AUSTRALIAN MATHS TRUST

Challenge Problems
Upper Primary: Years 5–6
Practice Problem

UP5: Grandma's Eye Drops

Grandma's eye drops come in a small bottle. The label says there are 2.7 millilitres (2.7mL) of solution in the bottle and 15 milligrams per millilitre (15mg/mL) of active ingredient in the solution.

A. How many milligrams of active ingredient are there in the bottle?

B. The manufacturer produces the eye drops in batches of 10 litres. How many grams of active ingredient do they put in each batch?

C. The instructions on the bottle say to put one drop in each eye at night. One 2.7mL bottle lasts 30 days.

D. How many millilitres of solution are there in each drop?

E. A different bottle contains 63mg of active ingredient in 4.5mL of solution. Is this solution stronger or weaker than the solution in the 2.7 mL bottle? Explain why.

Solutions

A. The amount of active ingredient in the bottle is $15 \times 2.7 = 40.5$ mg.

B. Since 1000 mL = 1 L and each mL of solution has 15 mg of active ingredient, 1 L of solution has 15000 mg of active ingredient. Since 1000 mg = 1 g, 1 L of solution has 15 g of active ingredient. Hence the amount of active ingredient in each batch of 10 L is 150 g.

C. The bottle lasts 30 days and each day 2 drops are used. Hence there are 60 drops in each 2.7mL bottle. So the amount of solution in each drop is

$$\frac{2.7}{60} = \frac{27}{600} = \frac{9}{200} = \frac{4.5}{100} = 0.045 \text{ mL}.$$

D. The number of milligramsof active ingredient per millilitre of solution in the 4.5 mL bottle is

$$\frac{63}{4.5} = \frac{630}{45} = \frac{126}{9} = 14.$$

This is less than 15mg/mL. So the solution in the larger bottle is weaker.