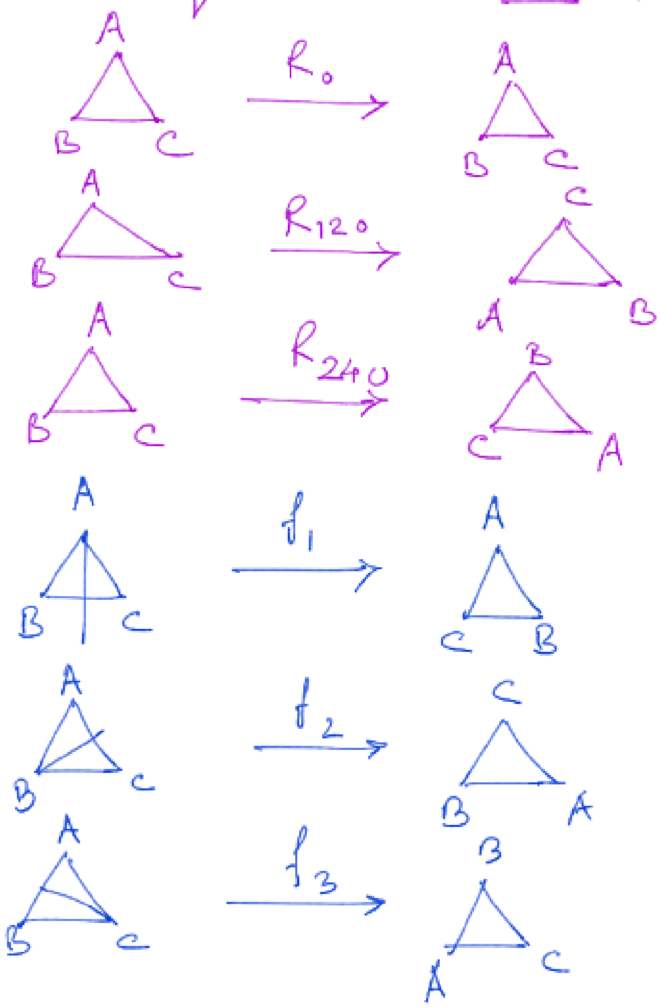
Def^n :— For any regular n-gon $(n \geq 3)$, the corresponding group is called dihedral group of order $2n$. and it is denoted by D_n.

[* order of a group is the no of elements of the group]

$$D_4 = \{R_0, R_{90}, R_{180}, R_{270}, H, V, D, D'\}$$

of order 8.

Equilateral triangle (D_3)



$R_{120} = R_{\frac{360}{3}}$

$R_{240} = R_{2 \cdot \frac{360}{3}}$

$f_i^{-1} = f_i$, $i = 1, 2, 3$

$f_i^2 = R_0$

$f_1 \cdot f_1 = R_0$

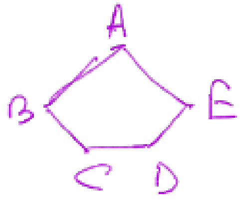
$$D_3 = \{R_0, R_{120}, R_{240}, f_1, f_2, f_3\}$$

Is D_3 closed ? (H/W)

Is D_3 commutative? (H/W)

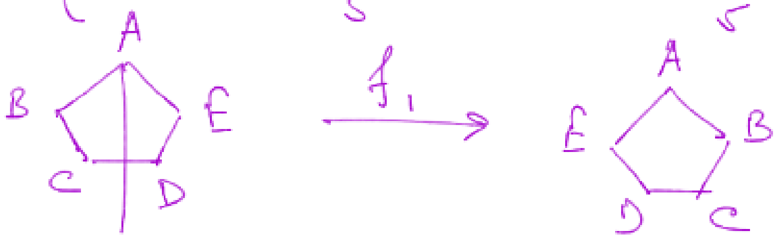
$$f_1 \cdot f_2 \neq f_2 \cdot f_1$$
$$(R_{120}) \qquad (R_{240})$$

Regular Pentagon (D_5)



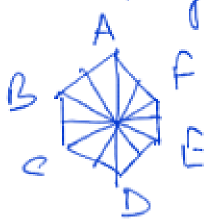
$\underline{\text{Rot}} \to R_0, R_{\frac{360}{5}}, R_{2 \cdot \frac{360}{5}}, R_{3 \cdot \frac{360}{5}}, R_{4 \cdot \frac{360}{5}}.$

$$\left\{ \begin{array}{l} R_{p \cdot \frac{360}{5}} = R_{r \cdot \frac{360}{5}}, \quad p = 5 \cdot q + r \\ R_{33 \cdot \frac{360}{5}} = R_{3 \cdot \frac{360}{5}} \end{array} \right.$$



Ref $\to f_1, f_2, f_3, f_4, f_5.$

Regular Hexagon (D_6).



Rot $\to R_0, R_{\frac{360}{6}}, \ldots, R_{5 \cdot \frac{360}{6}}$

Ref $\to f_i, \quad i = 1(1)6.$

Regular n-gon.

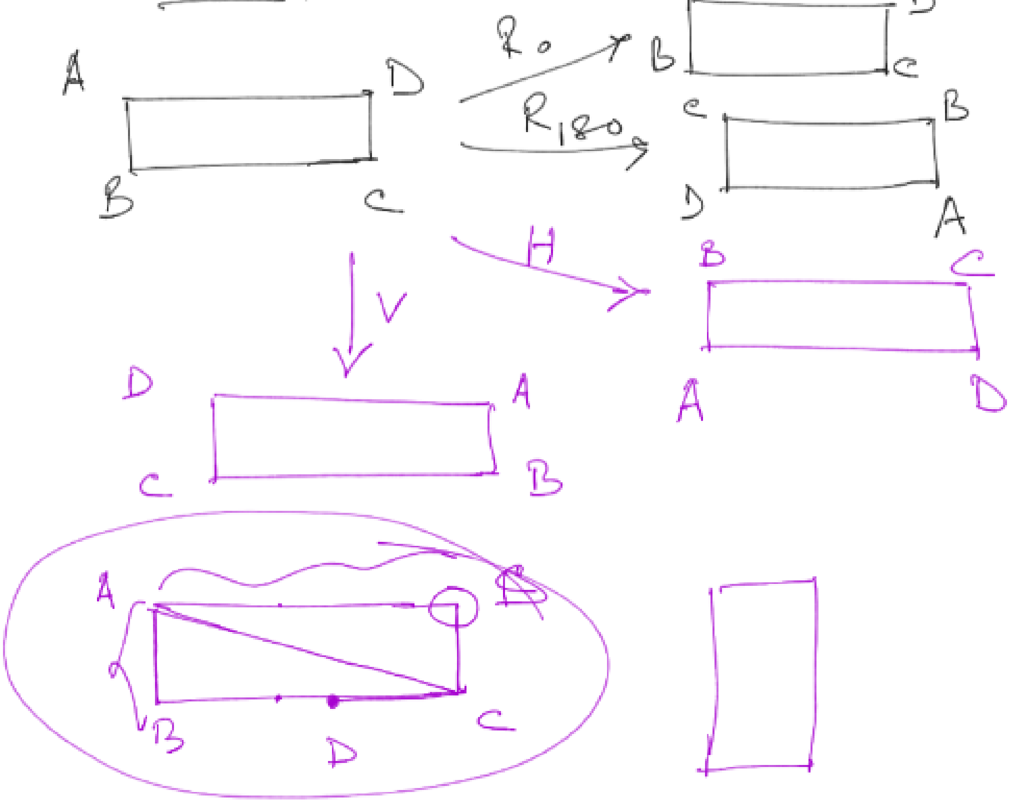
n rotations $\to R_0, R_{\frac{360}{n}}, R_{2 \cdot \frac{360}{n}}, \ldots\ldots, R_{(n-1)\frac{360}{n}}.$

n ref : —— f_i , $i = 1(1)n$.

n odd $\longrightarrow$ The lines from vertices to the midpoint of the opposite side.

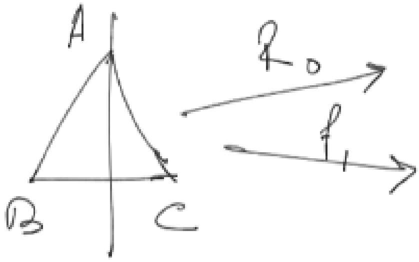
n even $\longrightarrow$ The lines joining opposite vertices and opposite midpoints.

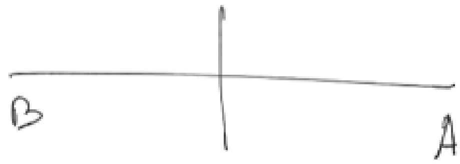
Rectangle : ——



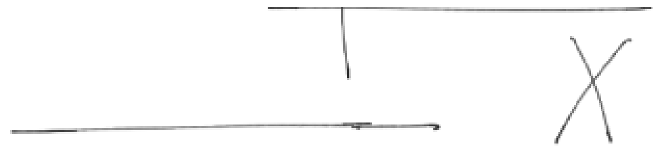
$$X = \{ R_0, R_{180}, H, V \}$$

Isocelles : ——



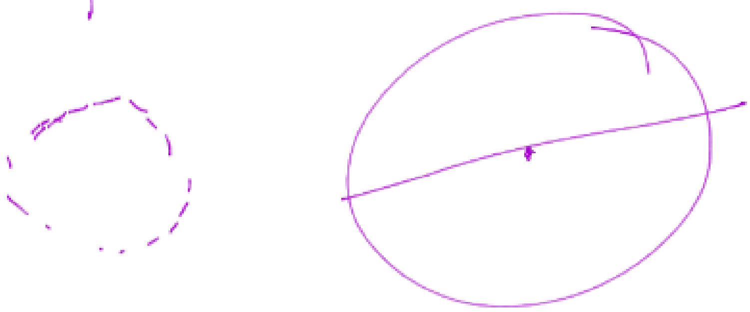


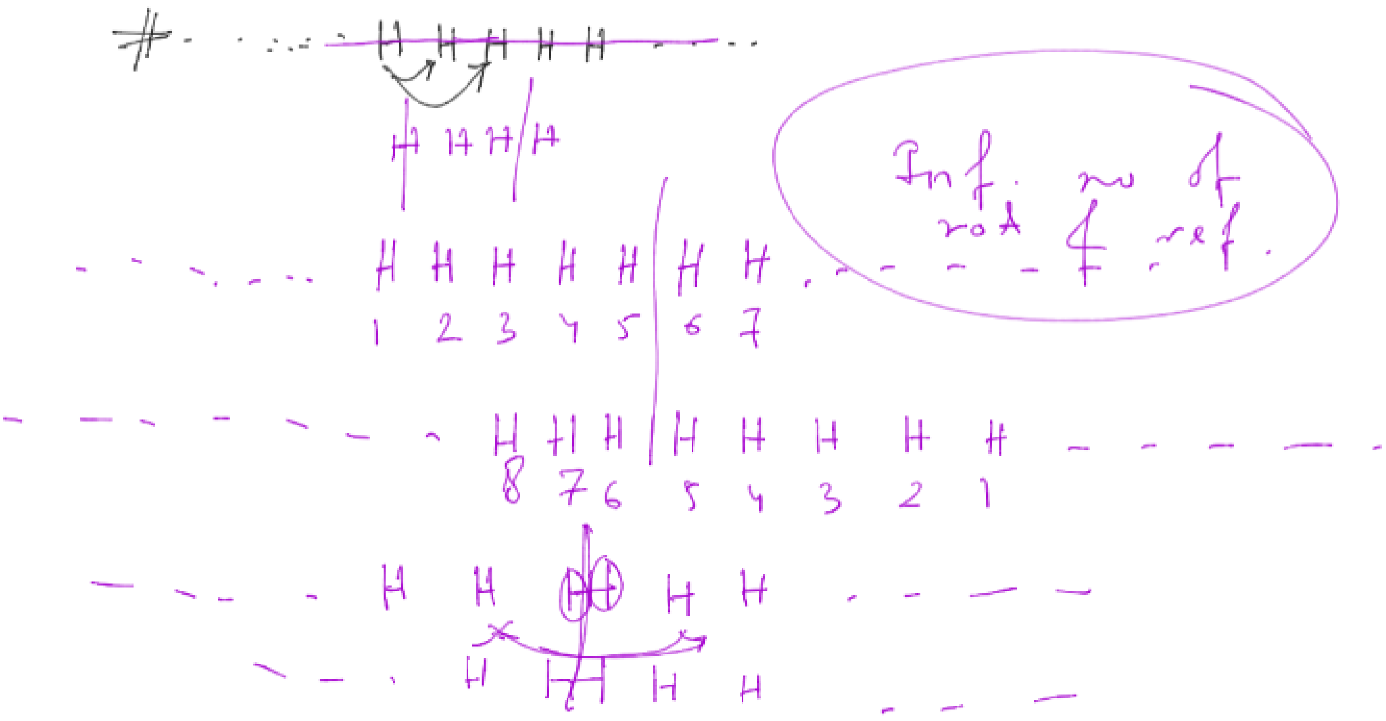
$f_1 = R_{180}$



circle :—

$\frac{360}{p}$, p rational





Inf. no of rot & ref.

1 2 3 4 5 6 7

8 7 6 5 4 3 2 1