

Costco NCLE

Review of Contact lens Calculations

Contact Lens Training Program

Review of Contact Lens Calculations

Radius of Curvature and Diopter Relationship

2 Ways to Convert Radius / Diopters

1. Formula
2. Conversion Chart / Table

Convert 45.00 Diopters to radius of curvature in mm

Convert 45.00 Diopters to radius of curvature in mm

$$337.5 \div 45.00D = 7.5\text{mm}$$

- Divide 337.50 by the Diopters to convert to radius of curvature

NOTE: 337.50 is the number to remember
for converting Diopters to Millimeters or vice versa

Convert 7.5mm radius of curvature to Diopters

Convert 7.5mm radius of curvature to Diopters

$$337.5 \div 7.5\text{mm} = 45.00D$$

- Divide 337.50 by millimeters to convert to Diopters

NOTE: 337.50 is the number to remember
for converting Diopters to Millimeters or vice versa

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Which of these curves are steeper?
41.00D or 42.00D

Which of these curves are steeper?
41.00D or 42.00D

42.00D is steeper

The higher dioptric power (42.00D), the steeper the curve
The lower dioptric power (41.00D), the flatter the curve

Which of these curves are steeper?
8.4mm or 7.4mm

Which of these curves are steeper?
8.4mm or 7.4mm

7.4mm is steeper

The shorter the radius (7.4mm), the steeper the curve
The longer the radius (8.4mm), the flatter the curve

Which of these curves are flatter?
40.50D or 43.25D

Which of these curves are flatter?
40.50D or 43.25D

40.50D is flatter

The lower dioptric power (40.50D), the flatter the curve
The higher dioptric power (43.25D), the steeper the curve

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Which of these curves are flatter?
8.1mm or 8.0mm

Which of these curves are flatter?
8.1mm or 8.0mm

8.1mm is flatter

The longer the radius (8.1mm), the flatter the curve
The shorter the radius (8.0mm), is the steeper the curve

Diopter to Radius of Curvature Conversion Chart

- There is a column for DIOPTER and a column for the equivalent RADIUS
- For example,
 - 45.00 DIOPTER = 7.5mm RADIUS

DIOPTER	RADIUS	DIOPTER	RADIUS	DIOPTER	RADIUS	DIOPTER	RADIUS	DIOPTER	RADIUS
24.00	14.58	25.12	13.81	26.25	13.04	27.38	12.27	28.50	11.50
24.50	14.26	25.62	13.47	26.75	12.70	27.88	11.93	29.00	10.77
25.00	13.95	26.12	13.14	27.25	12.37	28.38	11.60	29.50	10.44
25.50	13.64	26.62	12.81	27.75	12.04	28.88	11.27	30.00	10.11
26.00	13.33	27.12	12.48	28.25	11.71	29.38	10.94	30.50	9.78
26.50	13.02	27.62	12.15	28.75	11.38	29.88	10.61	31.00	9.45
27.00	12.71	28.12	11.82	29.25	11.05	30.38	10.28	31.50	9.12
27.50	12.40	28.62	11.49	29.75	10.72	30.88	9.95	32.00	8.79
28.00	12.09	29.12	11.16	30.25	10.39	31.38	9.62	32.50	8.46
28.50	11.78	29.62	10.83	30.75	10.06	31.88	9.29	33.00	8.13
29.00	11.47	30.12	10.50	31.25	9.73	32.38	8.96	33.50	7.80
29.50	11.16	30.62	10.17	31.75	9.40	32.88	8.63	34.00	7.47
30.00	10.85	31.12	9.84	32.25	9.07	33.38	8.30	34.50	7.14
30.50	10.54	31.62	9.51	32.75	8.74	33.88	7.97	35.00	6.81
31.00	10.23	32.12	9.18	33.25	8.41	34.38	7.64	35.50	6.48
31.50	9.92	32.62	8.85	33.75	8.08	34.88	7.31	36.00	6.15
32.00	9.61	33.12	8.52	34.25	7.75	35.38	6.98	36.50	5.82
32.50	9.30	33.62	8.19	34.75	7.42	35.88	6.65	37.00	5.49
33.00	8.99	34.12	7.86	35.25	7.09	36.38	6.32	37.50	5.16
33.50	8.68	34.62	7.53	35.75	6.76	36.88	5.99	38.00	4.83
34.00	8.37	35.12	7.20	36.25	6.43	37.38	5.66	38.50	4.50
34.50	8.06	35.62	6.87	36.75	6.10	37.88	5.33	39.00	4.17
35.00	7.75	36.12	6.54	37.25	5.77	38.38	5.00	39.50	3.84
35.50	7.44	36.62	6.21	37.75	5.44	38.88	4.67	40.00	3.51
36.00	7.13	37.12	5.88	38.25	5.11	39.38	4.34	40.50	3.18
36.50	6.82	37.62	5.55	38.75	4.78	39.88	4.01	41.00	2.85
37.00	6.51	38.12	5.22	39.25	4.45	40.38	3.68	41.50	2.52
37.50	6.20	38.62	4.89	39.75	4.12	40.88	3.35	42.00	2.19
38.00	5.89	39.12	4.56	40.25	3.79	41.38	3.02	42.50	1.86
38.50	5.58	39.62	4.23	40.75	3.46	41.88	2.69	43.00	1.53
39.00	5.27	40.12	3.90	41.25	3.13	42.38	2.36	43.50	1.20
39.50	4.96	40.62	3.57	41.75	2.80	42.88	2.03	44.00	0.87
40.00	4.65	41.12	3.24	42.25	2.47	43.38	1.70	44.50	0.54
40.50	4.34	41.62	2.91	42.75	2.14	43.88	1.37	45.00	0.21
41.00	4.03	42.12	2.58	43.25	1.81	44.38	1.04		
41.50	3.72	42.62	2.25	43.75	1.48	44.88	0.71		
42.00	3.41	43.12	1.92	44.25	1.15	45.38	0.38		
42.50	3.10	43.62	1.59	44.75	0.82	45.88	0.05		
43.00	2.79	44.12	1.26	45.25	0.49	46.38			
43.50	2.48	44.62	0.93	45.75	0.16	46.88			
44.00	2.17	45.12	0.60	46.25		47.38			
44.50	1.86	45.62	0.27	46.75		47.88			
45.00	1.55	46.12		47.25		48.38			

Vertex Conversion

3 Ways to Determine Vertex Changes

- General Rule Approximation
- Conversion Chart / Table
- Formula

For contact lens fitting,
which Spectacle Rx requires vertexing?
-3.50D or -4.50D

For contact lens fitting,
which Spectacle Rx requires vertexing?
-3.50D or -4.50D

-4.50D should be vertexed to -4.25D
 $-4.50D + (+0.25) = -4.25$

General Rule for Approximate Rx Change
for lens powers +/- 4.00 or greater
(varies with exact power and how many millimeters of vertex change)

- +/- 4.00D ≤ 5.75D add +0.25D to the spectacle Rx
- +/- 6.00D ≤ 7.75D add +0.50D to the spectacle Rx
- +/- 8.00D ≤ 9.75D add +0.75D to the spectacle Rx
- +/- 10.00D ≤ 11.75D add +1.00D to the spectacle Rx
- +/- 12.00D ≤ 13.75D add +1.25D to the spectacle Rx
- +/- 14.00D ≤ 15.75D add +1.50D to the spectacle Rx

Note: When vertexing from the spectacle plane to the contact lens plane, add plus power regardless if it's a plus or minus Spectacle Rx.

- Minus (-) CL Rx will always be a lesser power than the spectacle Rx
- Plus (+) CL Rx will always be a higher power than the spectacle Rx

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For contact lens fitting,
which Spectacle Rx requires vertexing?
+3.75D or +8.50D

For contact lens fitting,
which Spectacle Rx requires vertexing?
+3.75D or +8.50D

+8.50D should be vertexed to +9.25D

$$+8.50 + (+0.75D) = +9.25$$

General Rule for Approximate Rx Change
for lens powers +/- 4.00 or greater
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how many millimeters of vertex change)

+/- 4.00D ≤ 5.75D add +0.25D to the spectacle Rx
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+/- 12.00D ≤ 13.75D add +1.25D to the spectacle Rx
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Note: When vertexing from the spectacle
plane to the contact lens plane,
add plus power whether it's a plus or
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- Minus (-) CL Rx will always be a lesser power than the spectacle Rx
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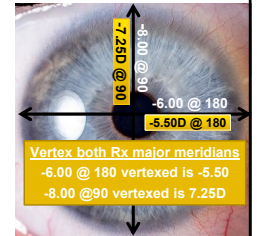
Vertex -6.00 -2.00 x 180 spectacle Rx
to a contact lens Rx

Vertex -6.00 -2.00 x 180 spectacle Rx
to a contact lens Rx

Vertexed to -5.50 -1.75 x 180

General Rule for Approximate Rx Change
(varies with exact power and
how many millimeters of vertex change)

+/- 4.00D ≤ 5.75D add +0.25D to the spectacle Rx
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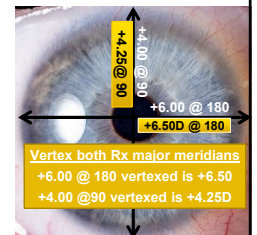
Vertex +6.00 -2.00 x 180 spectacle Rx
to a contact lens Rx

Vertex +6.00 -2.00 x 180 spectacle Rx
to a contact lens Rx

Vertexed to +6.50 -2.25 x 180

General Rule for Approximate Rx Change
(varies with exact power and
how many millimeters of vertex change)

+/- 4.00D ≤ 5.75D add +0.25D to the spectacle Rx
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+/- 10.00D ≤ 11.75D add +1.00D to the spectacle Rx
+/- 12.00D ≤ 13.75D add +1.25D to the spectacle Rx
+/- 14.00D ≤ 15.75D add +1.50D to the spectacle Rx



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Vertex Formula

$$F = \frac{D}{(1 - dD)}$$

This formula can be used to solve for F whether it is from the spectacle Rx to contact lens Rx, or vice versa

F = This is the converted diopter power corrected for vertex distance

D = This is the original lens power in diopters (whether it is the contact lens Rx or spectacle Rx). Be sure to include the appropriate plus or minus sign here.

d = This is the distance in meters the lens is moved. This is the distance between where the current Rx sits and where you now want it to be in relation to the front surface of the eye.

- If you are converting spectacle RX to contact lens RX, or moving the lens closer to the eye, make "d" a positive value.
- If you are converting a contact lens RX to spectacle RX, or moving the lens away from the eye, make "d" a negative value.

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Vertex +10.00D spectacle Rx to a contact lens Rx.
Vertex distance is 12mm

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Vertex +10.00D spectacle Rx to a contact lens Rx.
Vertex distance is 12mm

$$F = \frac{D}{(1 - dD)}$$

$$F = \frac{10.00D}{1 - (.012 \times 10.00)}$$

$$F = \frac{10.00D}{1 - (-.12)}$$

$$F = \frac{10.00D}{.88}$$

$$F = +11.36D \text{ (round up or down to the closest 0.25 diopter)}$$

$$F = +11.25D$$

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Vertex -10.00D spectacle Rx to a contact lens Rx.
Vertex distance is 12mm

Costco

Vertex -10.00D spectacle Rx to a contact lens Rx.
Vertex distance is 12mm

$$F = \frac{D}{(1 - dD)}$$

$$F = \frac{-10.00D}{1 - (.012 \times -10.00)}$$

$$F = \frac{-10.00D}{1 - (-.12)}$$

$$F = \frac{-10.00D}{1.12}$$

$$F = -8.928D \text{ (round up or down to the closest 0.25 diopter)}$$

$$F = -9.00D$$

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Conversion table
back vertex distance from 10 mm to 13 mm

Spectacle Rx	Contact lens power	Contact lens power	Spectacle Rx	Contact lens power	Contact lens power
4.00	4.25	3.75	11.25	13.00	9.75
4.25	4.50	4.00	11.50	13.50	10.00
4.50	4.75	4.25	11.75	13.75	10.25
4.75	5.00	4.50	12.00	14.00	10.50
5.00	5.25	4.75	12.25	14.25	10.75
5.25	5.50	5.00	12.50	14.50	11.00
5.50	5.75	5.25	12.75	14.75	11.25
5.75	6.00	5.50	13.00	15.00	11.50
6.00	6.25	5.75	13.25	15.25	11.75
6.25	6.50	6.00	13.50	15.50	12.00
6.50	6.75	6.25	13.75	15.75	12.25
6.75	7.00	6.50	14.00	16.00	12.50
7.00	7.25	6.75	14.25	16.25	12.75
7.25	7.50	7.00	14.50	16.50	13.00
7.50	7.75	7.25	14.75	16.75	13.25
7.75	8.00	7.50	15.00	17.00	13.50
8.00	8.25	7.75	15.25	17.25	13.75
8.25	8.50	8.00	15.50	17.50	14.00
8.50	8.75	8.25	15.75	17.75	14.25
8.75	9.00	8.50	16.00	18.00	14.50
9.00	9.25	8.75	16.25	18.25	14.75
9.25	9.50	9.00	16.50	18.50	15.00
9.50	9.75	9.25	16.75	18.75	15.25
9.75	10.00	9.50	17.00	19.00	15.50
10.00	10.25	9.75	17.25	19.25	15.75
10.25	10.50	10.00	17.50	19.50	16.00
10.50	10.75	10.25	17.75	19.75	16.25
10.75	11.00	10.50	18.00	20.00	16.50
11.00	11.25	10.75	18.25	20.25	16.75
11.25	11.50	11.00	18.50	20.50	17.00
11.50	11.75	11.25	18.75	20.75	17.25
11.75	12.00	11.50	19.00	21.00	17.50
12.00	12.25	11.75	19.25	21.25	17.75
12.25	12.50	12.00	19.50	21.50	18.00
12.50	12.75	12.25	19.75	21.75	18.25
12.75	13.00	12.50	20.00	22.00	18.50
13.00	13.25	12.75	20.25	22.25	18.75
13.25	13.50	13.00	20.50	22.50	19.00
13.50	13.75	13.25	20.75	22.75	19.25
13.75	14.00	13.50	21.00	23.00	19.50
14.00	14.25	13.75	21.25	23.25	19.75
14.25	14.50	14.00	21.50	23.50	20.00
14.50	14.75	14.25	21.75	23.75	20.25
14.75	15.00	14.50	22.00	24.00	20.50
15.00	15.25	14.75	22.25	24.25	20.75
15.25	15.50	15.00	22.50	24.50	21.00
15.50	15.75	15.25	22.75	24.75	21.25
15.75	16.00	15.50	23.00	25.00	21.50
16.00	16.25	15.75	23.25	25.25	21.75
16.25	16.50	16.00	23.50	25.50	22.00
16.50	16.75	16.25	23.75	25.75	22.25
16.75	17.00	16.50	24.00	26.00	22.50
17.00	17.25	16.75	24.25	26.25	22.75
17.25	17.50	17.00	24.50	26.50	23.00
17.50	17.75	17.25	24.75	26.75	23.25
17.75	18.00	17.50	25.00	27.00	23.50
18.00	18.25	17.75	25.25	27.25	23.75
18.25	18.50	18.00	25.50	27.50	24.00
18.50	18.75	18.25	25.75	27.75	24.25
18.75	19.00	18.50	26.00	28.00	24.50
19.00	19.25	18.75	26.25	28.25	24.75
19.25	19.50	19.00	26.50	28.50	25.00
19.50	19.75	19.25	26.75	28.75	25.25
19.75	20.00	19.50	27.00	29.00	25.50
20.00	20.25	19.75	27.25	29.25	25.75
20.25	20.50	20.00	27.50	29.50	26.00
20.50	20.75	20.25	27.75	29.75	26.25
20.75	21.00	20.50	28.00	30.00	26.50
21.00	21.25	20.75	28.25	30.25	26.75
21.25	21.50	21.00	28.50	30.50	27.00
21.50	21.75	21.25	28.75	30.75	27.25
21.75	22.00	21.50	29.00	31.00	27.50
22.00	22.25	21.75	29.25	31.25	27.75
22.25	22.50	22.00	29.50	31.50	28.00
22.50	22.75	22.25	29.75	31.75	28.25
22.75	23.00	22.50	30.00	32.00	28.50
23.00	23.25	22.75	30.25	32.25	28.75
23.25	23.50	23.00	30.50	32.50	29.00
23.50	23.75	23.25	30.75	32.75	29.25
23.75	24.00	23.50	31.00	33.00	29.50
24.00	24.25	23.75	31.25	33.25	29.75
24.25	24.50	24.00	31.50	33.50	30.00
24.50	24.75	24.25	31.75	33.75	30.25
24.75	25.00	24.50	32.00	34.00	30.50
25.00	25.25	24.75	32.25	34.25	30.75
25.25	25.50	25.00	32.50	34.50	31.00
25.50	25.75	25.25	32.75	34.75	31.25
25.75	26.00	25.50	33.00	35.00	31.50
26.00	26.25	25.75	33.25	35.25	31.75
26.25	26.50	26.00	33.50	35.50	32.00
26.50	26.75	26.25	33.75	35.75	32.25
26.75	27.00	26.50	34.00	36.00	32.50
27.00	27.25	26.75	34.25	36.25	32.75
27.25	27.50	27.00	34.50	36.50	33.00
27.50	27.75	27.25	34.75	36.75	33.25
27.75	28.00	27.50	35.00	37.00	33.50
28.00	28.25	27.75	35.25	37.25	33.75
28.25	28.50	28.00	35.50	37.50	34.00
28.50	28.75	28.25	35.75	37.75	34.25
28.75	29.00	28.50	36.00	38.00	34.50
29.00	29.25	28.75	36.25	38.25	34.75
29.25	29.50	29.00	36.50	38.50	35.00
29.50	29.75	29.25	36.75	38.75	35.25
29.75	30.00	29.50	37.00	39.00	35.50
30.00	30.25	29.75	37.25	39.25	35.75
30.25	30.50	30.00	37.50	39.50	36.00
30.50	30.75	30.25	37.75	39.75	36.25
30.75	31.00	30.50	38.00	40.00	36.50
31.00	31.25	30.75	38.25	40.25	36.75
31.25	31.50	31.00	38.50	40.50	37.00
31.50	31.75	31.25	38.75	40.75	37.25
31.75	32.00	31.50	39.00	41.00	37.50
32.00	32.25	31.75	39.25	41.25	37.75
32.25	32.50	32.00	39.50	41.50	38.00
32.50	32.75	32.25	39.75	41.75	38.25
32.75	33.00	32.50	40.00	42.00	38.50
33.00	33.25	32.75	40.25	42.25	38.75
33.25	33.50	33.00	40.50	42.50	39.00
33.50	33.75	33.25	40.75	42.75	39.25
33.75	34.00	33.50	41.00	43.00	39.50
34.00	34.25	33.75	41.25	43.25	39.75
34.25	34.50	34.00	41.50	43.50	40.00
34.50	34.75	34.25	41.75	43.75	40.25
34.75	35.00	34.50	42.00	44.00	40.50
35.00	35.25	34.75	42.25	44.25	40.75
35.25	35.50	35.00	42.50	44.50	41.00
35.50	35.75	35.25	42.75	44.75	41.25
35.75	36.00	35.50	43.00	45.00	41.50
36.00	36.25	35.75	43.25	45.25	41.75
36.25	36.50	36.00	43.50	45.50	42.00
36.50	36.75	36.25	43.75	45.75	42.25
36.75	37.00	36.50	44.00	46.00	42.50
37.00	37.25	36.75	44.25	46.25	42.75
37.25	37.50	37.00	44.50	46.50	43.00
37.50	37.75	37.25	44.75	46.75	43.25
37.75	38.00	37.50	45.00	47.00	43.50
38.00	38.25	37.75	45.25	47.25	43.75
38.25	38.50	38.00	45.50	47.50	44.00
38.50	38.75	38.25	45.75	47.75	44.25
38.75	39.00	38.50	46.00	48.00	44.50
39.00	39.25	38.75	46.25	48.25	44.75
39.25	39.50	39.00	46.50	48.50	45.00
39.50	39.75	39.25	46.75	48.75	45.25
39.75	40.00	39.50	47.00	49.00	45.50
40.00	40.25	39.75	47.25	49.25	45.75
40.25	40.50	40.00	47.50	49.50	46.00
40.50	40.75	40.25	47.75	49.75	46.25
40.75	41.00	40.50	48.00	50.00	46.50
41.00	41.25	40.75	48.25	50.25	46.75
41.25	41.50	41.00	48.50	50.50	47.00
41.50	41.75	41.25	48.75	50.75	47.25
41.75	42.00	41.50	49.00	51.00	47.50
42.00	42.25	41.75	49.25	51.25	47.75
42.25	42.50	42.00	49.50	51.50	48.00
42.50	42.75	42.25	49.75	51.75	48.25
42.75	43.00	42.50	50.00	52.00	48.50
43.00	43.25	42.75	50.25	52.25	48.75
43.25	43.50	43.00	50.50	52.50	49.00
43.50	43.75	43.25	50.75	52.75	49.25
43.75	44.00	43.50	51.00	53.00	49.50
44.00	44.25	43.75	51.25	53.25	49.

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Review of Contact lens Calculations

Spherical Equivalent Transposing

What is the spherical equivalent of this prescription
 $-1.00 -1.50 \times 180$

What is the spherical equivalent of this prescription
 $-1.00 -1.50 \times 180$

Rx: $-1.00 -1.50 \times 180$

Sphere: $-1.00D$

Half of $-1.50D$ (cyl) = $-0.75D$

$-1.00D + (-)0.75D = -1.75D$

Sum of the
sphere power
plus
one half of the
cylinder power

What is the spherical equivalent of this prescription
 $+2.50 -2.00 \times 180$

What is the spherical equivalent of this prescription
 $+2.50 -2.00 \times 180$

Rx: $+2.50 -2.00 \times 180$

Sphere: $+2.50D$

Half of $-2.00D$ (cyl) = $-1.00D$

$+2.50D + (-)1.00D = +1.50D$

Sum of the
sphere power
plus
one half of the
cylinder power

Transpose
 $+1.50 -0.50 \times 180$

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Review of Contact lens Calculations

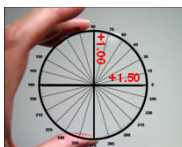
Transpose +1.50 -0.50 x 180

$$+1.50 -0.50 \times 180$$

$$+1.00 +0.50 \times 90$$

Compound Hyperopia

1. When the signs of the sphere and cylinder power are the same, add them together and keep the same sign
2. When the signs are different, subtract the smaller number to arrive at the new sphere
3. Change the sign of the cylinder from plus to minus or minus to plus
4. Change the axis by adding 90 degrees to axes of 90 or less or subtract 90 degrees from axes of 91 or more



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Transpose -1.50 +1.50 x 90

Costco

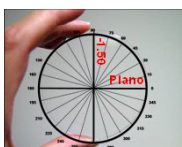
Transpose -1.50 +1.50 x 90

$$-1.50 +1.50 \times 90$$

$$\text{Plano } -1.50 \times 180$$

Simple Myopia

1. When the signs of the sphere and cylinder power are the same, add them together and keep the same sign
2. When the signs are different, subtract the smaller number to arrive at the new sphere
3. Change the sign of the cylinder from plus to minus or minus to plus
4. Change the axis by adding 90 degrees to axes of 90 or less or subtract 90 degrees from axes of 91 or more



Costco

Transpose +1.00 -2.00 x 90

Costco

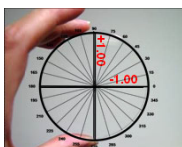
Transpose +1.00 -2.00 x 90

$$+1.00 -2.00 \times 90$$

$$-1.00 +2.00 \times 180$$

Mixed Astigmatism

1. When the signs of the sphere and cylinder power are the same, add them together and keep the same sign
2. When the signs are different, subtract the smaller number to arrive at the new sphere
3. Change the sign of the cylinder from plus to minus or minus to plus
4. Change the axis by adding 90 degrees to axes of 90 or less or subtract 90 degrees from axes of 91 or more



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Astigmatism

1. With-the-Rule (WTR) Astigmatism
2. Against-the-Rule (ATR) Astigmatism
3. Oblique Astigmatism
4. Spherical Cornea
5. Refractive Astigmatism
6. Residual / Internal Lenticular astigmatism
7. Irregular astigmatism

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Review of Contact lens Calculations

How much and what type of astigmatism
do these K readings reflect?
43.00 @ 180 / 44.00 @ 90

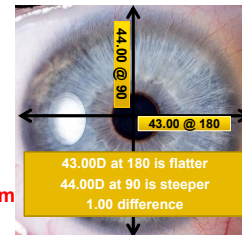
How much and what type of astigmatism
do these K readings reflect?
43.00 @ 180 / 44.00 @ 90

With-the-Rule (WTR) Astigmatism

- 180-degree meridian is flatter
- 90-degree meridian is steeper

43.00D at 180 is flatter
44.00D at 90 is steeper
1.00D difference

This is 1.00D of corneal WTR astigmatism



How much and what type of astigmatism
do these K readings reflect?
45.00 @ 180 / 43.50 @ 90

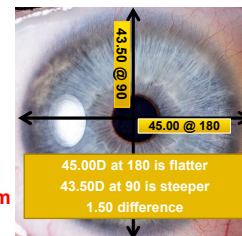
How much and what type of astigmatism
do these K readings reflect?
45.00 @ 180 / 43.50 @ 90

Against-the-Rule (ATR) Astigmatism

- 180-degree meridian is steeper
- 90-degree meridian is flatter

45.00D at 180 is steeper
43.50D at 90 is flatter
1.50D difference

This is 1.50D of corneal ATR astigmatism



How much and what type of astigmatism
do these K readings reflect?
42.50 @ 045 / 44.25 @ 135

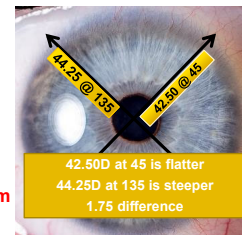
How much and what type of astigmatism
do these K readings reflect?
42.50 @ 045 / 44.25 @ 135

Oblique Astigmatism

- 45-degree meridian is flatter
- 135-degree meridian is steeper

42.50D at 45 is flatter
44.25D at 135 is steeper
1.75D difference

This is 1.75D of corneal oblique astigmatism



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Review of Contact lens Calculations

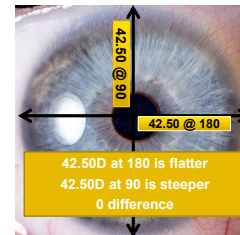
How much and what type of astigmatism
do these K readings reflect?
42.50 @ 180 / 42.50 @ 90

How much and what type of astigmatism
do these K readings reflect?
42.50 @ 180 / 42.50 @ 90

Spherical Cornea

- 180-degree meridian has the same curvature as the 90-degree meridian
42.50D at 180
42.50D at 90
0 difference

This is zero corneal astigmatism



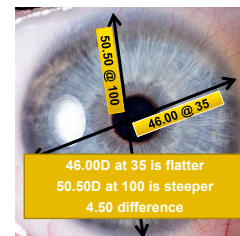
How much and what type of astigmatism
do these K readings reflect?
46.00 @ 35 / 50.50 @ 100

How much and what type of astigmatism
do these K readings reflect?
46.00 @ 35 / 50.50 @ 100

Irregular Corneal Astigmatism

- The two major meridians are not 90 degrees apart
- K-readings are very steep
46.00D at 35
50.50D at 100

Irregular astigmatism



With the following information, what is the refractive
astigmatism?
Spectacle Rx -2.00 -1.00 x 180
K-readings 43.00 @ 180 / 44.00 @ 90

With the following information, what is the refractive
astigmatism?
Spectacle Rx -2.00 -1.00 x 180
K-readings 43.00 @ 180 / 44.00 @ 90

- Refractive astigmatism is the cylinder amount in the spectacle Rx
- In this example the refractive astigmatism is 1.00D
- The K-reading is not needed to determine the refractive astigmatism

-2.00 **-1.00** x 180

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Review of Contact lens Calculations

With the following information, what is the residual astigmatism?

Spectacle Rx -2.00 -1.00 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

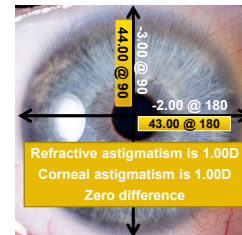
With the following information, what is the residual astigmatism?

Spectacle Rx -2.00 -1.00 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

- There is no residual astigmatism because the refractive and corneal astigmatism match

$$\begin{array}{r} -2.00 -1.00 \times 180 \\ 43.00 @ 180 / 44.00 @ 90 \\ \hline 1.00 \end{array}$$



With the following information, what is the residual astigmatism?

Spectacle Rx -2.00 -1.00 x 180

K-readings 43.00 @ 180 / 43.00 @ 90

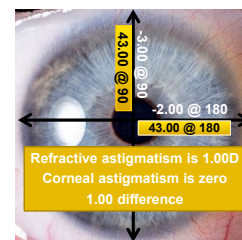
With the following information, what is the residual astigmatism?

Spectacle Rx -2.00 -1.00 x 180

K-readings 43.00 @ 180 / 43.00 @ 90

- There is 1.00D residual astigmatism because the refractive and corneal astigmatism do not match
- Since there is no corneal astigmatism, the refractive astigmatism is contributed by an internal / lenticular mechanism

$$\begin{array}{r} -2.00 -1.00 \times 180 \\ 43.00 @ 180 / 43.00 @ 90 \\ \hline \text{zero} \end{array}$$



With the following information, what is the residual astigmatism?

Spectacle Rx -2.00 -1.00 x 180

K-readings 43.00 @ 180 / 45.00 @ 90

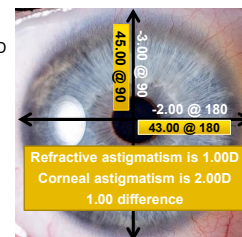
With the following information, what is the residual astigmatism?

Spectacle Rx -2.00 -1.00 x 180

K-readings 43.00 @ 180 / 45.00 @ 90

- There is 1.00D residual astigmatism because the refractive and corneal astigmatism do not match
- Since there is 2.00D corneal astigmatism, and 1.00D refractive astigmatism, the residual astigmatism is contributed by an internal / lenticular mechanism

$$\begin{array}{r} -2.00 -1.00 \times 180 \\ 43.00 @ 180 / 45.00 @ 90 \\ \hline 2.00D \end{array}$$



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Review of Contact lens Calculations

With the following information, what is the residual astigmatism?

Spectacle Rx -2.00 -2.00 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

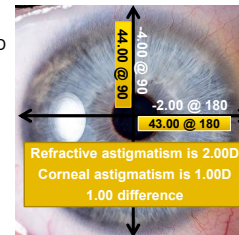
With the following information, what is the residual astigmatism?

Spectacle Rx -2.00 -2.00 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

- There is 1.00D residual astigmatism because the refractive and corneal astigmatism do not match
- Since there is 1.00D corneal astigmatism, and 2.00D refractive astigmatism, the residual astigmatism is contributed by an internal / lenticular mechanism

$$\begin{array}{c} -2.00 -2.00 \times 180 \\ 43.00 @ 180 / 44.00 @ 90 \\ \hline 1.00D \end{array}$$



Calculating Soft Contact Lenses (SCL)

1. Spherical SCL
2. Toric SCL

With the following information, what soft lens power would you order?

Spectacle Rx -2.00 sph

K-readings 43.00 @ 180 / 44.00 @ 90

With the following information, what soft lens power would you order?

Spectacle Rx -2.00 sph

K-readings 43.00 @ 180 / 44.00 @ 90

- If the spectacle Rx is spherical, the SCL power will be the same if under +/- 4.00D
- Vertex if the spectacle Rx spherical power is $\geq 4.00D$
- The SCL power to order is **-2.00D**

NOTE: K-reading are not necessary to determine the SCL power.

With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -5.00 sph

K-readings 43.00 @ 180 / 44.00 @ 90

Costco NCLE

Review of Contact lens Calculations

With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -5.00 sph

K-readings 43.00 @ 180 / 44.00 @ 90

- If the spectacle Rx is spherical, the SCL power will be the same if under +/- 4.00D
- Vertex if the spectacle Rx spherical power is $\geq 4.00D$
- The SCL power to order is **-4.75D (vertexed power)**

NOTE: K-reading are not necessary to determine the SCL power.

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With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -0.50 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

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With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -0.50 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

- If the spectacle Rx cylinder power is less than 0.75D then the spherical equivalent is the SCL power to order
- Vertex if the spherical equivalent power is $\geq 4.00D$
- The SCL power to order is **-2.25D**

Spherical Equivalent -2.00D + (-)0.25D = -2.25D

NOTE: K-reading are not necessary to determine the SCL power.

Costco

With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx +5.00 -0.50 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

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With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx +5.00 -0.50 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

- If the spectacle Rx cylinder power is less than 0.75D then the spherical equivalent is the SCL power to order
- Vertex if the spherical equivalent power is $\geq 4.00D$
- The SCL power to order is **+5.00D**

Spherical Equivalent +5.00D + (-)0.25D = +4.75D (needs to be vertexed)

Vertex +4.75 + (+)0.25 = +5.00D

NOTE: K-reading are not necessary to determine the SCL power.

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With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -1.25 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

Costco

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Review of Contact lens Calculations

With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -1.25 x 180

K-readings 43.00 @ 180 / 44.00 @ 90

- If the spectacle Rx cylinder power is greater than 0.75D, then a Toric SCL should be ordered
- Vertex if the two major meridians are $\geq 4.00D$
- The Toric SCL power to order is **-2.00 -1.25 x 180** if there is no lens rotation

NOTE: K-readings are not necessary to determine the SCL power.

Costco

With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -1.25 x 180

Diagnostic Lens -3.00 -1.25 x 180

No rotation

Costco

With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -1.25 x 180

Diagnostic Lens -3.00 -1.25 x 180

No rotation

- If there is no rotation, order the lens using the spectacle Rx sphere, cylinder and axis
- Vertex if the two major meridians if the powers are $\geq 4.00D$
- The Toric SCL power to order is **-2.00 -1.25 x 180**

Spectacle Rx

-2.00 -1.25 x 180

Diagnostic Lens

-3.00 -1.25 x 170

Order Lens

-2.00 -1.25 x 180

NOTE: The diagnostic lens is only to see if the lens fits and rotates. Toric SCL powers are calculated using the spectacle Rx.

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With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -1.25 x 180

Diagnostic Lens -3.00 -1.25 x 180

10 degrees right rotation

Costco

With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -1.25 x 180

Diagnostic Lens -3.00 -1.25 x 180

10 degrees right rotation

The Toric SCL power to order is **-2.00 -1.25 x 170**
(subtract 10 degrees from the spectacle axis 180)

Spectacle Rx

-2.00 -1.25 x 180

Diagnostic Lens

-3.00 -1.25 x 010

Order Lens

-2.00 -1.25 x 170

Left Add
Right Subtract
(LARS)

NOTE: The diagnostic lens is only to see if the lens fits and rotates. Toric SCL powers are calculated using the spectacle Rx.

Costco

With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -1.25 x 180

Diagnostic Lens -3.00 -1.25 x 180

10 degrees left rotation

Costco

Costco NCLE

Review of Contact lens Calculations

With the following information, what soft contact lens (SCL) power would you order?

Spectacle Rx -2.00 -1.25 x 180
Diagnostic Lens -3.00 -1.25 x 180
10 degrees left rotation

The Toric SCL power to order is **-2.00 -1.25 x 010**
(add 10 degrees to the spectacle axis 180)

Spectacle Rx
-2.00 -1.25 x 180
Diagnostic Lens
-3.00 -1.25 x 010
Order Lens
-2.00 -1.25 x 170

Left Add
Right Subtract
(LARS)

NOTE: The diagnostic lens is only to see if the lens fits and rotates.
Toric SCL powers are calculated using the spectacle Rx.

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Calculating Rigid Gas Permeable Contact Lenses (RGP or GP)

1. Spherical GP Lenses
(sphere power / 1 curve)
2. Bitoric GP Lenses
(2 powers / 2 curves)
3. Back Toric GP Lenses
(1 powers / 2 curves)
4. Front Toric GP Lenses
(2 powers / 1 curves)

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With the following information, fit a lens on K
Spectacle Rx -2.00 -1.00 x 180
K-readings 43.00 @ 180 / 44.00 @ 90

With the following information, fit a lens on K
Spectacle Rx -2.00 -1.00 x 180
K-readings 43.00 @ 180 / 44.00 @ 90

- Step 1 – Transpose Rx to minus cylinder
Step 2 – Use the flat K-reading as the starting point to determine the base curve
Step 3 – Use the spectacle Rx sphere power as the starting point for lens power calculation

Lens fit on K

43.00D Base Curve
-2.00D Lens Power

- Vertex if power is $\geq 4.00D$

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With the following information, fit lens 0.50D steeper than K
Spectacle Rx -2.00 -1.00 x 180
K-readings 43.00 @ 180 / 44.00 @ 90

With the following information, fit lens 0.50D steeper than K
Spectacle Rx -2.00 -1.00 x 180
K-readings 43.00 @ 180 / 44.00 @ 90

- Step 1 – Transpose Rx to minus cylinder
Step 2 – Use the flat K-reading as the starting point to determine the base curve
Step 3 – Use the spectacle Rx sphere power as the starting point for lens power calculation

Lens fit 0.50D steeper than K

43.50D Base Curve
(43.00 + 0.50 = 43.50D)
-2.50D Lens Power
(-2.00 + (-)0.50 = -2.50D)

- Vertex if power is $\geq 4.00D$

Steeper Add Minus (SAM)
Flatter Add Plus (FAP)

COSTCO

COSTCO

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Review of Contact lens Calculations

With the following information, fit lens 1.00D flatter than K
Spectacle Rx -2.00 -1.00 x 180
K-readings 43.00 @ 180 / 44.00 @ 90

With the following information, fit lens 1.00D flatter than K
Spectacle Rx -2.00 -1.00 x 180
K-readings 43.00 @ 180 / 44.00 @ 90

- Step 1 – Transpose Rx to minus cylinder
Step 2 – Use the flat K-reading as the starting point to determine the base curve
Step 3 – Use the spectacle Rx sphere power as the starting point for lens power calculation

Lens fit 1.00D flatter than K

42.00D Base Curve
(43.00 - 1.00 = 42.00D)

-1.00D Lens Power
(-2.00 + (+)1.00 = -1.00D)

- Vertex if power is $\geq 4.00D$

Steeper Add Minus (SAM)
Flatter Add Plus (FAP)

With the following information, what GP lens can be fit?
Spectacle Rx OD -3.50 -4.50 x 180
K-readings 43.00 @ 180 / 47.50 @ 90

With the following information, what GP lens can be fit?
Spectacle Rx OD -3.50 -4.50 x 180
K-readings 43.00 @ 180 / 47.50 @ 90

- Bitoric:** Use this lens design when there is over 2.50D of prescription cylinder and most if not all of it is from corneal astigmatism
- Bitorics aren't hard to design when you think of them as two spherical designs on one lens; 0.25 flatter for the flatter K and 0.75 flatter for the steeper K.
 - Vertex if power of either meridian is $\geq 4.00D$

Bitoric GP Lens ordered:
Flatter K-reading -3.25/42.75

(-3.50 + (-)0.25 = -3.25D)

(43.00 - 0.25 = 42.75D)

Steeper K-reading -6.50/46.75

-3.50 + (-)4.50 = -8.00D

-8.00D (vertexed -7.25D)

(-7.25 + (+)0.75 = -6.50D)

(47.50 - 0.75 = 46.75D)

Flatter Add Plus (FAP)

With the following information, what GP lens can be fit?
Spectacle Rx OD -2.00 -4.50 x 180
K-readings 42.00 @ 180 / 45.00 @ 090

With the following information, what GP lens can be fit?
Spectacle Rx OD -2.00 -4.50 x 180
K-readings 42.00 @ 180 / 45.00 @ 090

Back Toric: This lens design will only function optically when the refractive cylinder exceeds the corneal astigmatism by approximately one third

Back toric GP Lens ordered:
42.00/45.00

-2.00D

- The back surface toric design is mostly for rotational control when 2.00D or more corneal astigmatism is present
- Fit to the corneal curves (on K)
- Order spherical power from the prescription
- Vertex if power is $\geq 4.00D$

4.50D refractive cylinder exceeds the 3.00D corneal astigmatism by approximately 1/3

Costco NCLE

Review of Contact lens Calculations

With the following information, what GP lens can be fit?
Spectacle Rx OD -2.50 -2.50x180
K-readings 44.00 @ 180 / 44.00 @ 090

With the following information, what GP lens can be fit?
Spectacle Rx OD -2.50 -2.50x180
K-readings 44.00 @ 180 / 44.00 @ 090

Front Toric: This lens design is used when there is over 1.25D of spectacle cylinder correction with a spherical or near spherical cornea

- This lens is ordered with a cylinder power and axis
- To prevent the lens from rotating, the lens is usually ordered with a 1.5Δ base down prism base down to act as weighted ballast or stabilizer
- Vertex if power is $\geq 4.00D$

Front toric GP Lens ordered:
44.00 Base Curve (on K)
-2.50 -2.50 x 180
1.5Δ prism ballast

Lens Selection

Which of the following choices would work best for the patient's visual need given the following information?
Spectacle Rx -2.00 +0.25 x 90
K-readings 42.25 @ 180 / 43.25 @ 90

- GP Lens: 42.25D Base Curve and -2.00D Power
- Spherical soft lens
- Soft toric lens
- Front surface GP toric

Which of the following choices would work best for the patient's visual need given the following information?
Spectacle Rx -2.00 +0.25 x 90
K-readings 42.25 @ 180 / 43.25 @ 90

- GP Lens: 42.25D Base Curve and -2.00D Power
- Spherical soft lens**
- Soft toric lens
- Front surface GP toric

Choose a spherical soft lens because:

- The refractive astigmatism is near spherical
- The K-reading are not necessary to determine the SCL power

Which of the following choices would work best for the patient's visual need given the following information?
Spectacle Rx -3.00 -1.50 x 90
K-readings 46.00 @ 180 / 45.50 @ 90

- Spherical soft lens
- Soft toric lens
- Back surface GP toric
- Front surface GP toric

Costco NCLE

Review of Contact lens Calculations

Which of the following choices would work best for the patient's visual need given the following information?

Spectacle Rx -3.00 -1.50 x 90

K-readings 46.00 @ 180 / 45.50 @ 90

- a) Spherical soft lens
- b) **Soft toric lens**
- c) Back surface GP toric
- d) Front surface GP toric

Choose a toric soft lens because:

- The refractive astigmatism can be fully corrected with the toric power in the lens
- Astigmatism is lenticular
- The K-reading are not necessary to determine the toric SCL power

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Which of the following lens designs would provide the best visual acuity for the patient?

Spectacle Rx -2.00 -1.25 x 90

K-readings 42.00 @ 180 / 43.25 @ 90

- a) Spherical soft lens
- b) Spherical GP lens
- c) Back surface GP toric
- d) Front surface GP toric

Costco

Which of the following lens designs would provide the best visual acuity for the patient?

Spectacle Rx -2.00 -1.25 x 90

K-readings 42.00 @ 180 / 43.25 @ 90

- a) Spherical soft lens
- b) **Spherical GP lens**
- c) Back surface GP toric
- d) Front surface GP toric

Choose a spherical GP lens because:

- There is too much refractive cylinder for a spherical soft lens
- Not enough corneal astigmatism for a back toric and the ratio between the refractive cylinder and corneal astigmatism isn't one third
- There is too much corneal cylinder for a front toric lens

Costco

Which of the following lens designs would provide the best visual acuity for the patient?

Spectacle Rx -2.00 -1.75 x 90

K-readings 42.00 @ 180 / 42.00 @ 90

- a) Spherical soft lens
- b) Spherical GP lens
- c) Front toric GP lens
- d) Bitoric GP lens

Costco

Which of the following lens designs would provide the best visual acuity for the patient?

Spectacle Rx -2.00 -1.75 x 90

K-readings 42.00 @ 180 / 42.00 @ 90

- a) Spherical soft lens
- b) Spherical GP lens
- c) **Front toric GP lens**
- d) Bitoric GP lens

Choose a front toric GP lens because:

- K-readings are spherical and there is more than 1.25D refractive astigmatism
- There is too much refractive astigmatism for a spherical soft lens
- Not enough corneal astigmatism for a bitoric

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Which of the following lens designs would provide the best visual acuity for the patient?

Spectacle Rx OD -2.00 -3.00 x 180

K-readings 42.00 @ 180 / 44.00 @ 090

- a) Spherical soft lens
- b) Spherical GP lens
- c) Front toric GP lens
- d) Back toric GP lens

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Review of Contact lens Calculations

Which of the following lens designs would provide the best visual acuity for the patient?

Spectacle Rx OD -2.00 -3.00 x 180

K-readings 42.00 @ 180 / 44.00 @ 090

- a) Spherical soft lens
- b) Spherical GP lens
- c) Front toric GP lens
- d) **Back toric GP lens**

Choose a back toric GP lens because:

- 3.00D refractive cylinder exceeds the 2.00D corneal astigmatism by approximately 1/3
- There is too much refractive cylinder for a spherical soft lens
- There is too much corneal cylinder for a front toric lens

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Which of the following lens designs would provide the best visual acuity for the patient?

Spectacle Rx OD -2.00 -3.00 x 180

K-readings 42.00 @ 180 / 45.50 @ 090

- a) Spherical soft lens
- b) Spherical GP lens
- c) Front toric GP lens
- d) **Bitoric GP lens**

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Which of the following lens designs would provide the best visual acuity for the patient?

Spectacle Rx OD -2.00 -3.00 x 180

K-readings 42.00 @ 180 / 45.50 @ 090

- a) Spherical soft lens
- b) Spherical GP lens
- c) Front toric GP lens
- d) **Bitoric GP lens**

Choose a back toric GP lens because:

- There is more than 2.50D of corneal astigmatism to require a bitoric design
- There is too much refractive cylinder for a spherical soft lens
- There is too much corneal cylinder for a front toric lens

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