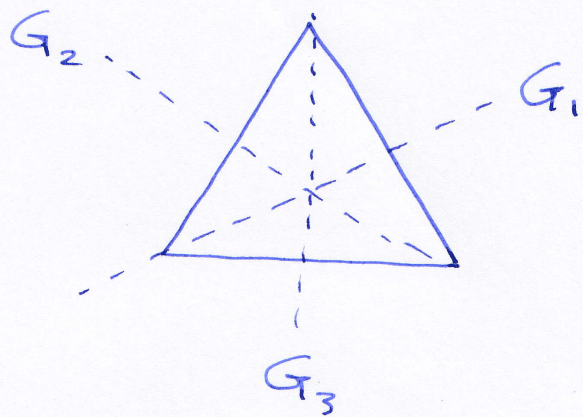


Sym(Δ)



$$I := id$$

$$A := \psi_1 = 120^\circ \curvearrowright$$

$$B := \psi_2 = -120^\circ \curvearrowleft$$

$$1 := \phi_1 = \text{Spiegelung um } G_1$$

$$2 := \phi_2 = \text{ " " } G_2$$

$$3 := \phi_3 = \text{ " " } G_3$$

Multiplication table for $\text{Sym}(\Delta)$

\circ	I	A	B	1	2	3
I	I	A	B	1	2	3
A	A	B	I	3	1	2
B	B	I	A	2	3	1
1	1	2	3	I	A	B
2	2	3	1	B	I	A
3	3	1	2	A	B	I

Multiplication table for $\text{Sym}(\Delta)$

\circ	I	A	B	1	2	3
I	I	A	B	1	2	3
A	A	B	I	3	1	2
B	B	I	A	2	3	1
1	1	2	3	I	A	B
2	2	3	1	B	I	A
3	3	1	2	A	B	I

Multiplication table for $\text{Sym}(\Delta)$

\circ	I	A	B	1	2	3
I						
A						
B						
1						
2						
3						

fill it in

Multiplication table for $\text{Sym}(\Delta)$

\circ	I	A	B	1	2	3
I	I	A	B	1	2	3
A	A					
B	B					
1	1					
2	2					
3	3					

General rules:

1) The first row and first column are automatic: $\forall \phi \ I\phi = \phi I = \phi$

Multiplication table for $\text{Sym}(\Delta)$

\circ	I	A	B	1	2	3
I	I	A	B	1	2	3
A	A	B	I			
B	B	I	A			
1	1					
2	2					
3	3					

General rules:

1) The first row and first column are automatic

Relations just for $\text{Sym}(\Delta)$:

3) Rotations: $A^2 = B$, $B^2 = A$, $AB = BA = I$

Multiplication table for $\text{Sym}(\Delta)$

\circ	I	A	B	1	2	3
I	I	A	B	1	2	3
A	A	B	I			
B	B	I	A			
1	1			I		
2	2				I	
3	3					I

General rules:

1) The first row and first column are automatic

Relations just for $\text{Sym}(\Delta)$:

3) Rotations

4) Flip squared: $1^2 = 2^2 = 3^2 = I$

Multiplication table for $\text{Sym}(\Delta)$

\circ	I	A	B	1	2	3
I	I	A	B	1	2	3
A	A	B	I			
B	B	I	A			
1	1			I	A	
2	2			B	I	
3	3					I

General rules:

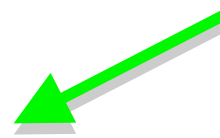
- 1) The first row and first column are automatic

Relations just for $\text{Sym}(\Delta)$:

- 3) Rotations
- 4) Flip squared

5) Flip-flip: $21 = B$, $12 = A$

computed in class



Multiplication table for $\text{Sym}(\Delta)$

\circ	I	A	B	1	2	3
I	I	A	B	1	2	3
A	A	B	I			
B	B	I	A	2		
1	1		3	I	A	
2	2			B	I	
3	3					I

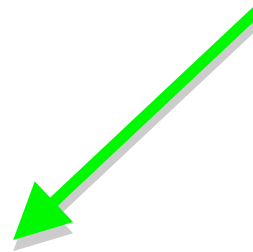
General rules:

- 1) The first row and first column are automatic

Relations just for $\text{Sym}(\Delta)$:

- 3) Rotations
- 4) Flip squared
- 5) Flip-flip
- 6) Rotate-flip: $1B = 3, B1 = 2$

please check



Multiplication table for $\text{Sym}(\Delta)$

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I	I	A	B	1	2	3
A	A	B	I	3	1	2
B	B	I	A	2	3	1
1	1	2	3	I	A	B
2	2	3	1	B	I	A
3	3	1	2	A	B	I

General rules:

- 1) The first row and first column are automatic
- 2) Each symbol appears exactly once in every row (bzw column)

Relations just for $\text{Sym}(\Delta)$:

- 3) Rotations
- 4) Flip squared
- 5) Flip-flip
- 6) Rotate-flip

Multiplication table for $\text{Sym}(\Delta)$

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I	I	A	B	1	2	3
A	A	B	I	3	1	2
B	B	I	A	2	3	1
1	1	2	3	I	A	B
2	2	3	1	B	I	A
3	3	1	2	A	B	I

General rules:

1) The first row and first column are automatic

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warum eigentlich

Relations just for $\text{Sym}(\Delta)$:

3) Rotations

4) Flip squared

5) Flip-flip

6) Rotate-flip

Multiplication table for $\text{Sym}(\Delta)$

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I	I	A	B	1	2	3
A	A	B	I	3	1	2
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1	1	2	3	I	A	B
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General rules:

- 1) The first row and first column are automatic.
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Relations just for $\text{Sym}(\Delta)$:

- 3) Rotations: $A^2 = B$, $B^2 = A$, $AB = BA = I$
- 4) Flip squared: $1^2 = 2^2 = 3^2 = I$
- 5) Flip-flip: $21 = B$, $12 = A$
- 6) Rotate-flip: $1B = 3$, $B1 = 2$

Übung

- (a) Man konstruiere die Multiplikationstafel der Einheitsquaternionen $\{\pm 1, \pm i, \pm j \pm k\}$.
- (b) Man konstruiere die Multiplikationstafel der Diedergruppe $D_4 = \text{Sym}(P_4)$.
- (c) Kann man die eine in die andere durch schlaue Symbolensubstitutionen umwandeln?