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NTI Proposition 9. If n is and integer, then $n|0$.

Proof:

By Definition 1, for any integer n, n divides an integer b if there exists an integer k such that $nk = b$. Let $b = 0$, any integer n multiplied by zero equals zero. So $k = 0$,
Therefore,

$$n|0$$

Q.E.D.

NTI Corollary 10. If n and a are integers then $n|(a - a)$.

Proof:

Building on Proposition 9, $(a - a)$ will always equal zero.
Therefore,

$$n|(a - a)$$

Q.E.D.

NTI Proposition 11. Let n, a, b be integers. If $n|(a - b)$, the $n|(b - a)$.

Proof:

By Definition 1, $nk = (a - b)$, using the commutative property and multiplying -1 through we get: $n(-k) = (b - a)$ $-k$ is still an integer
Therefore,

$$n|(b - a)$$

Q.E.D.

NTI Proposition 12. Let n, a, b, c be integers. If $n|(a-b)$ and $n|(b-c)$, then $n|(a-c)$.

Proof:

By Definition 1, $nk_1 = (a-b)$ and $nk_2 = (b-c)$ such that k_1 and k_2 are integers. By adding c to both sides on the second equation we obtain:

$$c + nk_2 = b$$

We can now substitute b out of the first equation:

$$nk_1 = a - c + nk_2$$

After tidying up the equation we get:

$$n(k_1 - k_2) = a - c$$

Through the basic properties we know the Left Hand Side will always be and integer.
Therefore,

$$n|(a-c)$$

Q.E.D.