Transposition: 3 Steps

1. Change the axis by 90 degrees
2. Change the sign of the cylinder
3. Combine the sphere with the cylinder

Let’s Do It

Rx: -1.00 +2.00 x 180

1. Change the axis by 90 degrees
   180-90 = 90
2. Change the sign of the cylinder
   +2.00 becomes -2.00
3. Combine the sphere with the cylinder
   -1.00 combined with +2.00 = +1.00

Transposed Rx: +1.00 -2.00 x 090
Problems Combining a Positive and Negative Numbers?

Think about the numbers as if the first one is the balance in your checkbook and the second one is either a deposit (+) or a debit (-).

Problems With the Axis?

Easy as pie......

180=90 (1+8=9)  
90=180 (9-1=8)

170=80 (1+7=8)  
80=170 (8-1=7)

160=70 (1+6=7)  
70=160 (7-1=6)

Now You Do It

1. Rx: +2.50 +1.25 x 060
2. Rx: -1.00 +1.75 x 080

Transposed:
1. +3.75 -1.25 x 150
2. +0.75 -1.25 x 170
Spherical Equivalent: 2 Steps

1. Combine ½ of the cylinder power to the sphere
2. Drop the axis

Let’s Do It

Rx: -1.00 +1.00 x 180

1. Combine ½ of the cylinder power to the sphere
\[(+1.00 / 2) = +0.50\] Combined with -1.00 = -0.50
2. Drop the axis

Spherical equivalent is: -0.50 sphere

Now You Do It

Rx: +2.00 -0.50 x 090

Spherical equivalent is: +1.50 sphere
Reading Prescription: 1 Step

1. Combine the add power with the sphere power. The cylinder and the axis stay the same.

Think About It This Way

Lens Power is -3.00

Let's Do It

Rx: -1.00 +1.00 x 180  Add +1.25

Combine the add power with the sphere power. The cylinder and the axis stay the same.

-1.00 (sphere power) combined with +1.25 (add) = +0.25

Reading Rx: +0.25 +1.00 x 180
Now You Do It

What is the reading glasses prescription for the following: +1.00 - 1.25 x 180
+1.25 - 1.00 x 175
Add +2.00

Answer:
+3.00 - 1.25 x 180
+3.25 - 1.00 x 175

Converting Meters to Feet

• 1 m = 3.28 ft.
• Divide denominator by 3
• 6/6 (6/3=2) so 6/6=20/20
• 6/9 (9/3=3) so 6/9=20/30

Converting Feet to Meters

• It’s easy…just do the opposite
• Multiply denominator by 3
• 20/20 (2 x 3=6) so 20/20=6/6
• 20/30 (3 x 3=9) so 20/30=6/9
Now You Do It

<table>
<thead>
<tr>
<th>Feet</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/80</td>
<td>______</td>
</tr>
<tr>
<td>______</td>
<td>6/12</td>
</tr>
</tbody>
</table>

Converting Focal Length into Diopters

- Formula: \( D = \frac{1}{F} \)
  
  - \( D \) = power of lens in diopters
  - \( F \) = focal length in meters

Examples:
- Lens with focal length of 1 m = 1/1 = 1.00 D
- Lens with focal length of 2 m = 1/2 = 0.50 D
- Lens with focal length of 4 m = 1/4 = 0.25 D

Now You Do It

What is the dioptric power of a lens with a focal length of .5 m?
The formula is \( D = \frac{1}{F} \)
\[ \frac{1}{.5} = 2 \]
### Lens Power Compared to Focal Length

<table>
<thead>
<tr>
<th>Lens Power</th>
<th>Focal Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 D</td>
<td>2 m (200 cm)</td>
</tr>
<tr>
<td>1.0 D</td>
<td>1 m (100 cm)</td>
</tr>
<tr>
<td>2.0 D</td>
<td>0.50 m (50 cm)</td>
</tr>
<tr>
<td>3.0 D</td>
<td>0.33 m (33 cm)</td>
</tr>
<tr>
<td>4.0 D</td>
<td>0.25 m (25 cm)</td>
</tr>
<tr>
<td>5.0 D</td>
<td>0.20 m (20 cm)</td>
</tr>
<tr>
<td>6.0 D</td>
<td>0.17 m (17 cm)</td>
</tr>
<tr>
<td>7.0 D</td>
<td>0.14 m (14 cm)</td>
</tr>
<tr>
<td>8.0 D</td>
<td>0.13 m (13 cm)</td>
</tr>
<tr>
<td>9.0 D</td>
<td>0.11 m (11 cm)</td>
</tr>
<tr>
<td>10.0 D</td>
<td>0.10 m (10 cm)</td>
</tr>
</tbody>
</table>

### The Optical Cross

- A spherical lens has one power.
- A spherocylindrical lens has one spherical and one cylindrical surface, giving it 2 radii of curve (unequal power).
- An optical cross is used to illustrate the powers of a spherocylindrical lens.

Remember: The power of the cylinder is found 90 degrees away from the placement of the axis.

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**Rx:** +3.00 +1.00 x 180

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The Optical Cross

\[ -4.00 \quad + \quad 0 \quad = \quad -4.00 \]
\[ -4.00 \quad + \quad +1.00 \quad = \quad -3.00 \]

Rx: \(-4.00 +1.00 \times 090\)

Now You Do It

\[ -1.00 \quad + \quad +1.00 \quad = \quad \]

What is the prescription?

Prentice’s Rule

If the patient is not looking through the optical center of a lens that has power, they are looking through prism.
Prentice’s Rule

Prism = Power x Decentration in cm

Prism = lens power (in diopters) multiplied by D in cm
(Where D = amount the patient PD varies from the major reference point in cm)

EX: -4.00 (power) x .5cm (decentration in cm)= 2 prism diopters

Decentration

• Plus lens-decenteration shifts with the lens
  – Lens decentered out/induced prism is BO
• Minus lens-decenteration shifts opposite from the lens
  – Lens decentered out/induced prism is BI

Prentice’s Rule

Which direction is the lens decentered?
Are the lenses minus or plus?
What type of prism is induced?
Now You Do It

• Exercise:

Rx: OD: +11.00 Sph
OS: +12.00 Sph
The optical centers are both displaced 4 mm temporally (out)

What is the amount and direction of induced prism?

Answer

Formula is: Prism = Power x Decentration in cm
OD: +11.00 x .4 = 4.4 4 ½ prism diopters (rounded)
OS: +12.00 x .4 = 4.8 5 prism diopters (rounded)
Prism is base out because with a plus lens, the decentration shifts with the lens.

Low Vision Calculations

• To find the dioptic power of a magnifier, multiply the X power by 4.
  – Example:
  – A magnifier that is 10x would be 40 diopters (10 x 4 = 40)
Low Vision Calculations

• To figure the distance that a magnifier should be held from the page to get the clearest image:
  – Convert the diopters to X by dividing by 4
  – Divide this number into 10

Example – Where should a 20 D magnifier be held for clearest vision?

\[
\frac{20}{4} = 5 \times x \\
\frac{10}{5} = 2 \text{ inches}
\]

Now You Do It

Where should a 2x magnifier be held to achieve the clearest vision?

\[
\frac{10}{2} = 5 \text{ inches}
\]

What is the dioptic power of a 2x magnifier?

\[
2 \times 4 = 8 \text{ D}
\]
Test Height Calculations

The 20/400 E should be 88 mm in height if patient is 20 feet away.

What if patient is 17 feet away?

\[
\frac{20 \text{ ft}}{88 \text{ mm}} = \frac{17 \text{ ft}}{X \text{ mm}}
\]

Cross multiply:

88 times 17 equals 1496

Divide each side by 20:

X equals 74.8

Now You Do It

What if the patient is 15 feet away?

\[
\frac{20 \text{ ft}}{88 \text{ mm}} = \frac{15 \text{ ft}}{X \text{ mm}}
\]

Cross multiply:

88 times 15 equals 1320

Divide each side by 20:

X equals 66 mm