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| **UNIT 4: Fractions and percentages** |

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**SPECIFICATION REFERENCES**

N1 order positive and negative integers, decimals and fractions; use the symbols =, ≠, <, >, ≤, ≥

N2 apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative; understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals)

N3 recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions); use conventional notation for priority of operations, including brackets, powers, roots and reciprocals

N8 calculate exactly with fractions …

N10 work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and  or 0.375 and )

N12 interpret fractions and percentages as operators

N13 use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate

R3 express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1

R9 define percentage as ‘number of parts per hundred’; interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively; express one quantity as a percentage of another; compare two quantities using percentages; work with percentages greater than 100%; solve problems involving percentage change, including percentage increase/decrease, and original value problems and simple interest including in financial mathematics

S2 interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data, tables and line graphs for time series data and know their appropriate use

**PRIOR KNOWLEDGE**

Students should be able to use the four operations of number.

Students should be able to find common factors.

Students have a basic understanding of fractions as being ‘parts of a whole’.

Students should be able to define percentage as ‘number of parts per hundred’.

Students should know number complements to 10 and multiplication tables.

**KEYWORDS**

Decimal, percentage, inverse, addition, subtraction, multiplication, division, fractions, mixed, improper, recurring, integer, decimal, terminating, percentage, VAT, increase, decrease, multiplier, profit, loss

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| **4b. Percentages**  (N12, N13, R9) | **Teaching time**  5-7 hours |

**OBJECTIVES**

By the end of the sub-unit, students should be able to:

* Express a given number as a percentage of another number;
* Find a percentage of a quantity without a calculator: 50%, 25% and multiples of 10% and 5%;
* Find a percentage of a quantity or measurement (use measurements they should know from Key Stage 3 only);
* Calculate amount of increase/decrease;
* Use percentages to solve problems, including comparisons of two quantities using percentages;
* Percentages over 100%;
* Use percentages in real-life situations, including percentages greater than 100%:
* Price after VAT (not price before VAT);
* Value of profit or loss;
* Simple interest;
* Income tax calculations;
* Use decimals to find quantities;
* Find a percentage of a quantity, including using a multiplier;
* Use a multiplier to increase or decrease by a percentage in any scenario where percentages are used;
* Understand the multiplicative nature of percentages as operators.

**POSSIBLE SUCCESS CRITERIA**

What is 10%, 15%, 17.5% of £30?

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Sale prices offer an ideal opportunity for solving problems allowing students the opportunity to investigate the most effective way to work out the “sale” price.

Problems that involve consecutive reductions such as: Sale Prices are 10% off the previous day’s price. If a jacket is £90 on Monday, what is the price on Wednesday?

**COMMON MISCONCEPTIONS**

It is not possible to have a percentage greater than 100%.

**NOTES**

When finding a percentage of a quantity or measurement, use only measurements they should know from Key Stage 3.

Amounts of money should always be rounded to the nearest penny.

Use real-life examples where possible.

Emphasise the importance of being able to convert between decimals and percentages and the use of decimal multipliers to make calculations easier.