Dilution Factor:

A water sample was tested (with dithizone in methylene chloride to make a color solution) for lead content, but was diluted prior to obtaining the spectroscopy instrument reading at 510 nm. This dilution involved using volumetric pipet to transfer 10 mL of the sample to 250 mL volumetric flask. Based on the obtained calibration graph, the instrument reading gave a concentration of 24.0 ppm for this diluted sample, what is the concentration of lead in the original sample?
Solution:

$$24.0\ \frac{mg}{L} \times 250\ mL \times \frac{1L}{1000\,mL} = 6.0\ mg\ \ Pb\ in\ \ flask$$

This is also the milligram of Pb in the 10 mL (pipet) of original sample. Thus,

$$6.0\ mg \div (\,10\ mL\ \times \frac{1L}{1000\,mL}\,) = 600.0\ \ ppm\ Pb$$

Therefore, there is 600.0 ppm Pb in the original water sample.

Alternative Solution:

Using "dilution factor"

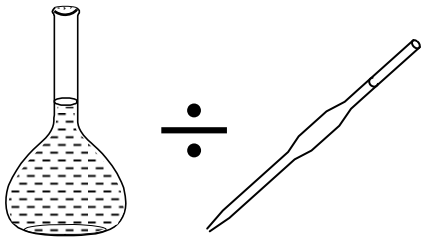
Dilution factor is defined as: total volume of solution per aliquot volume.
Where total volume of solution is: 10.0 + 240.0 = 250.0 mL (volumetric flask.)

$$\frac{250\ mL}{10\ mL} = 25$$

Therefore, in the original water sample:

$$24.0\ \ ppm \times 25 = 600.0\ \ ppm\ Pb$$

$$DF = \frac{Volume\ \ of\ \ Flask}{Volume\ of\ \ Pipet}$$



Note: For multiple dilutions the dilution factor is the product of the dilution factors for each individual dilution.

$$DF_{total} = DF_1 \times DF_2 \times DF_3 \times \ldots \times DF_n$$