Source: KB20200825132400

1 | **Groups**

- definition
  - closed
    - if $a, b \in S$ then $a + b \in S$
  - has an identity e
    - $e + a = a + e = a$
  - each element has an inverse
    - $-a + a = a + -a = e$
  - needs to be associative
    - $(a + b) + c = a + (b + c)$
- communitivity is nice but not required
  - $a + b = b + a$
- Which number systems are groups under addition and multiplication? | Number System | Multiplication | Addition | |———————|:———————:|:———————:| | Natural Numbers | No inverse | No identity | | Whole Numbers | No inverse | No inverse | | Integers | No inverse | Yes | | Rationals | Yes | Yes | | Reals | Yes | Yes | | Complex Numbers | Yes | Yes |
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$$\begin{bmatrix} 8 & 2 \\ -2 & 0 \end{bmatrix}$$
