1. Say whether the following is true or false and support your answer by a proof. $(\exists m \in \mathcal{N})(\exists n \in \mathcal{N})(3m + 5n = 12)$

PROOF The statement is false. The smallest $m, n \in \mathcal{N}$ that we can try are 1 and 1.

- Substituting these in the above equation: $3 * 1 + 5 * 1 = 8 < 12$.

- Let us try the next possible value for m, which is 2: $3 * 2 + 5 * 1 = 11 < 12$.

- For $m = 3, n = 1$, and $m = 1, n = 2$, and all other combinations of m and n, $3m + 5n > 12$.

- Therefore $\neg[(\exists\ m \in \mathcal{N})(\exists\ n \in \mathcal{N})(3m + 5n = 12)]$.

- Or, $(\forall\ m \in \mathcal{N})(\forall\ n \in \mathcal{N})(3m + 5n \neq 12)$.

This completes the proof. ■