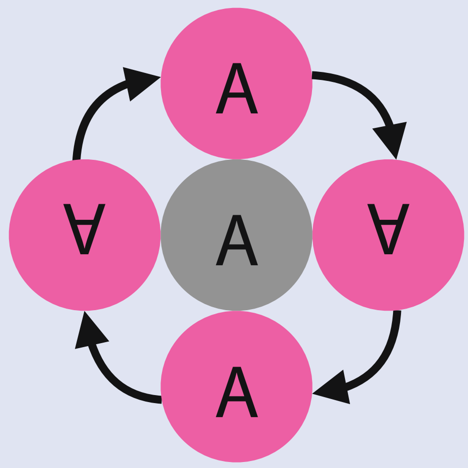
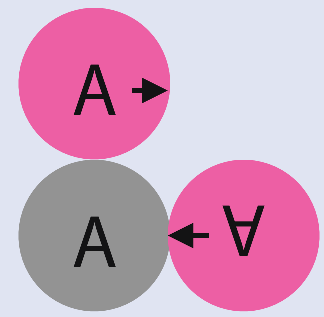
PUZZLE 1

One approach to solving these puzzles is to actually cut the circles out of paper or cardboard and just do it very slowly.



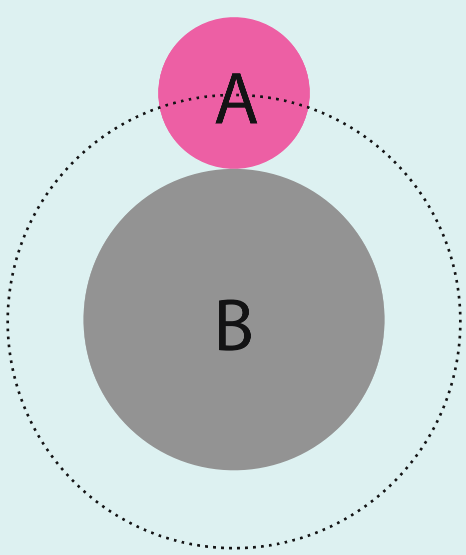
The surprise jumps out right away: the coin that rolls along the other ***revolves twice****, not just once. One way you can see this in the diagram itself is to consider the point of contact between the coins. The arrow pointing right will touch the right side of the stationary coin as it rolls. That means that in a quarter of its journey, the coin rotates 180 degrees.*



PUZZLE 2

We can solve all the puzzles the way we did the first. However, I'd like to find a more powerful perspective.

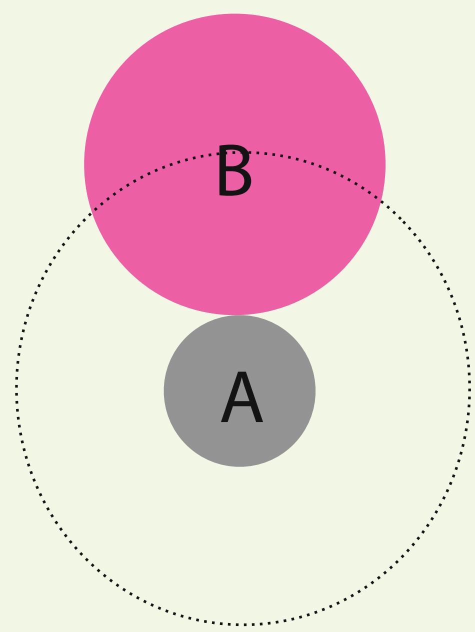
Here's another approach: imagine that the rotating coin is rotating at a constant rate, given by its speed. We just need to find out how far it goes. What confuses this approach is that different points on the coin go different distances, and travel at different speeds. But what if we track the centre of the circle?



In this case, the path the centre of coin alpha travels is three times its diameter. That means its own diameter will uncoil three times as it rotates around beta, which means it will make ***three revolutions****!*

PUZZLE 3

And in fact, this method seems to keep working. For the larger coin, the distance the centre of beta travels is in a 3:2 ratio with the diameter of beta, which means beta turns ***1.5 revolutions*** *as it travels around alpha.*



My own experience with this argument is that I have a hard time trusting it. I convince myself it works, then I doubt my own argument. Do you find it convincing? Can you use it to solve the general case of coins of different sizes rotating around each other? Do you believe your argument?

Happy puzzling!