



## Problem of the Week

### Problem D and Solution

#### Sticker Situation

#### Problem

Kendi has a large collection of vinyl stickers, and each sticker has an animal on it or an emoji on it (but not both). In this collection, 300 of the stickers have animals on them, and 1 out of 5 of all of the stickers have animals on them. She would like to add more stickers to her collection so that there are 3 stickers with animals on them out of every 10 stickers.

If she can buy the stickers in packages of 60 stickers where 21 are animal stickers and the remaining are emoji stickers, how many whole packages does she need to buy?

#### Solution

There were initially 300 animal stickers, and there was 1 animal sticker for every 5 stickers. This means that 4 out of 5 stickers were emoji stickers. Therefore, there were four times as many emoji stickers as animal stickers. That is, there were  $4 \times 300 = 1200$  emoji stickers and a total of  $300 + 1200 = 1500$  stickers.

Each package contains 21 animal stickers and 39 emoji stickers, for a total of  $21 + 39 = 60$  stickers.

Let  $n$  represent the number of additional whole packages required to add to this collection so that there are 3 animal stickers out of every 10 of the stickers. By purchasing  $n$  packages, she is adding  $60n$  stickers to her collection, of which  $21n$  are animal stickers. Thus, she will have a total of  $1500 + 60n$  stickers, of which  $300 + 21n$  are animal stickers.

If 3 out of 10 of the stickers in her collection are animal stickers, then we have

$$\begin{aligned}\frac{\text{the number of animal stickers}}{\text{the total number of stickers}} &= \frac{3}{10} \\ \frac{300 + 21n}{1500 + 60n} &= \frac{3}{10} \\ 10(300 + 21n) &= 3(1500 + 60n) \\ 3000 + 210n &= 4500 + 180n \\ 30n &= 1500 \\ n &= 50\end{aligned}$$

Therefore, 50 additional packages of stickers must be purchased so that 3 out of 10 of the stickers in her collection are animal stickers.

We can check this. After purchasing 50 additional packages of stickers, there would be  $300 + 21(50) = 1350$  animal stickers and a total of  $1500 + 60(50) = 4500$  stickers. Then, the ratio of animal stickers to the total number of stickers is  $\frac{1350}{4500} = \frac{3}{10}$ , as required.