Reverse Percentages – GCSE Maths

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1. Introduction

Reverse Percentage also known as "**Reverse Percent**" is a mathematical operation that involves finding the original value or quantity from which a percentage was calculated.

2. What are Reverse Percentages?

- Reverse percentage is a mathematical concept which is used to find or determine the original value before the percentage **increase** or **decrease**.
- Start with the final amount after a percentage change and work backward to find the original number.
- If you know the final value **after** a percentage change, reverse percentages help you find the original value **before** the change.

Formula used in Reverse Percentages:

$$\text{original value} = \frac{\text{Final value}}{1 \pm \frac{\text{percentage}}{100}}$$

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Example:

Problem: A TV now costs **£300** after a **25%** increase. What was its original price?

Solution:

Step#1: Given,

- New value = **£300**
- Percentage increased = **25%**

Step#2: Applying the formula,

$$\text{original value} = \frac{\text{Final value}}{1 \pm \frac{\text{percentage}}{100}}$$

Step#3: Put the values in formula,

$$\text{original value} = \frac{300}{1 + \frac{25}{100}}$$

Step#4: Simplify the denominator,

$$= 1 + \frac{25}{100} = 1 + 0.25$$

$$= 1.25$$

Step#5: The final value is ,

$$\text{original value} = \frac{300}{1.25} = \frac{300 \times 100}{125}$$

$$\text{original value} = \frac{30000}{125} = 240$$

The original price of TV was **£240.**

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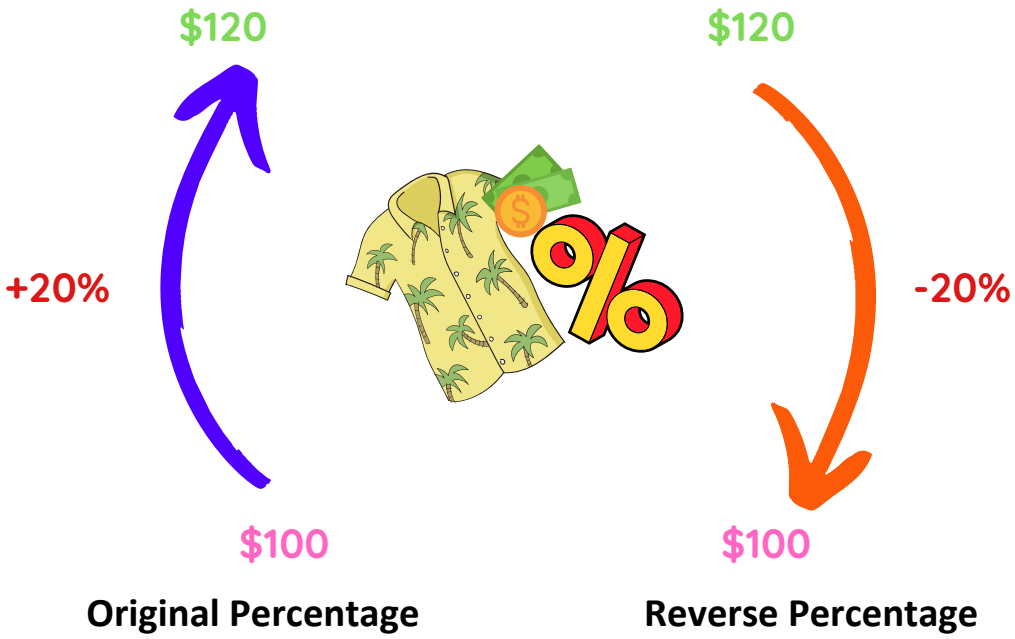
3. How Reverse Percentage is Different From Original Percentage?



Original Percentages:

- It is use when we know the original number or value and want to calculate a percentage of it.
- If original price of shirt is £100 then after 20% increase, the new price will be £120.

Reverse Percentages:

- It is use when we know the final value after a percentage change and want to find the original value.
- After a 20 % increase, the new price of a shirt is £120 then the original price of a shirt was £100.

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4. Steps to Solve Reverse Percentages.

Step#1: Understand the Question

Check the new value is increased or decreased after the change of original value:

- If the final value is after a **percentage increase**, **the formula is:**

$$\text{original value} = \frac{\text{Final value}}{1 + \frac{\text{percentage}}{100}}$$

- If the final value is after a **percentage decrease, the formula is:**

$$\text{original value} = \frac{\text{Final value}}{1 - \frac{\text{percentage}}{100}}$$

Step#2: Work out what percentage you now have.

Step#3: Solve the equation

- We know the original equivalent percentage for all the process is 100%.
- Use this to find the 1% of original price or value.

Step#4: Now multiply the 1% with 100% to get the original value or price.

Note: *To solve this easily, we should also know the concept of Original Percentages.*

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5. Solved Examples

Problem 1: A jacket costs **£60** after a **20%** discount. What was the original price?

Solution:

Step #1: Given,

- New value = **£60**
- Percentage increased = **20%**

Step #2: Applying the formula,

$$\text{original value} = \frac{\text{Final value}}{1 \pm \frac{\text{percentage}}{100}}$$

Step#3: Put the values in formula,

$$\text{original value} = \frac{60}{1 - \frac{20}{100}}$$

Step#4: Simplify the denominator,

$$= 1 - \frac{20}{100} = 1 - 0.20$$

$$= 0.80$$

Step#5: The final value is ,

$$\text{original value} = \frac{60}{0.80} = \frac{60 \times 100}{80}$$

$$\text{original value} = \frac{6000}{80} = 75$$

The original price of jacket was **£75.**

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Problem2: A product costs **£120** including **20%** VAT. What was the price before tax?

Solution:

Step #1: Given,

- New value = **£120**
- Percentage increased = **20%**

Step #2: Applying the formula,

$$\text{original value} = \frac{\text{Final value}}{1 \pm \frac{\text{percentage}}{100}}$$

Step#3: Put the values in formula,

$$\text{original value} = \frac{120}{1 + \frac{20}{100}}$$

Step#4: Simplify the denominator,

$$= 1 + \frac{20}{100} \quad = 1 + 0.2$$

$$= 1.2$$

Step#5: The final value is ,

$$\text{original value} = \frac{120}{1.2} = \frac{120 \times 10}{12}$$

$$\text{original value} = \frac{1200}{12} = 100$$

The original price of product was **£100.**

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Problem3: A house increased in value by **15%** and is now worth **£230,000**. What was its original price?

Solution:

Step #1: Given,

- New value = **£230,000**
- Percentage increased = **15%**

Step #2: Applying the formula,

$$\text{original value} = \frac{\text{Final value}}{1 \pm \frac{\text{percentage}}{100}}$$

Step#3: Put the values in formula,

$$\text{original value} = \frac{230000}{1 + \frac{15}{100}}$$

Step#4: Simplify the denominator,

$$= 1 + \frac{15}{100} = 1 + 0.15$$

$$= 1.15$$

Step#5: The final value is ,

$$\text{original value} = \frac{230000}{1.15} = \frac{230000 \times 100}{115}$$

$$\text{original value} = \frac{23000000}{115} = 200000$$

The original price of house was **£200,000.**