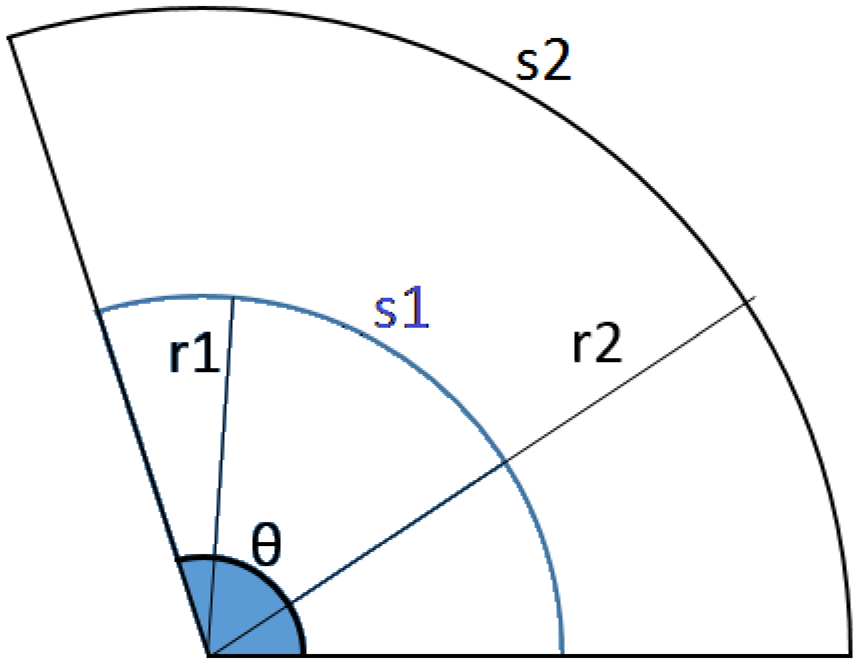
Going through the math for figuring out wheel rotations

Assuming that we can properly segment strings into areas where we are turning and areas where we are going straight, here are the calculations for a specific turn:

We will make the approximation that both wheel follow arcs of different circles as shown in the figure below:



In the figure, both wheels turn an angle θ. The inner wheel moves a distance s_1, which is an arc of the circle with radius r_1. The outer wheel moves a distance s_2, which is an arc of the circle with radius r_2. We can simplify things by pointing out that r_1 and r_2 are related by the distance between the two wheels. We can thus rewrite it so that the inner wheel has a radius of r and the outer wheel has a radius of $r + w$, where w is the distance between the wheels.

The goal of the problem is to find the angle θ of the turn. We are given as input a string matching [LR]* which correspond to distances for the right and left wheels. Since we're assuming this string is already segmented, the number of Rs in this case will correspond to s_2, and the number of Ls will correspond to s_1[1]. We thus have two equations and two unknowns:

$$r_1\theta = s_1$$

$$(r_1 + w)\theta = s_2$$

[1] The exact value of s_1 and s_2 is based on the wheel length, and the wheel length seems to be about $30cm$, so we expect s_2 = #R(string)*10cm, and s_1 = #L(string)*10cm

We know s_1, s_2, and w, so we'll just substitude for r_1 to find θ[2].

$$(s_1/\theta + w)\theta = s_2$$

$$s_1 + w\theta = s_2$$

$$\theta = \frac{s_2 - s_1}{w}$$

[2]we could also probably record r instead, but it seems like θ is more intuitive