For all integers $a$, $b$, and $c$,

1. If $a|b$ and $a|c$, then $a|(b + c)$.

2. If $a|b$, then $a|(bc)$.

3. If $a|b$ and $b|c$, then $a|c$.

Proofs:

1. Suppose $a|b$ and $a|c$.

Then there are integers $m$ and $m$ such that $b = am$ and $c = an$.

Then $b + c = am + an = a(m + n)$, so $a|(b + c)$.

2. Suppose $a|b$.

Then there is an integer $n$ such that $b = an$.

Then $bc = (an)c = a(nc)$, so $a|(bc)$.

3. Suppose $a|b$ and $b|c$.

Then there are integers $m$ and $m$ such that $b = am$ and $c = bn$.

Then $c = bn = (am)n = a(mn)$, so $a|c$. 