

## Proof 1

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Say whether the following is true or false and support your answer by a proof.

$$(\exists m \in \mathbb{N})(\exists n \in \mathbb{N})(3m + 5n = 12)$$

### Proof

By contradiction.

Let us assume the statement is **true**.

Therefore,  $3m + 5n = 12$  must hold true.

$$\begin{aligned} 3m + 5n &= 12 \\ \implies 3m &= 12 - 5n \\ \implies m &= \frac{12 - 5n}{3} \end{aligned}$$

But for any natural multiple of  $n$ ,  $m$  would result in a rational or an integer.

But  $m \in \mathbb{N}$ . Contradiction.

Therefore, our initial assumption must be **false**. Hence, the statement is false.