Reverse percentages

Starter

1. **(Review of last lesson)** A farmer buys a tractor for £150,000. It depreciates by 25 % in the first year and then by 15 % thereafter. How much will it be worth in 8 years?
   N.B. Depreciates means "goes down in value".

2. **(Review of previous material)** A fridge is reduced by 12 % in a sale. If the original price is £180 what is the sale price?

3. **(Review of previous material)** A fridge is in the sale for £125 after a 12 % reduction. What was the original price of the fridge?

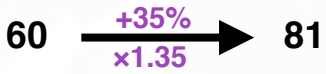
Notes

A reverse percentages question is where a percentage change has occurred and we are given the final, rather than the original, value.

Increase by a percentage vs. reverse percentage

When £60 is increased by 35 % it becomes £81.

In pairs, discuss what the diagram means in relation to "increasing 60 by 35 % gives 81"



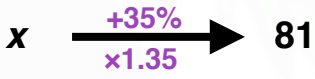
Here is what the diagrams and calculations would look like for the different types of question

Increase by a percentage

$$60 \times 1.35 = y$$

$$y = 81$$

Reverse percentage



$$x \times 1.35 = 81$$

$$x = \frac{81}{1.35} = 60$$

Notice that increase by a percentage is just a calculation, whereas reverse percentages requires rearranging.

Alternative working for reverse percentages

Another method aims to find original price by finding 100 %.

E.g. The price of an item increases by 35 % and becomes £81. What was the old price?

Working:

Increase by 35 % $\Rightarrow$ $135\% \equiv 81$

Divide by 135 : $1\% \equiv \frac{81}{135}$

Multiply by 100: $100\% \equiv \frac{81}{135} \times 100 = 60$

The old price is £60.

You can choose which method you want to use.

Recognising reverse percentages questions

It is easy to recognise reverse percentages questions because the question will use the ***past tense*** when referring to what you need to find e.g. "What was the price…?" "Find the value of the house before…".

E.g. 1 After an increase of $8\,\%$, the price of a car is £6696. Find the price of the car before the increase.

Working: Let x be the price of the car before the increase.

$$x \xrightarrow[\times 1.08]{+8\%} 6696 \quad \Rightarrow \quad x \times 1.08 = 6696$$

$$x = \frac{6696}{1.08} = 6200$$

The price of the car before the increase was £6200.

E.g. 2 The number of frogs in a pond has decreased by $15\,\%$ this year to 391. How many frogs were there last year?

When a number represents the increase or decrease

Rather than the final value, questions can give the number that is equivalent to the increase or decrease. In such cases either use algebra or put the percentage equivalent to the number and find $100\,\%$.

E.g. 3 Since Michael bought his house, the price has gone up by $4\,\%$ and is now worth £6500 ***more***. How much did Michael buy the house for?

Working: Let x be the price of the house when Michael bought it.

$$x \xrightarrow[\times 1.04]{+4\%} x + 6500 \quad \Rightarrow \quad x \times 1.04 = x + 6500$$

$$0.04x = 6500$$

$$x = \frac{6500}{0.04} = 162500$$

Michael bought the house for £162500.

Alternatively: $4\,\%$ represents 6500 i.e. $4\,\% \equiv 6500$

$$1\,\% \equiv \frac{6500}{4}$$

$$100\,\% \equiv \frac{6500}{4} \times 100$$

$$100\,\% \equiv 162500$$

Michael bought the house for £162500.

E.g. 4 The average attendance of a football club fell by $7\,\%$ this year. If 2030 fewer people went to matches this year, how many went last year?

Hint: If x people attended matches last year, write down in terms of x how many attended this year?

Video: Reverse percentages

Solutions to Starter and E.g.s

Exercise

9-1 class textbook:	p34 M2.4 Qu 1-16
A*-G class textbook:	p32 M2.4 Qu 1-19
9-1 homework book:	p10 M2.4 Qu 1-11
A*-G homework book:	p8 M2.4 Qu 1-10

Summary

A reverse percentages question is where a percentage change has occurred and we are given the final, rather than the original, value.

Reverse percentages questions can be recognised by the use of the ***past tense*** when referring to what you need to find.

Draw a diagram like this to help: $x \xrightarrow[\times 0.85]{-15\%} 391$