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Question: Is set of odd numbers with binary operations (+), ie <0,+> an abelian group? If not explain the reasons with necessary notations

Solution:

$O = \{ \ldots -3, -1, 1, 3, 5, 7, 9, 11, 13, 15 \ldots \}$

1. Clousure: if $a, b \in O$ then $a+b \in O$

Let, $a = 3$
$b = 5$

then, $3 + 5 = 8$ not $\in O$

So, condition fails this requirement.

2. Identify element: 0 is even number, so in $e + a \in G$ is work out.

3. Associative: If $\forall a, b, c \in O$ then $a + (b+c) = (a+b) + c \in O$

Let, $a = 3$
$b = 5$
$c = -5$

then, $3 + (5-3) = (3+5) - 3 = 5 \in O$

So, this condition is satisfying.

4. Inverse Element: If $a, a' \in O$ and $(a+a') = e \in O$

Let $a = 3$

$a' = -3$

then, $3 - 3 = 0 \in O$

So, the set is not satisfying the inverse property.

5. Communicative: If $\forall a, b \in O$, the $(a+b) = b+a \in O$

Let $a = 5$

$b = 7$

then, $5+7 = 7+5 = 12$ not $\in O$

So, this condition is satisfying.

Here, given odd numbers set is not an abelian because it is not pass the all condition of abelion.