Group in Algebra ✓

$G \rightarrow$ a non-empty set

$* \rightarrow$ multiplication

$(G, *) \rightarrow$ Algebraic structure

1. Closure property
2. Associativity
3. Existence of identity
4. Existence of inverse

1. Closure property

$a, b \in G$

$a * b \in G$

2. Associativity

a, b and $c \in G$

$a * (b * c) = (a * b) * c$

3. Existence of identity

There exists $e \in G$

such that $a e = e a = a$ $\quad a \in G$

↓

identity element

④ Existence of inverse

$a \in G$

$b \in G$

$a * b = b * a = e \in G$

$(G, *)$

$G \longrightarrow Q$

$(Q, *)$

① $3 \in Q$, $5 \in Q$

$3 * 5 = 15 \in Q$

Closure property is satisfying

② $2 \in Q$, $3 \in Q$ and $5 \in Q$

$2 * (3 * 5) = (2 * 3) * 5$

$2 * 15 = 6 * 5$

$30 = 30$

Associativity is also satisfying.

(3) $1 \in \mathbb{Q}$, $5 \in \mathbb{Q}$

$1 * 5 = 5$ } $\in a = a$

$5 * 1 = 5$ } $a \in = a$

Existence of identity

(4) $5 \in \mathbb{Q}$ $\frac{1}{5} \in \mathbb{Q}$

$5 * \frac{1}{5} = \frac{1}{5} * 5 = 1 \rightarrow$ Identity

Existence of inverse

$\mathbb{Q} \rightarrow$ Set of rational numbers satisfying all 4 properties, $\mathbb{Q} \rightarrow$ Group.