

Answer on Question #57332 – 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

$$0.15 < \frac{600 * 0.12 + x * 0.30}{600 + x} < 0.18,$$

where percent expressed as decimal (e.g. 15% = 0.15), x is the number of litres of 30% acid solution. Expression in the middle is resulting concentration of mixture ($\frac{\text{litres of pure acid}}{\text{litres of mixture}}$).

Solve the first inequality

$$0.15 < \frac{600 * 0.12 + x * 0.30}{600 + x}$$

$$0.15(600 + x) < 600 * 0.12 + x * 0.30$$

$$600 * 0.15 - 600 * 0.12 < x * 0.30 - x * 0.15$$

$$600(0.15 - 0.12) < x(0.30 - 0.15)$$

$$600 * 0.03 < x * 0.15$$

$$\frac{600 * 0.03}{0.15} < x$$

$$120 < x$$

Solve the second inequality

$$\frac{600 * 0.12 + x * 0.30}{600 + x} < 0.18$$

$$600 * 0.12 + x * 0.30 < 0.18(600 + x)$$

$$x(0.30 - 0.18) < 600(0.18 - 0.12)$$

$$x * 0.12 < 600 * 0.06$$

$$x < \frac{600 * 0.06}{0.12}$$

$$x < 300$$

Thus,

$120 < x < 300$ (in liters).

Answer: $120 < x < 300$ (in liters).