cm too wide) (+3.00)
OD Prism = 0.50 D. B.I. & O.S. Prism = 0.60 D. B.O.
Total Prism = Prism OD + Prism OS
Total Prism = 0.50 D B. I. + 0.60 D. B. O.
Total Prism = 0.10 D ^ B.O. (base out because the stronger prism is Base Out)

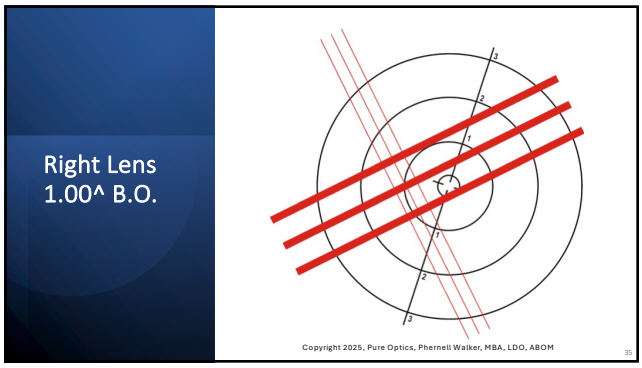
32

Lensometry and Prism

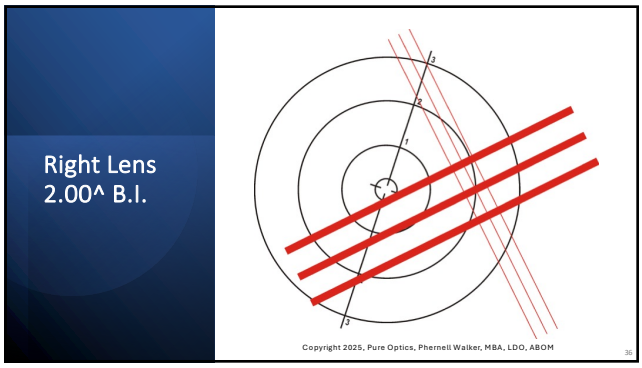
33


Null
Generated
Prism
Copyright 2025, Pure Optics, Phernell Walker, MBA, LDO, ABOM

34

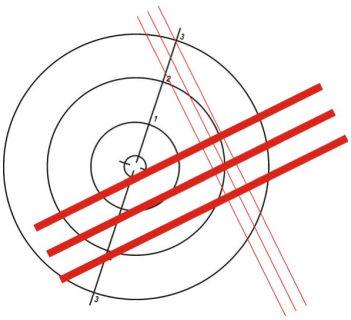

Right Lens
1.00^ B.O.
Copyright 2025, Pure Optics, Phernell Walker, MBA, LDO, ABOM

35


Right Lens
2.00^ B.I.
Copyright 2025, Pure Optics, Phernell Walker, MBA, LDO, ABOM

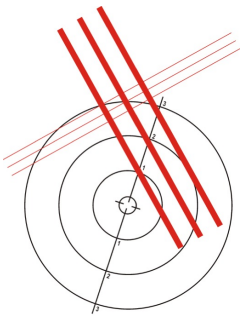
36

Left Lens 2.00^ B.O.



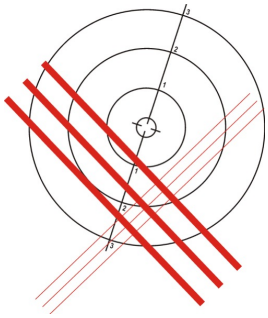
37

Right or Left Lens 3.00^ B.U.



38

Right or Left Lens 2.00^ B.D.



39

Convert Degrees to Rectangular Notation

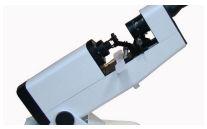
$V = D_e$ (sine a)

$H = D_e$ (cosine a)

where:

- V = vertical prism
- H = horizontal prism
- D_e = prism dioptric power

40



Convert the following prescription neutralized in the lensometer from polar notation to rectangular notation:

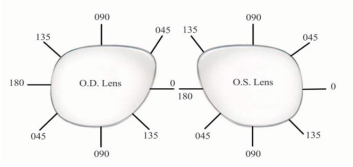
OD +3.25 DS, 4.00 $^{\Delta}$ B.I. @ 045

41

OD: -3.25 DS, 4^{Δ} BI @ 045

V = (4.00) (.707)
H = (4.00) (.707)
V = 2.82
H = 2.82

OD: +3.25, 2.82^{Δ} B.U., 2.82^{Δ} B.I.Notice the rectangular coordinates for the right eye directly corresponds with the polar coordinate of 045 degrees (fig. 11-5).

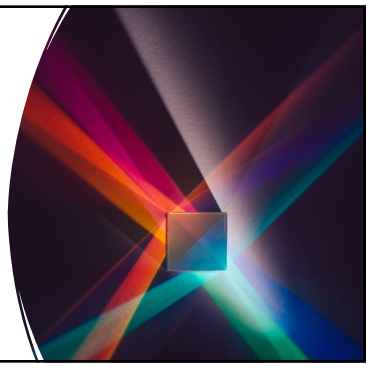


42

Combined Horizontal & Vertical Prism

$\sqrt{P} = V^2 + H^2$

$\tan^{-1} a = v/ h$



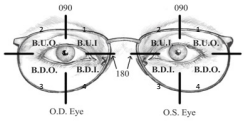
43

What is the Net Result?

Rx

OD: -2.00 DS, 1.00 ▲ B.U. & 3.00 ▲ B.I.

OS: -2.50 DS, 1.00 ▲ B.U. & 3.00 ▲ B.I.



44

OD (^ = Q1)	OS (^ = Q2)
$\sqrt{P} = V^2 + H^2$	$\sqrt{P} = V^2 + H^2$
$\sqrt{P} = 1^2 + 3^2$	$\sqrt{P} = 1^2 + 3^2$
$\sqrt{P} = 1 + 9$	$\sqrt{P} = 1 + 9$
$\sqrt{P} = 10$	$\sqrt{P} = 10$
$\sqrt{P} = 3.16$	**$\sqrt{P} = 3.16$**
$\tan^{-1} a = v/ h$	$\tan^{-1} a = v/ h$
$\tan^{-1} a = 1/ 3$	$\tan^{-1} a = 1/ 3$
$\tan^{-1} a = 18.43$	$\tan^{-1} a = 18.43$
$\tan^{-1} a = 18$ degrees	**$\tan^{-1} a = 162$ degrees**

Determine the Tangent Angle	
a_1	a
Quadrant I	$a_1 = a$
Quadrant II	$180 - a_1 = a$
Quadrant III	$180 + a_1 = a$
Quadrant IV	$360 - a_1 = a$

Excerpt: Copyright 2023, Pure Optics Third Ed. Textbook

45

Rectangular Prism Rx

OD: -2.00 DS, 1.00 ▲ B.U. & 3.00 ▲ B.I.

OS: -2.50 DS, 1.00 ▲ B.U. & 3.00 ▲ B.I.

Combined Prism Rx

OD: -2.00 DS, 3.16 ▲ @ 018 degrees

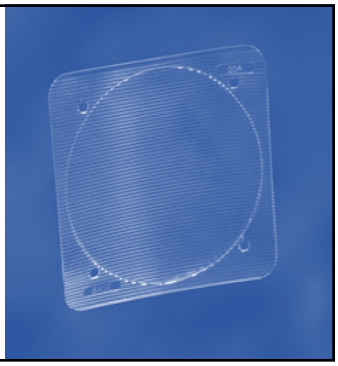
OS: -2.50 DS, 3.16 ▲ @ 162 degrees

46

Treatment Options

Temporary

Testing Prism



47

Prism Power

- Bilateral prism - splitting prism between both eyes
- Convergence (ESO) - bilateral Base Out (B.O.)
- Divergence (EXO) - bilateral Base In (B.I.)
- Right (Hyper)
  - OD lens = Base Down (B.D.)
  - OS lens = Base Up (B.U)
- Left (Hyper)
  - OD lens = Base Up (B.U.)
  - OS lens = Base Down (B.D)

48


Questions
Copyright 2025, Pure Optics, Phernell Walker, MBA, LDO, ABOM

49