



Problem of the Week

Problem D and Solution

Don't Want to Miss a Sale

Problem

A customer came into an auto shop requiring a quantity of anti-freeze of which 8% is glycerine. This was the percentage recommended in her owner's manual. The shop owner has the following:

- a three litre bottle of anti-freeze of which 7% is glycerine,
- a four litre bottle of anti-freeze of which 20% is glycerine, and
- a bulk supply of antifreeze of which 5% is glycerine.

The owner, not wanting to miss a sale, felt that she could create an anti-freeze mixture with the required percentage by combining the contents of the entire three litre bottle with the contents of the entire four litre bottle and then adding some anti-freeze from the bulk supply. How many litres of anti-freeze from the bulk supply must be added to create a quantity of anti-freeze of which 8% is glycerine? (You may assume that the shop owner has enough of the bulk supply to create the appropriate mixture.)

Solution

Let x be the number of litres from the bulk supply..

The 3 L container of anti-freeze of which 7% is glycerine has $0.07 \times 3 = 0.21$ L of glycerine.

The 4 L container of anti-freeze of which 20% is glycerine has $0.20 \times 4 = 0.80$ L of glycerine.

In the x L from the bulk supply there is $0.05 \times x = 0.05x$ L of glycerine.

Therefore, the total amount of glycerine in the final mixture is

$$0.21 + 0.80 + 0.05x = (1.01 + 0.05x) \text{ L.}$$

The final mixture contains $3 + 4 + x = (7 + x)$ L of liquid, of which 8% is glycerine.

Therefore, $0.08 \times (7 + x) = (0.56 + 0.08x)$ L of the final mixture is glycerine.

Since we have shown that the amount of glycerine in the final mixture is $(1.01 + 0.05x)$ L and $(0.56 + 0.08x)$ L, we must have

$$\begin{aligned} 1.01 + 0.05x &= 0.56 + 0.08x \\ 0.05x - 0.08x &= 0.56 - 1.01 \\ -0.03x &= -0.45 \\ x &= 15 \end{aligned}$$

Therefore, 15 L of the bulk anti-freeze is required.

