Prove that for any integer n, at least one of the integers n, $n+2$, $n+4$ is divisible by 3.

Proof:

Given an arbitrary integer n, by Division Theorem, there exist unique integers q, r such that $n = 3q + r$ and $0 \leq r < 3$. Such r can take three possible values: 0, 1, 2. Examine each case:
when $r = 0$, $n = 3q$, n is divisible by 3;
when $r = 1$, $n = 3q + 1$ and $n + 2 = 3q + 3 = 3(q + 1)$, $n + 2$ is divisible by 3;
when $r = 2$, $n = 3q + 2$ and $n + 4 = 3q + 6 = 3(q + 2)$, $n + 4$ is divisible by 3.
So for all possible cases of n, there is one of n, $n + 2$, $n + 4$ is divisible by 3, as required.