Textbook Reading: Chapters 15 **Due Date:** Friday, March 19, 2021 by 11:59pm

Questions

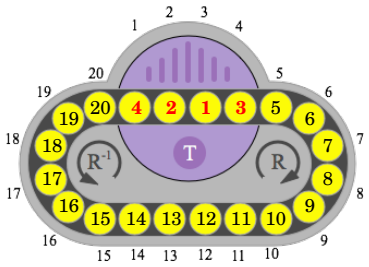
1. **2-cycles on OT with $T = (1\ 4)(2\ 3)$.** Find a conjugate of the fundamental 2-cycle $\sigma_2 = (1\ 3)$ which produces the 2-cycle $\alpha = (1\ 7)$. That is, find a sequence of moves β^{-1} so the $\beta^{-1}\sigma_2\beta$ produces $\alpha = (1\ 7)$.

   (Your answer for β^{-1} should be expressed as a product of R and T moves. Use the virtual version on our course website to explore move sequences.)

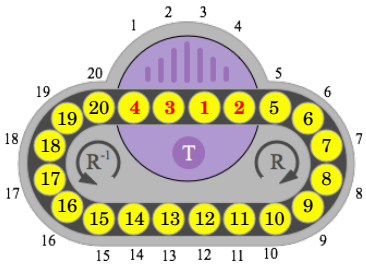
2. **3-cycles on OT with $T = (1\ 4)(2\ 3)$.** Find a conjugate of the fundamental 3 cycle $\sigma_3 = (1\ 4\ 7)$, or its inverse σ_3^{-1} which produces the 3-cycle $\alpha = (2\ 3\ 5)$. That is, find a sequence of moves β^{-1} so the $\beta^{-1}\sigma_3\beta$ produces $\alpha = (2\ 3\ 5)$.

   (Your answer for β^{-1} should be expressed as a product of R and T moves. Use the virtual version on our course website to explore move sequences.)

3. There are two end-game configurations shown below. (i) Write out each in cycle notation. (ii) Plan a strategy for solving the end-game. (iii) Describe the steps involved in implementing your strategy. That is, describe the moves you would make to complete each part of your strategy for solution.



(a)

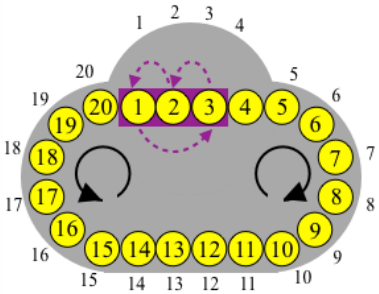


(b)

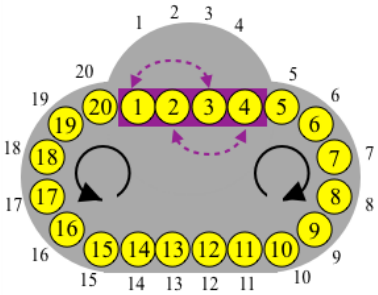
   You may find it useful to use the virtual puzzle on the course website to try out your move sequences:
   (a) `http://www.sfu.ca/~jtmulhol/math302/applets/ovaltrackExercise3a/OvalTrackExercise3a.html`
   (b) `http://www.sfu.ca/~jtmulhol/math302/applets/ovaltrackExercise3b/OvalTrackExercise3b.html`

4. In each part (a) and (b), consider the variation of the turntable move T on the Oval Track puzzle with 20 disks. Are all permutations of the puzzle pieces possible?

   (You may use SageMath to answer the questions. You do not need to hand in your code, just describe what computation you had SageMath perform, and how you used the result to answer the question.)



(a) $T = (1, 3, 2)$



(b) $T = (1, 3)(2, 4)$