



Given: Two circles as above. Circle A is stationary and Circle B is rolling clockwise along the circumference of circle A starting from the top point.

l_A, l_B = vertical rays relative to centers of corresponding circles, for orientation

L = the distance rolled by circle B. [Note that this must be the same distance travelled along circle A because there is no slippage].

α = the angular position (in radians) of circle B relative to l_A . [Note the corresponding angle in circle B].

β = the rotation (in radians) of circle B relative to l_B .

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In circle A, $L = r_A \alpha$; in circle B, $L = r_B (\beta - \alpha)$

Thus:

$$r_B (\beta - \alpha) = r_A \alpha$$

$$r_B \beta - r_B \alpha = r_A \alpha$$

$$r_B \beta = r_A \alpha + r_B \alpha$$

$$r_B \beta = \alpha (r_A + r_B)$$

$$\beta = \frac{\alpha (r_A + r_B)}{r_B}$$

$$\beta = \alpha \left(\frac{r_A}{r_B} + 1 \right)$$