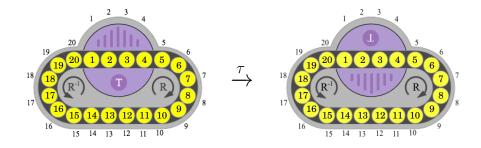
SFU faculty of science department of mathematics

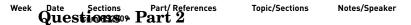
Math 304

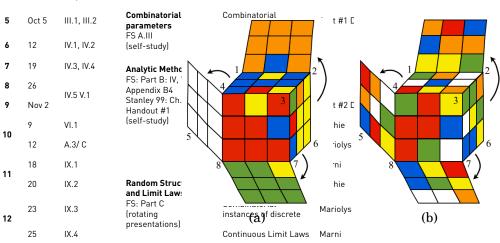
Textbook Reading: Chapters 17, 18, 19, 20					Due Date: Friday, April 9, 2021 by 11:59pm		
Week	Date	Sections from FS2009	Part/ References	Topic/Sections	Notes/Speaker		
Questions, H2 Part dimbinatorial Symbolic methods							
2 1. 3	Con	1.4, 1.5, 1.6 jugation i : 11.1, 11.2, 11.3	Structures FS: Part A.1 A.2 Somerguivalen Handout #1	Unlabelled structures ce relation. Le Labelled structures I	et G be a group, show the	at the relation	
4	28	11.4, 11.5, 11.6	(self study)	Labg(Rd/s tructu (es \$)	g is a conjugate of h ,		
5	is ^{ct5} an	equivalenc	Combinatorial Coaronateron. FS A.III	Combinatorial Parameters	Asst #1 Due		
2 .	Č ² ons	sider the gr	$\operatorname{oup}^{[self-\mathbb{Z}^{udy]}}_{12}$ and the	$\overset{\rm Multivariable}{\rm subgroup}{}^{\rm GF}\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!$	$\langle 4 \rangle = \{0, 4, 8\}.$		
7 8	19 (a) 26	Are the foll	Analytic Methods low മൂട്ടമുണ്ണം Appendix B4	Complex Analysis Complex Analysis Singularity Analysis	under \sim_H ?		
9	Nov 2 9	(i) 3,7	Stanley 99: Ch. 6 Handout #1 (self-study)	Asymptoti (ni) th 5 ds11	Asst #2 Due Sophie	(iii) 6,9	
10	1(2b)	Finadcall (le	ft) cosets of H ir	1 Izepgluction to Prob.	Mariolys		
1 3 .	${ m In}_{_{20}}^{18} S_{7}$	$_{7}, \operatorname{are}_{^{ X,1 }}_{^{ X,2 }}$ the fo	Random Structures	Limit Laws and Comb elements relate Discrete Limit Laws	$\operatorname{d}^{\operatorname{Marni}}_{\operatorname{Sophie}} \sim_H \operatorname{where} H =$	$A_7?$	
12	$(a)_{23}$	$(2_{1X.3})(4\ 6),$	and Limit Laws ($f\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!$	Combinatorial instances of discrete	Mariolys (b) $(1\ 3\ 7\ 2)$, $(2\ 4)$	4365).	
4.	$\operatorname{Let}^{25}I$	H be a subg	group of a group	$G^{\text{ontinuous}}_{With} H \stackrel{\text{Limit Laws}}{=} \frac{1}{2} $	$G^{Marni}_{ .}$		
13	30 (a)	Show that	$a \notin H$ implies G	Quasi-Powers and Gauffianjlimfia	Sophie		
14	[[] (H) ¹⁰	Show that	$a \not\in H$ implies a	$^{n}H \neq a^{n+1}H.$	Asst #3 Due		
	(c)	Deduce the	at <i>H</i> contains ev	ery element in (G of odd order.		

- 5. (a) How many 3-cycles are there in A_5 ?
 - (b) How many 5-cycles are there in A_5 ?
 - (c) Use Exercise 4 to show that A_5 has no subgroup of order 30.
- 6. Back to Oval Track Flipping the Turntable: Find a move sequence τ that flips the turntable over but is the identity permutation on the disks (see figure). This shows that the orientation of the turntable is independent of the permutation of the disks.

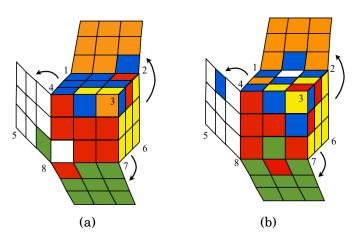
(Play with the applet on the course website to help find a move sequence.)







- 8. Fix the Impossible Configurations. In an and part below, a configuration is shown. Show that each con-¹³ figuration is impossible by showing sits position vector doesn't satisfy at least one of the three conditions
- of the First Fundamental Theorem of Cubology. ADetermine the quickest way to disassemble/reassemble it so that it becomes solvable. That is, decide if you have to swap two pieces, or flip a single edge, or twist a corner, or a combination of these, etc., in order to make it solvable. Also, determine the representative $X_{i,j,k}$ (from Figure 20.6 in Chapter 20) for the coset to which each configuration belongs.

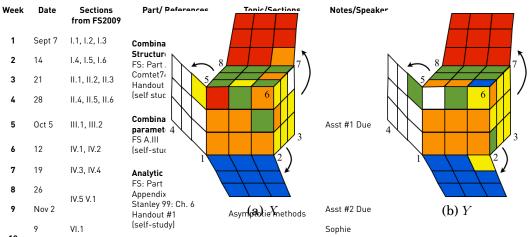


9. For the following position vector $(\rho, \sigma, v, w) \in S_8 \times S_{12} \times \mathbb{Z}_3^8 \times \mathbb{Z}_2^{12}$ draw the corresponding configuration. (Assume the standard orientation as shown in Figure 20.1 of Chapter 20.)

 $(\rho, \sigma, \boldsymbol{v}, \boldsymbol{w}) = ((2, 4)(1, 3), \varepsilon, (1, 1, 0, 2, 0, 2, 0, 0), (1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0))$

(Use the Rubik's cube puzzle template available on the assignments page of the course webpage.)

10. Are the following two (possibly illegal) configurations equivalent under cube moves? That is, by starting with a cube in configuration X can you get to configuration Y by just using Rubik's cube moves, or would you necessarily have to take the cube apart and reassemble it?



19. In Singmaster's book Handbook of Cubik Math, it is stated:

- "The Z and Y commutators are so powerful that you could use either of them, applying each 18 11 to different pairs subfaces, and restare any sgrambled cube without using any other [move se-
 - 20 and Limit Laws quences]." FS: Part C

IX.3

23

- Combinatorial
 - Mariolys
- ²³ IX.3 [rotating instances of discrete Mariolys] Unfortunately this statement is not true. Find the subtle reason why this statement is false, and provide 12 an explanation. Provide a very small modification to this statement which will make it true.

13	30	IX.5	Quasi-Powers and Gaussian limit laws	Sophie

14 Dec 10 Presentations Asst #3 Due