

Example Proof of a Biconditional

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Theorem 1. For all integers n , n is even if and only if $\frac{n}{2}$ is an integer.

Proof. We will prove each direction separately. For the first direction, we assume n is even and will show that $\frac{n}{2}$ is an integer. Since n is even, there exists an integer k such $n = 2k$. Therefore $\frac{n}{2} = k$. This completes the proof for the first direction since k is an integer. For the second direction, we assume that $\frac{n}{2}$ is an integer, and will show that n is even. Let q be the integer such that $\frac{n}{2} = q$. Then $n = 2q$, which shows that n is even by the definition of even numbers. This completes the second direction and so we have shown that n is even if and only if $\frac{n}{2}$ is an integer. \square