

Name: _____

Definitions

A number is **even** if it can be written in the form $2k$ for some integer k . A number is **odd** if it can be written in the form $2k + 1$ for some integer k .

Given $n, m \in \mathbb{Z}$, we say that n **divides** m , written $n \mid m$, if there exists $k \in \mathbb{Z}$ such that $m = nk$. If $n \mid m$, we may also say m is **divisible** by n or n is a **factor** of m . If n **does not divide** m , we write $n \nmid m$.

Give a proof for each statement below.

1. The sum of any three consecutive integers is divisible by three.

2. If $a \mid n$, then $a \mid mn$.



Doing math out loud is vulnerable, so remember to be kind and supportive to each other.

3. If $c, a, r \in \mathbb{R}$ such that $c \neq 0$ and $r \neq a/c$, then there exists a unique $x \in \mathbb{R}$ such that $(ax + 1)/(cx) = r$.

4. If ab divides n , then a divides n and b divides n .

5. If n is odd, then 8 divides $n^2 - 1$.

6. If a divides b and b divides c , then $a \mid c$.

7. For all $n \in \mathbb{Z}$, $3n^2 + n + 14$ is even.