

Test Flight Question 4

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Theorem. *Prove that every odd natural number is one of the forms $4n + 1$ or $4n + 3$, where n is an integer.*

Proof. Let m be any odd natural number. It can be expressed as $2k + 1$, where k is an integer greater than or equal to 0. k must be either even or odd:
If k is even, it can be expressed as $2n$, where n is an integer. Then:

$$m = 2(2n) + 1 = 4n + 1$$

If k is odd, it can be expressed as $2n + 1$, where n is an integer. Then we have the following expression for our odd number m :

$$m = 2(2n + 1) + 1 = 4n + 2 + 1 = 4n + 3$$

We have shown the two cases for m and the theorem is proved. □