

# Test Flight Question 1

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**Theorem.** *The following statement is false:  $(\exists m \in \mathcal{N})(\exists n \in \mathcal{N})(3m+5n = 12)$*

*Proof.* Because  $m$  and  $n$  are natural numbers,  $3m$  and  $5n$  are also natural numbers. For them to sum to 12, they must both be less than 12.

For  $m$ :

$$3m < 12$$

$$m < 4$$

For  $n$ :

$$5n < 12$$

$$n < 2.4$$

So  $m$  can be any of 1, 2, or 3 while  $n$  is either 1 or 2. We enumerate the six permutations of the expression:

$$3(1) + 5(1) = 8$$

$$3(1) + 5(2) = 13$$

$$3(2) + 5(1) = 11$$

$$3(2) + 5(2) = 16$$

$$3(3) + 5(1) = 14$$

$$3(3) + 5(2) = 19$$

None of these expressions equal 12 so the theorem is proved false.  $\square$