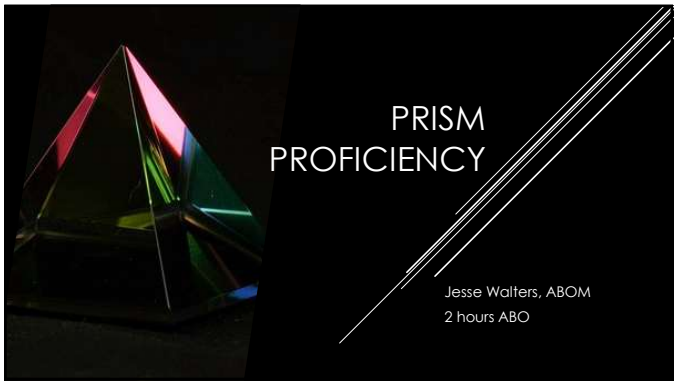
On behalf of Vision Expo, we sincerely thank you for being with us this year.

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

1



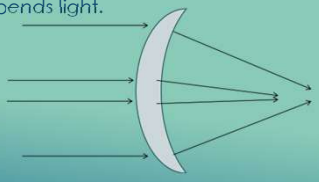
2

JESSE WALTERS, ABOM

- No Financial interests to disclose
- Account Representative and Optical Trainer for an independent OD owned national lab: Summit Optical
- CE Author, content editor and advisor for the Optical Training Institute
- CE contributor for Quantum Optical
- All relevant relationships have been mitigated

3

A prism is any two refractive surfaces with an angle between them that bends light.



ALL LENSES ARE PRISMS

4

- Inspection
- Frame adjustment
- Troubleshooting
- Optical center alignment
- Pupillary distance
- Segment height
- Customizing corridors
- Frame selection

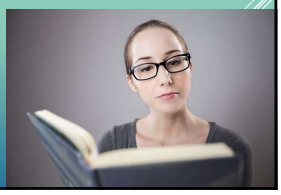
CONSIDERING PRISMS

If your job includes any of these functions, you need to understand prism.

5

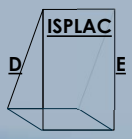
- What is the anatomy of a prism?
- Why and how is prism prescribed?
- How do you identify prism and tolerances?
- Why is prism important to consider when choosing a frame and taking measurements?

LEARNING OBJECTIVES



6

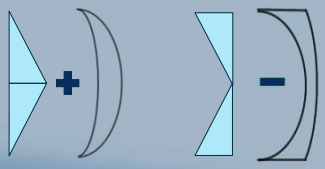
- Prisms have an *apex* and a *base*
- Prisms always bend light towards its base
- An image viewed through a prism will always be *displaced* towards the apex



THE ANATOMY OF A PRISM

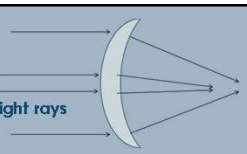
7

- Plus lenses are prisms joined at their base
- Minus lenses are prisms joined at their apex
- Where the prisms meet is called the *optical center*

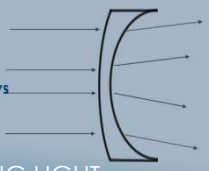


LENS POWER: + AND -

8



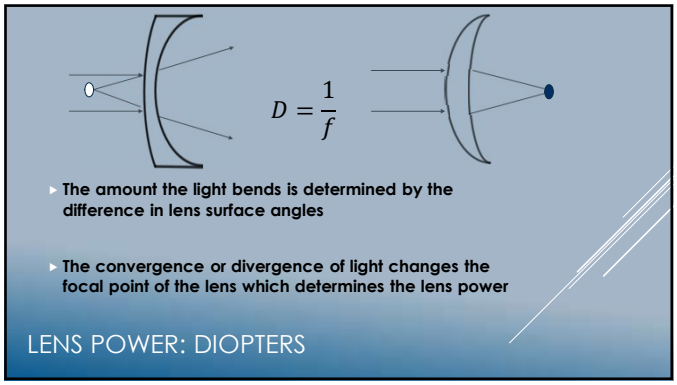
- Plus lenses converge light rays



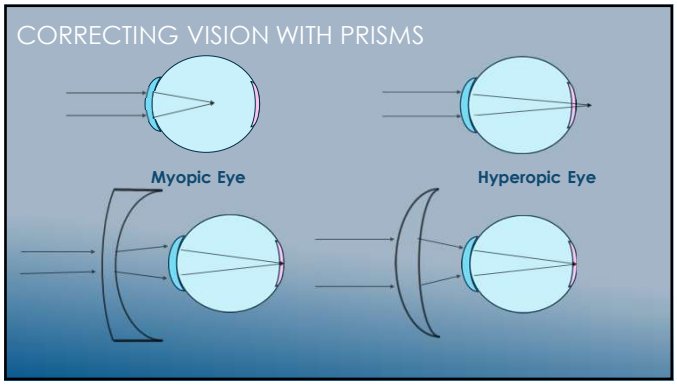
- Minus lenses diverge light rays

LENS POWER: BENDING LIGHT

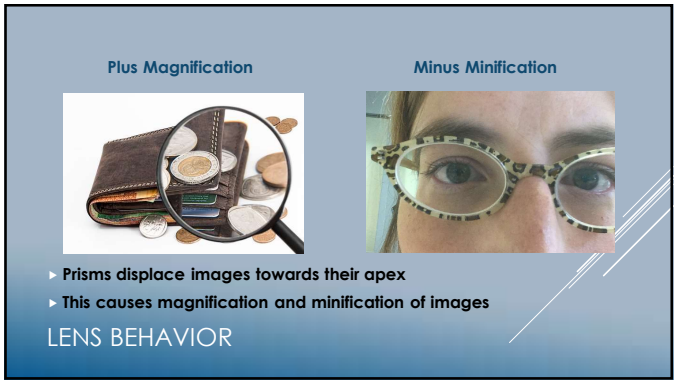
9


$D = \frac{1}{f}$
The amount the light bends is determined by the difference in lens surface angles
The convergence or divergence of light changes the focal point of the lens which determines the lens power
LENS POWER: DIOPTERS

10


CORRECTING VISION WITH PRISMS
Myopic Eye
Hyperopic Eye

11


Plus Magnification
Minus Minification
Prisms displace images towards their apex
This causes magnification and minification of images
LENS BEHAVIOR

12

PRESCRIBED PRISM

Intentional displacement of images to correct for double vision and muscle imbalances.

13

Δ = deviation (cm) / distance away (Meters)

- **3 Diopters of prism will move an object that is 10 meters away by 30cm**
- **3 Diopter Base Up moves the image DOWN**

PRISM POWER

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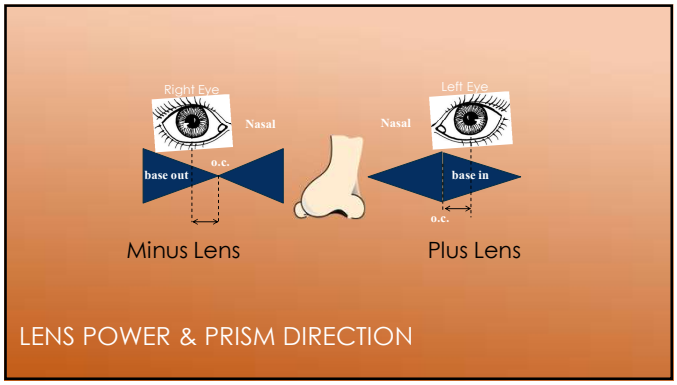
Ground-in Prism

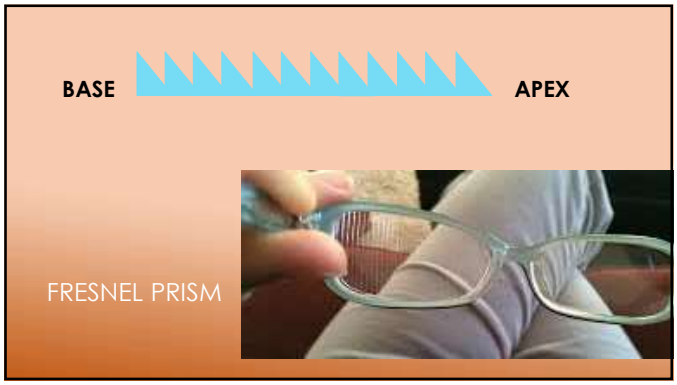
Decentered Prism

INDUCING PRISM

15


Right Eye
Nasal
o.c.
base out
Left Eye
Nasal
base in
o.c.
Minus Lens
Plus Lens
LENS POWER & PRISM DIRECTION

16


BASE
APEX
FRESNEL PRISM

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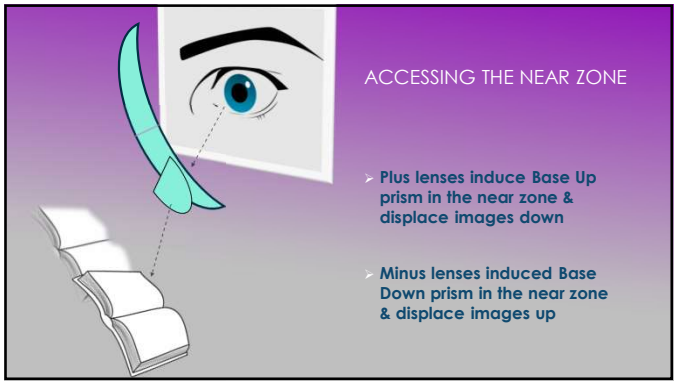
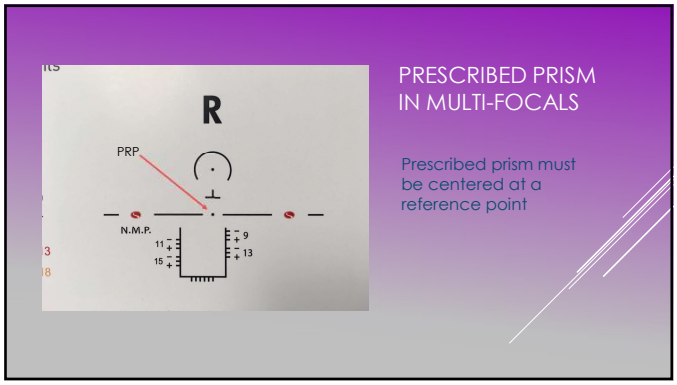
PRISMS IN MULTI-FOCALS

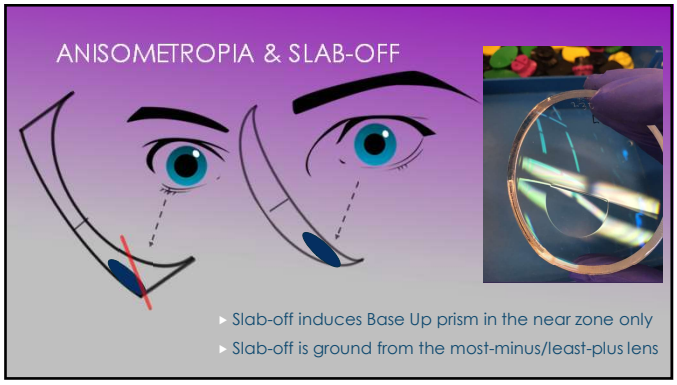
18


ACCESSING THE NEAR ZONE
Plus lenses induce Base Up prism in the near zone & displace images down
Minus lenses induced Base Down prism in the near zone & displace images up

19


R
PRP
N.M.P.
PRESCRIBED PRISM IN MULTI-FOCALS
Prescribed prism must be centered at a reference point

20


ANISOMETROPIA & SLAB-OFF
Slab-off induces Base Up prism in the near zone only
Slab-off is ground from the most-minus/least-plus lens

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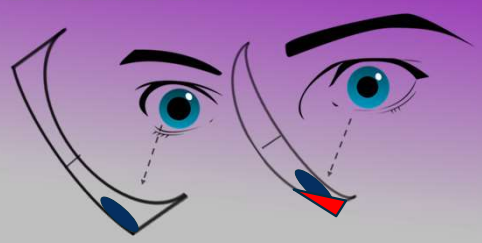
REVERSE SLAB-OFF



- Reverse Slab-off induces Base Down prism in the near zone only
- Reverse Slab-off is molded to the most-plus/least-minus lens

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SPECIALTY FUSED PRISM

Prism can be applied to exclusively to the side, top, or bottom of a lens by cutting and attaching lenses together.

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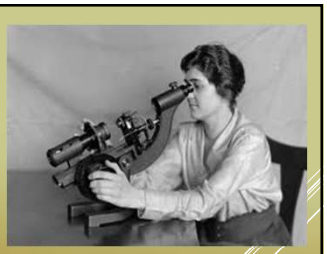

LENS VERIFICATION

Prism must be verified on ALL lenses whether prescribed or not…

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ANSI STANDARDS

- **Last updated in 2015, updated every 5 years**
- **Use of standards are completely voluntary and does NOT prevent any manufacturer or purchaser from making or using products not conforming to standards**
- **Widely recognized as the industry standard for Rx manufacturing**

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ANSI STANDARDS

- Standards are different for vertical & horizontal prism
- Standards are measured differently for lower & higher powers

ANSI Standards for Prism Imbalance

Vertical prism:
- Plano to ±3.37 ≤ 0.33
- Over ±3.37 ≤ 1mm difference in PRP height

Horizontal prism:
- Plano to ± 2.75 ≤ 0.67
- Over ± 2.75 ≤ 2.5mm (1mm for PAL) difference from specified interpupillary distance

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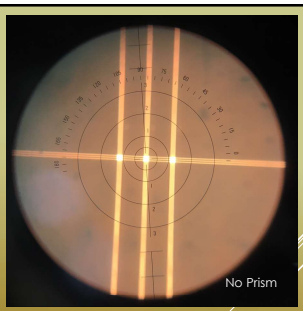
- Prism is measured by the fixed target in a lensometer
- The prism should be set to zero before mounting a prescription lens



PRISM RINGS

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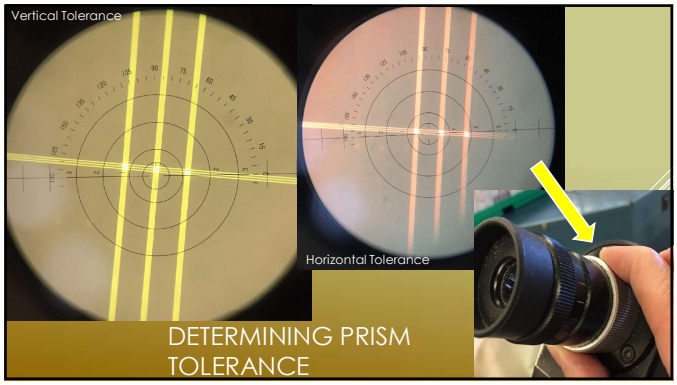
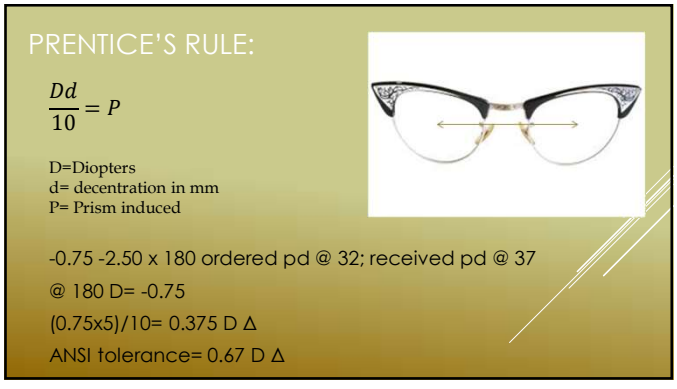

Vertical Tolerance
Horizontal Tolerance
DETERMINING PRISM TOLERANCE

28


PRISM VERIFICATION: SINGLE-VISION & LINED MULTI-FOCALS

29


PRENTICE'S RULE:
$\frac{Dd}{10} = P$
D=Diopters
d= decentration in mm
P= Prism induced
-0.75 -2.50 x 180 ordered pd @ 32; received pd @ 37
@ 180 D= -0.75
(0.75x5)/10= 0.375 D Δ
ANSI tolerance= 0.67 D Δ

30

HIGH RX TOLERANCE

- Higher power tolerance is measured in millimeters of deviation
- Simply spot the lens at the ordered p.d. and o.c., and then re-spot where the prism is correct

ANSI Standards for Prism Imbalance

Vertical prism:
- Over ±3.37 ≤ 1mm difference in PRP height

Horizontal prism:
- Over ± 2.75 ≤ 2.5mm (1mm for PAL) difference from specified interpupillary distance

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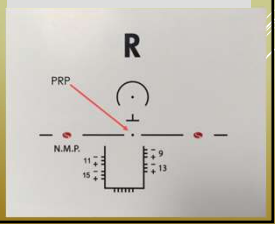
VERIFYING PROGRESSIVES

- Align lens stop on the CENTER of the PRP, double checking position with lens markers and stabilizing with the stage.
- Check prism position from one lens to the other. Lens power is not considered.
- There should be zero horizontal prism(unless prescribed)and matching vertical prism.

Example:
Prescribed:
OD: 2BU OS: 2BD
@PRP: (1BD prism thinning)
OD: 1BU OS:3BD



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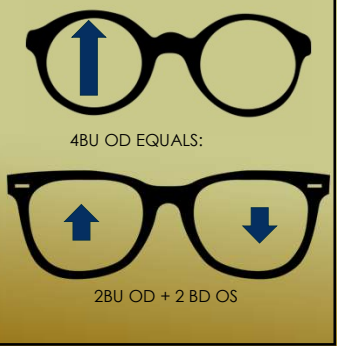
RESULTANT PRISM

- Prism *can* be split between lenses for the same prismatic result
- Ask the prescribing doctor before splitting prism, *especially* for single-eye horizontal prism



4BU OD EQUALS:

2BU OD + 2 BD OS

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YOKED PRISM

- Prism going in the same direction in both lenses cancels itself out (called YOKED prism)
- Yoked prism must be considered to calculate resultant prism

4BU + 1 BU =3 BU

4BO + 1 BI =3 BO

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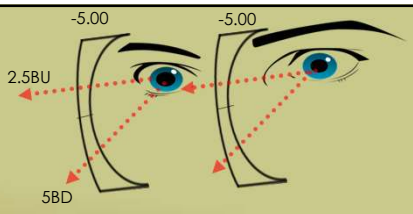

Prentice's Rule:

$$\frac{Dd}{10} = P$$

PRESCRIBED & NOT PRESCRIBED YOKED PRISM

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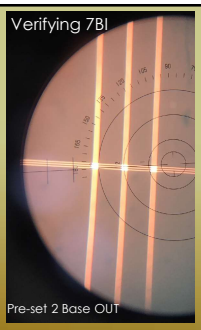
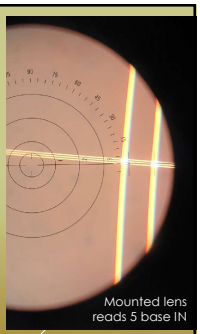
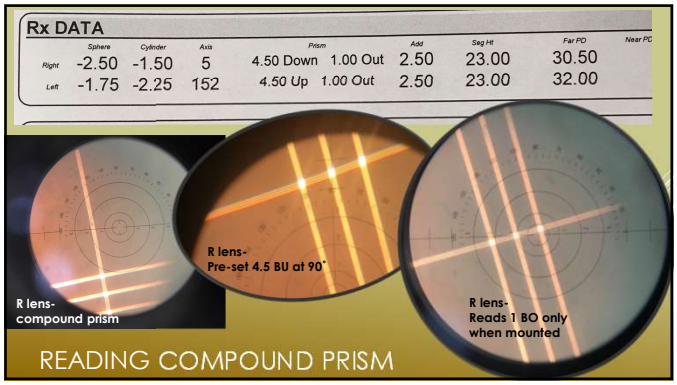




VERIFYING LARGE AMOUNTS OF PRISM

36


Rx DATA
Sphere Cylinder Axis Prism Add Seg Ht Far PD Near PD
Right -2.50 -1.50 5 4.50 Down 1.00 Out 2.50 23.00 30.50
Left -1.75 -2.25 152 4.50 Up 1.00 Out 2.50 23.00 32.00
R lens-
compound prism
R lens-
Pre-set 4.5 BU at 90°
R lens-
Reads 1 BO only
when mounted
READING COMPOUND PRISM

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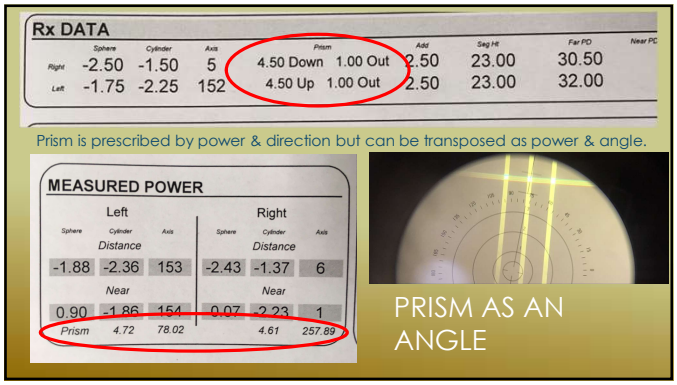
Rx DATA
Sphere Cylinder Axis Prism Add Seg Ht Far PD Near PD
Right -2.50 -1.50 5 4.50 Down 1.00 Out 2.50 23.00 30.50
Left -1.75 -2.25 152 4.50 Up 1.00 Out 2.50 23.00 32.00
Prism is prescribed by power & direction but can be transposed as power & angle.
MEASURED POWER
Left
Right
Sphere Cylinder Axis
Distance
-1.88 -2.36 153
-2.43 -1.37 6
Near
0.90 -1.86 154
0.07 -2.23 1
Prism 4.72 78.02
4.61 257.89
PRISM AS AN ANGLE

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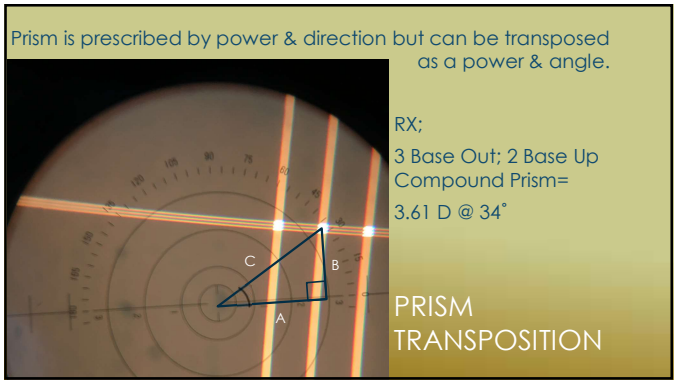
Prism is prescribed by power & direction but can be transposed as a power & angle.
RX;
3 Base Out; 2 Base Up
Compound Prism=
3.61 D @ 34°
C
B
A
PRISM TRANSPOSITION

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	Sphere	Cylinder	Axis	Prism	Add
Right	-2.25	-1.25	28		2.50
Left	-1.00	-3.25	112		2.50

MEASURED POWER

	Left			Right		
	Sphere	Cylinder	Axis	Sphere	Cylinder	Axis
Distance	-0.91	-3.24	112	-2.17	-1.25	32
Near	1.48	-3.24	112	0.21	-1.25	32
Prism	0.51	180.00			0.25	0.00

WRAP COMPENSATION

40

- Intentional prism can be easily detected in lenses with laser markings
- Single vision lenses must be dotted at pupil center and prism can be *estimated*
- High Rxs can be falsely identified as having prism

"CAN YOU CHECK IF THESE HAVE PRISM"

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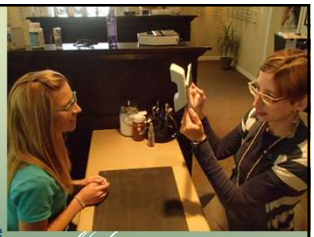

PRISM ALIGNMENT

Measurements determine the amount of prism experience throughout a lens.

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- P.D.s determine the alignment of horizontal prism
- Our faces are asymmetrical, and measurements should be taken monocularly
- Cosmetics and optics should be weighed with visible bifocal segments

PUPIL DISTANCE

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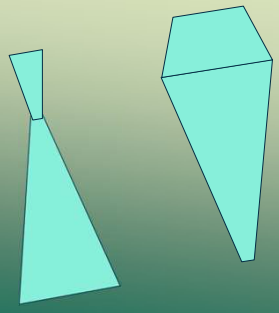

OPTICAL CENTER HEIGHTS

O.C. heights help center the optics of the lens but also changes prismatic effect throughout the vertical lens axis.

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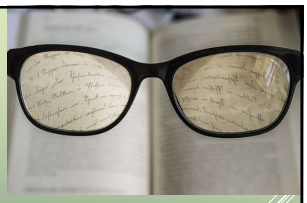
- PRP already compensates for vertical prismatic balance
- Fitting heights outside of standard recommendations may have prismatic consequences
- Corridor length customizations can help vertical prism imbalance



PROGRESSIVE HEIGHT & CORRIDOR

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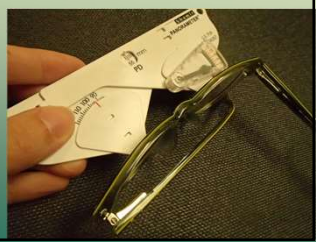
POSITION OF WEAR

- Changing the angle of a lens induces prism
- Pantoscopic tilt and frame wrap have prismatic consequences
- Lens compensations can correct for unwanted prism



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FRAME ADJUSTMENT

- Pantoscopic tilt should measure between 6-9 degrees
- Frame wrap adjustments can correct for p.d. alignment

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PRISM PROFICIENCY

Jesse Walters, ABOM
jesse@summitoptical.com

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