

Dot Zero ($n=0$) is the arc AB on the vertical part of the cylinder
 Dot 1 ($n=1$) is the arc BC
 These arcs subtend an angle of ϕ at the centre of the cylinder

The length of chords AB and BC is d
 D is the mid point of chord BC and
 F the mid point of chord AB
 Therefore the angles BOD and DOC are
 both $\phi/2$, as are AOF and FOB

We need to find Y_1 , the projected height of Dot 1

Angle OBE = angle FOB = $\phi/2$ (alternate angles)

In the right angled triangle OBD, angle OBD = Θ + angle OBE
 = $\Theta + \phi/2$
 and the angles of this triangle must sum to 180°
 therefore $\Theta + \phi/2 + 90 + \phi/2 = 180$
 giving $\Theta = 90 - \phi$

From the right angled triangle BCE, $Y_1 = CE = BC \sin\Theta$
 Therefore $Y_1 = d \sin\Theta = d \sin(90 - \phi) = d \cos\phi$

In the same way, it can be shown that $Y_n = d \cos(n\phi)$

