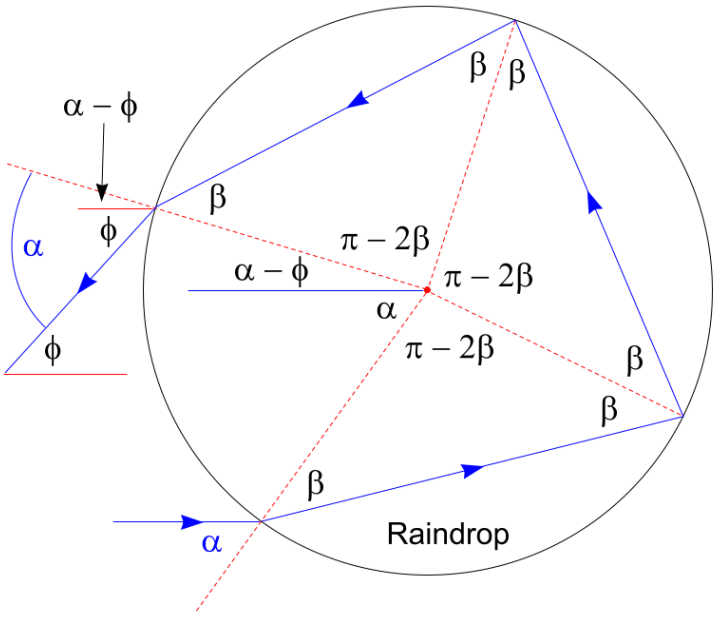
HW-C1. Secondary Rainbow.



Set $\frac{d\phi(\alpha)}{d\alpha} = 0$ as we did for the primary rainbow to show that the secondary rainbow angle ranges from 50° to 54°, i.e.,

Red is on bottom at **50°**,

Violet is on top with rainbow angle **54°**.

Use for the red end of the spectrum, an index of refraction n_{red} = 1.331 and for the violet end n_{violet} = 1.345.

[Grading Rubric: 10 points clearly showing all steps. This assignment is a derivation problem where the derivation steps are weighted more than the actual numerical result.]

HW-C2. Glass Bow.

Dispersion Table for Several Transparent Solids

Medium	Color, Wavelength (nm), and Index of Refraction					
	Violet 410	Blue 470	Green 550	Yellow 580	Orange 610	Red 660
Ice	1.3170	1.3136	1.3110	1.3087	1.3080	1.3060
Crown Glass	1.5380	1.5310	1.5260	1.5225	1.5216	1.5200
Quartz	1.5570	1.5510	1.5468	1.5438	1.5432	1.5420
Light Flint	1.6040	1.5960	1.5910	1.5875	1.5867	1.5850
Dense Flint	1.6980	1.6836	1.6738	1.6670	1.6650	1.6620
Diamond	2.4580	2.4439	2.4260	2.4172	2.4150	2.4100

Fundamentals of Optics (4th ed.), Jenkins and White (McGraw Hill, NY, 1976).

Imagine cute little light crown glass spheres falling gently in the sky. Find the range for the primary rainbow angles to 3 significant figures using the appropriate index of refraction for violet and red in the above table. You may start with any formulas from our text.

[Grading Rubric: 6 points for neatly and clearly showing all steps. Then, 2 points for each of the 2 angles in your final answers if each is correct to three significant figures.]