



QT Repeated percentage change

1. There is a 20% reduction from normal prices in a shop sale. On Saturday the manager decides to offer a further 10% discount.

Ahmedyar says "Prices have now been reduced by 30%."

Is Ahmedyar correct? You must show your working.

No - 20% reduction \rightarrow further 10%.

$$0.8 \times 0.9 = 0.72$$

$$1 - 0.72 = 0.28$$

\therefore Prices reduced by 28%.

2. Florence invests £3500 for 3 years in a savings account. She gets 2% per annum compound interest for the first year, then x% compound interest for 2 years.

Florence has £3677.90 at the end of 3 years.

Work out the value of x.

$$\begin{aligned} \text{1st year} &= \text{orig} \times \text{multiplier}^n \\ &= 3500 \times 1.02^1 \\ &= 3570 \end{aligned}$$

$$\begin{aligned} &102\% \\ &1.02 \end{aligned}$$

$$3677.90 = 3570 \times \text{multiplier}^2$$

$$\sqrt{\frac{3677.90}{3570}} = \text{multiplier}$$

$$1.014999... = \text{multiplier}$$

$$101.499... \%$$

$$\begin{aligned} x &= 1.5\% \\ &(\underline{1.5\%}) \end{aligned}$$



3. Joseph invests £2600 for 5 years in a savings account. He gets 3% per annum compound interest for the first year, then $x\%$ compound interest for 4 years.

Joseph has £2956.01 at the end of 5 years.

Work out the value of x . Give your answer correct to 2 decimal places.

$$\begin{aligned} \text{After 1st year} &= \text{orig} \times \text{mult}^1 \\ &= 2600 \times 1.03 \\ &= 2678 \\ 2956.01 &= 2678 \times \text{mult}^4 \\ \sqrt[4]{\frac{2956.01}{2678}} &= \text{mult} \end{aligned}$$
$$\begin{aligned} &1.024999 \\ &102.5\% \\ \underline{\underline{x = 2.5\%}} \end{aligned}$$

4. The population of a small town increases by $x\%$ each year. The population is expected to increase by 36% in the next 8 years. Work out the value of x giving your answer to 1 decimal place.

$$\begin{aligned} \text{Multiplier } (x)^8 &= 1.36 && 103.915\% \\ x^8 &= 1.36 \\ x &= \sqrt[8]{1.36} \\ &= 1.03918 \\ \underline{\underline{x = 3.9\% \text{ per year}}} \end{aligned}$$

5. A workman's van is decreasing by $x\%$ in value each year. After 5 years the van will be worth 50% of the price it was bought for. Work out the value of x giving your answer to 1 decimal place.

$$\begin{aligned} \text{Total} &= \text{orig} \times \text{mult}^5 \\ 500 &= 1000 \times \text{mult}^5 \\ \sqrt[5]{\frac{500}{1000}} &= \text{mult} \\ 0.87055 &= \text{mult} \end{aligned}$$
$$\begin{aligned} 1 - 0.87055 & \\ &= 0.129449 \\ &= \underline{\underline{12.9\% \text{ per year}}} \end{aligned}$$



6. The radius of a circle increases by 30%. Find the increase in the circle's area.

$$\begin{aligned} \text{Area of circle} &= \pi r^2 && \text{radius } r \\ \text{New circle Area} &= \pi (1.3r)^2 \\ \text{Area} &= 1.69\pi r^2 \\ \text{New circle} & \text{ 169\% bigger} && \therefore \text{ increase of } \underline{\underline{69\%}} \end{aligned}$$

7. A bacteria strain is increasing its population by 15% each hour. Calculate the percentage increase after 4 hours.

$$\begin{aligned} \text{Increasing by 15\%} &= 1.15 \\ \text{4 hours} & \\ 1.15 \times 1.15 \times 1.15 \times 1.15 & \\ &= 1.749 \\ &= 174.9\% \\ \therefore \text{ increase of } & \underline{\underline{74.9\%}} \end{aligned}$$