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Theorem: An integer is a multiple of nine iff the sum of its digits is a multiple of nine.

Proof: Express the integer as the sum of its digits: $d_0 + 10d_1 + 100d_2 + \ldots + 10^n d_n$. This may be grouped into the sum of its digits $d_0 + d_1 + \ldots + d_n$ plus the expression $9d_1 + 99d_2 + \ldots + (10^n - 1)d_n$. Since each $(10^i - 1)d_i$ is divisible by 9, the result follows. $\square$