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

(Idea:)

proof:

An arbitary integer n can be of 3 forms. : 3k, 3k+1, 3k+2

case 1: $n = 3k$
n is divisible by 3

case 2: $n = 3k+1$
$$n+2 = 3k+3$$
$$n+2 = 3(k+1)$$
n+2 is divisible by 3

case 3: $n = 3k+2$
$$n+4 = 3k+6$$
$$n+4 = 3(k+2)$$
n+4 is divisible by 3

$\therefore$ For any integer n, we have 3 divides n or 3 divides n+2 or 3 divides n+4.