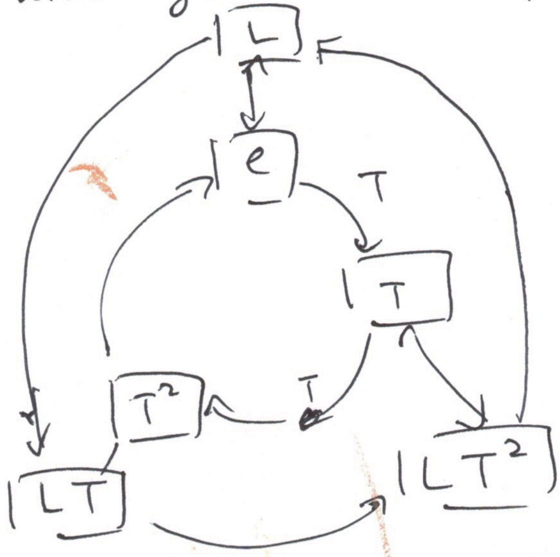
6-1 [after LaTeX notes].
=7.1

Cyclic groups. Show pictures from book.
what are the symmetries of a pinwheel?

The cyclic group C_n is this symmetry group. Label $0, 1, \dots, n-1$
[Draw Cayley diagram] or $e, g, g^2, \dots g^{n-1}$.
[Show Fig 4.4 and 4.5.].
This is isomorphic to $\mathbb{Z}_n$.

You can find cyclic groups inside other groups.
Ex. S_3 with generators L, T ← 3-cycle $123 \to 312$.

did.



The middle is the cyclic group C_3.
Can you find another cyclic group? $\langle L \rangle$.
Another? $\langle LT \rangle$
Another? $\langle LT^2 \rangle$.

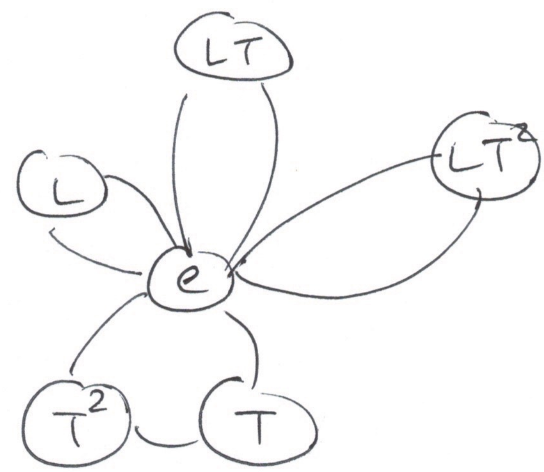
p. 2.

The orbits: $\{e, T, T^2\}$

$\{e, L\}$

$\{e, LT\}$

$\{e, LT^2\}$.



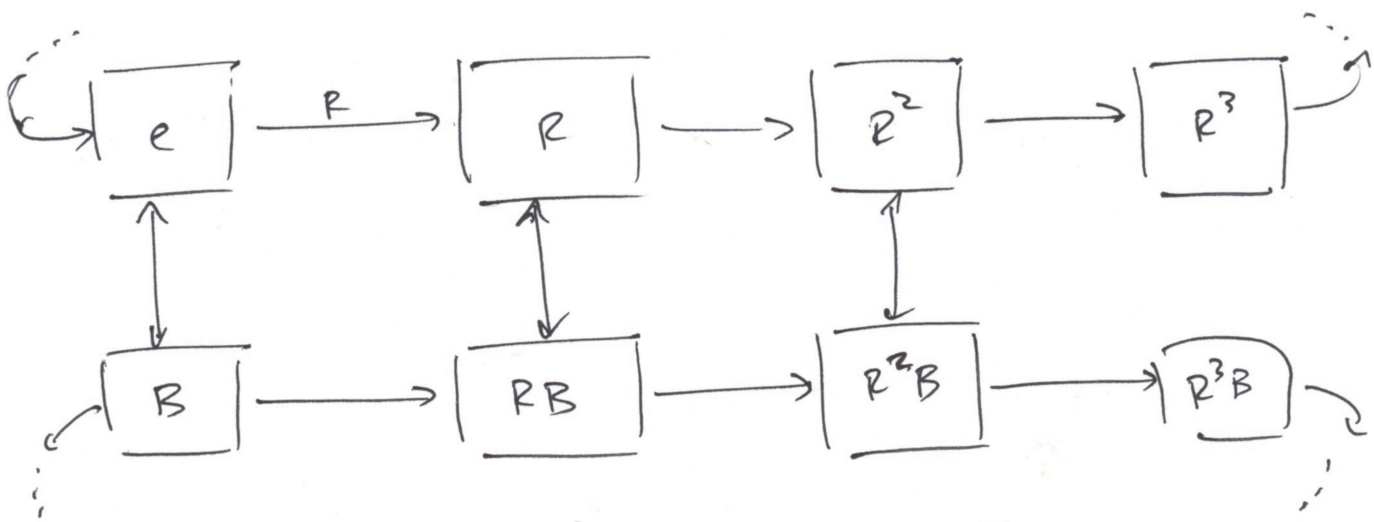
You can make an orbit diagram:

These are called cycle graphs.

Abelian groups.

Def. G is abelian if $gh = hg$ for all $g, h \in G$.

Ex.



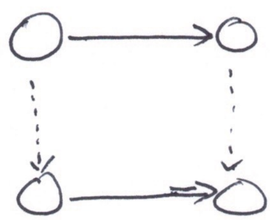
Notice that $RB = BR$.

Since the group consists of composites of B and R this means everything commutes.

This is $C_4 \times C_2$.

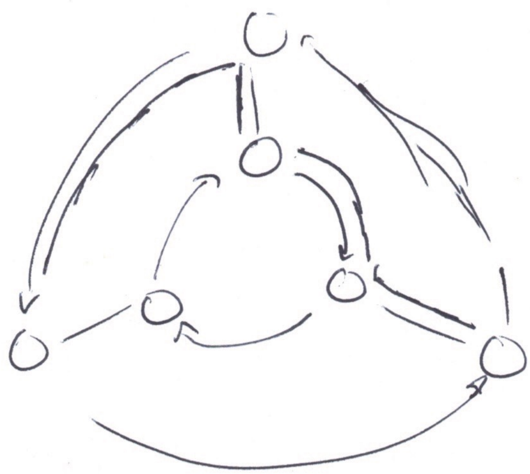
7.3

How to tell if a group is abelian?



Every pair of arrows leaving a node has to close to a diamond shape.

e.g. S_3



Multiplication tables must have symmetry.

4.

$$\begin{tikzcd} e \arrow[r, "R"] \arrow[d, leftrightarrow, "B"] & R \\ B \arrow[r] & RB \arrow[u, leftrightarrow] \end{tikzcd}$$

$C_2 \times C_2$.

$$\begin{tikzcd} e \arrow[r] \arrow[d, leftrightarrow] & R \arrow[r] \arrow[d, leftrightarrow] & R^2 \arrow[d, leftrightarrow] \\ B \arrow[r] & RB \arrow[r] & R^2B \end{tikzcd}$$

This is $C_3 \times C_2$.

But add one for RB. It's C_6 too!

See this in NT.

Look at $\mathbb{Z}_5 \times \mathbb{Z}_3$. (will formally define DP later.)

$n \pmod 3$ \ $n \pmod 5$	0	1	2	3	4
0	0	6	12	3	9
1	10	1	7	13	4
2	5	11	2	8	14

Adding 1 gets you everything.

This group is cyclic.

7.5

Look at $\mathbb{Z}_4 \times \mathbb{Z}_2$ (do same) — is not.

— Day 7: ended here.

Show the cycle graphs from the book.

Dihedral groups:

Do the square now. R and H.

Draw the CD.

Suppose you had a hexagon.

In general

$D_n = \langle r, f \mid r^n = f^2 = e, \; rf = fr^{-1} \rangle.$

- Multiplication tables.

Now, do the clustering.

Non-flip $\times$ non-flip = flip.

etc.

C_5 as a subgroup, C_2 as a quotient

Is C_5 a quotient?