

Conditions

at a certain place a few cows, a few oxen and 45 hens have been kept. one man has been deputed to look after every 15 animals. number of oxen is double the number of cows. if the number of total heads is 186 less than number of legs, then how many men have been deputed for looking after animals

Solution

There are 45 hens, so they have 45 heads and 90 legs.

Each oxen has one head and 4 legs, each cow has the same.

Let the number of cows and oxen is X . Then the total amount of their heads is X , the total amount of legs is $4X$.

Let the number of total heads is Y . Then the number of total legs is $Y+186$.

Now we can construct a system of 2 equations for legs and for heads:

$$\begin{cases} x + 45 = y \\ 4x + 90 = y + 186 \end{cases}$$

Substitute y from 1st equation to 2nd:

$$4x + 90 = x + 45 + 186$$

$$3x = 186 - 45 = 141$$

$$x = 47$$

$$47 + 45 = y = 92$$

Now we know that there were 92 heads or 92 animals.

If for every 15 animals there was 1 man, then we can say that there were $90/15=6$ men + 1 man (to look after the remained 2 animals)

Answer: 7 men (6 men to look after every 15 animals and another one to look for the last)

2nd case (we count men's legs and heads)

For this case we will have an additional summand, which represents the amount of men's heads and legs in each equation.

If we know that for every 15 animals there were 1 man, then for $x+45$ heads there were additionally $(x+45)/15$ men's heads. Consider the updated system of equations:

$$\begin{cases} x + 45 + \frac{x + 45}{15} = y \\ 4x + 90 + \frac{2x + 90}{15} = y + 186 \end{cases}$$

This system has a solution $x=45$, $y=96$.

And then we can make a conclusion, that the amount of men was (counted by their heads):

$$\frac{x + 45}{15} = \frac{90}{15} = 6$$

Answer: 6 men