

In a certain town, there are 3 people for each horse, 4 sheep for each cow and 3 ducks for each person. Which of the following numbers could NOT be the total number of people, horses, sheep, cows and ducks?

41 47 59 61 66

First we convert into algebra:

$$P = 3H$$

$$S = 4C$$

$$D = 3P$$

We have 3 equations and 5 unknowns, so in our expression for the total we expect to include two unknowns.

Note that $D = 3P = 3(3H) = 9H$

Using this, our total is

$$\begin{aligned} P + H + S + C + D &= 3H + H + 4C + C + 9H \\ &= 13H + 5C \end{aligned}$$

So the question is asking which of the given numbers can not be written as a sum of a positive multiple of 13 and a positive multiple of 5.

Let's make a table of multiples of 13:

N	13N
1	13
2	26
3	39
4	52
5	65

We can write

$$\begin{aligned}41 &= 26 + 15 \\ &= 2 \times 13 + 3 \times 5\end{aligned}$$

$$\begin{aligned}59 &= 39 + 20 \\ &= 3 \times 13 + 4 \times 5\end{aligned}$$

$$\begin{aligned}61 &= 26 + 35 \\ &= 2 \times 13 + 7 \times 5\end{aligned}$$

$$66 = 26 + 40$$

$$= 2 \times 13 + 8 \times 5$$

Hence the answer is $\boxed{47}$