

Answer on Question #60758 – Math – Algebra

Question

A manufacturer has 600 litres of 12% acid solution. How many litres of 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?

Solution

Let the volume of acid solution be x litres. After adding this solution to the initial volume we get $(600+x)$ litres. The quantity of acid in new solution is $\frac{600 \cdot 0.12 + x \cdot 0.3}{600+x}$.

So, we have the following inequality:

$$0.15 \leq \frac{600 \cdot 0.12 + x \cdot 0.3}{600 + x} \leq 0.18$$

Multiply both sides of the inequality by $600 + x > 0$:

$$0.15(600 + x) \leq 600 \cdot 0.12 + x \cdot 0.3 \leq 0.18(600 + x)$$

$$90 + 0.15x \leq 72 + x \cdot 0.3 \leq 108 + 0.18x,$$

hence

$$\begin{cases} 90 + 0.15x \leq 72 + x \cdot 0.3, \\ 72 + x \cdot 0.3 \leq 108 + 0.18x, \end{cases}$$

$$\begin{cases} 90 - 72 \leq 0.3x - 0.15x, \\ 0.3x - 0.18x \leq 108 - 72, \end{cases}$$

$$\begin{cases} 18 \leq 0.15x, \\ 0.12x \leq 36, \end{cases}$$

$$\begin{cases} 0.15x \geq 18, \\ 0.12x \leq 36, \end{cases}$$

$$\begin{cases} x \geq \frac{18}{0.15}, \\ x \leq \frac{36}{0.12}, \end{cases}$$

$$\begin{cases} x \geq 120, \\ x \leq 300, \end{cases}$$

that is,

$$120 \leq x \leq 300.$$

Answer: from 120 litres to 300 litres can be added.